# UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

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| Attorney Docket No. | SRC015 CON |
| First Inventor | Jon M. Huppenthal et al. |
| Title | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS |
| | EFS-Web |

**APPLICATION ELEMENTS**

Commissioner for Patents
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1. ☐ Fee Transmittal Form
**(submit an original and a duplicate for fee processing)**
2. ☐ Applicant claims small entity status. See 37 CFR 1.27
3. ☒ Specification [ total pages 38 ]
(preferred Arrangement set forth below)
- Descriptive title of the Invention
- Cross References to Related Applications
- Statement Regarding Fed sponsored R&D
- Reference to sequence listing, a table, or a computer program listing appendix
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings
- Detailed Description
- Claim(s)
- Abstract of the Disclosure

4. ☒ Drawing(s) [ total sheets 20 ]
5. ☒ Oath or Declaration [ total pages 3 ]
a. ☐ Newly executed (original or copy)
b. ☒ Copy from prior appl. (37 C.F.R. § 1.63(d))
(for continuation/divisional with Box 18 completed)
i. ☐ DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s) named in prior application, see 37 C.F.R. §§ 1.63(d)(2) and1.33(b).

6. ☒ Application Data Sheet. (See 37 CFR 1.76
7. ☐ CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix)
8. Nucleotide and/or Amino Acid Sequence Submission (if *applicable, all necessary)*
a. ☐ Computer Readable Form
b. ☐ Specification Sequence Listing on:
i. ☐ CD-ROM or CD-R (2 copies); or
ii. ☐ paper
c. ☐ Statements verifying identity of above copies

**ACCOMPANYING APPLICATION PARTS**

9. ☐ Assignment Papers (coversheet/document(s))
10. ☐ 37 CFR. 3.73(b) Statement (*when there is an assignee*) ☒ Power of Attorney
11. ☐ English Translation Document
12. ☐ IDS & Form PTO/SB/08A ☐ Copies of IDS Citations
13. ☐ Preliminary Amendment
14. ☐ Return Receipt Postcard (MPEP 503)
15. ☐ Certified Copy of Priority Document(s)
16. ☐ Nonpublication Request Under 35 USC 122(b)(2)(B)(i).Applicant must attach form PTO/SB/35
17. ☐ Other: Certificate of Mailing by Express Mail

18. **If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheet under 37 CFR 1.76:**

☒ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: **10/285,318**

*Prior application information:* *Examiner:* **Coleman, Eric** *Group/Art Unit:* **2183**

FOR CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted form the submitted application parts.

**19. CORRESPONDENCE ADDRESS**

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| (Signature) | /Michael C. Martensen/ | Date | April 9, 2007 |

# MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS

## CROSS REFERENCE TO RELATED PATENT APPLICATIONS

The present application is a Continuation of U.S. Patent Application Serial No. 10/285,318 filed October 31, 2002 which is related to the subject matter of United States Patent Application Ser. No. 09/755,744 filed January 5, 2001 for: "Multiprocessor Computer Architecture Incorporating a Plurality of Memory Algorithm Processors in the Memory Subsystem" and is further related to the subject matter of United States Patent No. 6,434,687 for: "System and Method for Accelerating Web Site Access and Processing Utilizing a Computer System Incorporating Reconfigurable Processors Operating Under a Single Operating System Image", all of which are assigned to SRC Computers, Inc., Colorado Springs, Colorado and the disclosures of which are herein specifically incorporated in their entirety by this reference.

## COPYRIGHT NOTICE/PERMISSION

whatsoever. The following notice applies to the software and data and described below, inclusive of the drawing figures where applicable: 

## BACKGROUND OF THE INVENTION

The present invention relates, in general, to the field of computing systems and techniques. More particularly, the present invention relates to multi-adaptive processing systems and techniques for enhancing parallelism and performance of computational functions.

Currently, most large software applications achieve high performance operation through the use of parallel processing. This technique allows multiple processors to work simultaneously on the same problem to achieve a solution in a fraction of the time required for a single processor to accomplish the same result. The processors in use may be performing many copies of the same operation, or may be performing totally different operations, but in either case all processors are working simultaneously.

The use of such parallel processing has led to the proliferation of both multi-processor boards and large scale clustered systems. However, as more and more performance is required, so is more parallelism, resulting in ever larger systems. Clusters exist today that have tens of thousands of processors and can occupy football fields of space. Systems of such a large physical size present many obvious downsides, including, among other factors, facility requirements, power, heat generation and reliability.

SUMMARY OF THE INVENTION

However, if a processor technology could be employed that offers orders of magnitude more parallelism per processor, these systems could be reduced in size by a comparable factor. Such a processor or processing element is possible through the use of a reconfigurable processor. Reconfigurable processors instantiate only the functional units needed to solve a particular application, and as a result, have available space to instantiate as many functional units as may be required to solve the problem up to the total capacity of the integrated circuit chips they employ.

At present, reconfigurable processors, such as multi-adaptive processor elements (MAP™, a trademark of SRC Computers, Inc.) can achieve two to three orders of magnitude more parallelism and performance than state-of-the-art microprocessors. Through the advantageous application of adaptive processing techniques as disclosed herein, this type of reconfigurable processing parallelism may be employed in a variety of applications resulting in significantly higher performance than that which can now be achieved while using significantly smaller and less expensive computer systems.

However, in addition to these benefits, there is an additional much less obvious one that can have even greater impact on certain applications and has only become available with the advent of multi-million gate reconfigurable chips. Performance gains are also realized by reconfigurable processors due to the much tighter coupling of the parallel functional units within

each chip than can be accomplished in a microprocessor based computing system.

In a multi-processor, microprocessor-based system, each processor is allocated but a relatively small portion of the total problem called a cell. However, to solve the total problem, results of one processor are often required by many adjacent cells because their cells interact at the boundary and upwards of six or more cells, all having to interact to compute results, would not be uncommon. Consequently, intermediate results must be passed around the system in order to complete the computation of the total problem. This, of necessity, involves numerous other chips and busses that run at much slower speeds than the microprocessor thus resulting in system performance often many orders of magnitude lower than the raw computation time.

On the other hand, in the use of an adaptive processor-based system, since ten to one thousand times more computations can be performed within a single chip, any boundary data that is shared between these functional units need never leave a single integrated circuit chip. Therefore, data moving around the system, and its impact on reducing overall system performance, can also be reduced by two or three orders of magnitude. This will allow both significant improvements in performance in certain applications as well as enabling certain applications to be performed in a practical timeframe that could not previously be accomplished.

Particularly disclosed herein is a method for data processing in a reconfigurable computing system comprising a plurality of functional units. The method

comprises: defining a calculation for the reconfigurable computing system; instantiating at least two of the functional units to perform the calculation; utilizing a first of the functional units to operate upon a subsequent data dimension of the calculation and substantially concurrently utilizing a second of the functional units to operate upon a previous data dimension of the calculation.

Further disclosed herein is a method for data processing in a reconfigurable computing system comprising a plurality of functional units. The method comprises: defining a first systolic wall comprising rows of cells forming a subset of the plurality of functional units; computing a value at each of the cells in at least a first row of the first systolic wall; communicating the values between cells in the first row of the cells to produce updated values; communicating the updated values to a second row of the first systolic wall; and substantially concurrently providing the updated values to a first row of a second systolic wall of rows of cells in the subset of the plurality of functional units.

Also disclosed herein is a method for data processing in a reconfigurable processing system which includes setting up a systolic processing form employing a speculative processing strategy.

## BRIEF DESCRIPTION OF THE DRAWINGS

The aforementioned and other features and objects of the present invention and the manner of attaining them will become more apparent and the invention itself will be best understood by reference to the following

description of a preferred embodiment taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a simplified functional block diagram of typical clustered inter-processor communications path in a conventional multi-processor computing system;

Fig. 2 is a functional block diagram of an adaptive processor communications path illustrating the many functional units ("FU") interconnected by reconfigurable routing resources within the adaptive processor chip;

Fig. 3A is a graph of the actual performance improvement versus the number of processors utilized and illustrating the deviation from perfect scalability of a particular application utilizing a conventional multi-processor computing system such as that illustrated in Fig. 1;

Fig. 3B is a corresponding graph of the actual performance improvement versus the number of processors utilized and illustrating the performance improvement over a conventional multi-processor computing system utilizing an adaptive processor-based computing system such as that illustrated in Fig. 2;

Fig. 4A is a simplified logic flowchart illustrating a conventional sequential processing operation in which nested Loops A and B are alternately active on different phases of the process;

Fig. 4B is a comparative, simplified logic flowchart illustrating multi-dimensional processing in accordance with the technique of the present invention wherein multiple dimensions of data are processed by both Loops A and B such that the computing system logic is operative on every clock cycle;

Fig. 5A is illustrative of a general process for performing a representative multi-dimensional pipeline operation in the form of a seismic migration imaging function utilizing the parallelism available in the utilization of the adaptive processing techniques of the present invention;

Fig. 5B is a follow-on illustration of the computation phases employed in implementing the exemplary seismic migration imaging function of the preceding figure;

Fig. 6A is a simplified logic flowchart for a particular seismic migration imaging application illustrative of the parallelism provided in the use of an adaptive processor-based computing system;

Fig 6B illustrates the computational process which may be employed by a microprocessor in the execution of the seismic imaging application of the preceding figure;

Fig. 6C illustrates the first step in the computational process which may be employed by an adaptive processor in the execution of the seismic imaging application of Fig. 6A in which a first shot (S1) is started;

Fig. 6D illustrates the second step in the same computational process for the execution of the seismic imaging application of Fig. 6A in which a second shot (S2) is started;

Fig. 6E illustrates the third step in the same computational process for the execution of the seismic imaging application of Fig. 6A in which the operation on the first and second shots is continued through compute;

Fig. 6F illustrates the fourth step in the same computational process showing the subsequent operation on shots S1 and S2;

Fig. 6G illustrates the fifth step in the same computational process followed by the continued downward propagation of shots S1 and S2 over all of the depth slices;

Fig. 7A illustrates a process for performing a representative systolic wavefront operation in the form of a reservoir simulation function also utilizing the parallelism available in the utilization of the adaptive processing techniques of the present invention;

Fig. 7B illustrates the general computation of fluid flow properties in the reservoir simulation of the preceding figure which are communicated to neighboring cells;

Fig. 7C illustrates the creation of a systolic wall of computation at Time Set 1 which has been started for a vertical wall of cells and in which communication of values between adjacent rows in the vertical wall can occur without storing values to memory;

Fig. 7D is a follow on illustration of the creation of a systolic wall of computation at Time Set 1 and Time Set 2 showing how a second vertical wall of cells is started after the computation for cells in the corresponding row of the first wall has been completed;

Fig. 8A illustrates yet another process for performing a representative systolic wavefront operation in the form of the systolic processing of bioinformatics also utilizing the parallelism available in the

utilization of the adaptive processing techniques of the present invention;

Fig. 8B illustrates a systolic wavefront processing operation which further incorporates a speculative processing strategy based upon an evaluation of the rate of change of XB;

Fig. 8C is a further illustration of the systolic wavefront processing operation of the preceding figure incorporating speculative processing;

Fig. 9A illustrates still another process for performing a representative systolic wavefront operation in the form of structure codes calculating polynomials at grid intersections, again utilizing the parallelism available in the utilization of the adaptive processing techniques of the present invention;

Fig. 9B illustrates the computation start for a vertical wall of grid points at Time Set 1 for a polynomial evaluation performed on grid intersections wherein calculations between rows are done in a stochastic fashion using values from a previous row; and

Fig. 9C is a further illustration of the polynomial evaluation performed on grid intersections of the preceding figure wherein a second wall is started after the cells in the corresponding row of the first wall have been completed.

## DESCRIPTION OF A REPRESENTATIVE EMBODIMENT

This application incorporates by reference the entire disclosure of Caliga, D. et al. "Delivering Acceleration: "The Potential for Increased HPC Application Performance Using Reconfigurable Logic", SC2001, November 2001, ACM 1-58113-293-X/01/0011.

With reference now to Fig. 1, a simplified functional block diagram of typical clustered inter-processor communications path in a conventional multi-processor computing system 100 is shown. The computer system comprises a number of memory and input/output ("I/O" controller integrated circuits ("ICs") $102_0$ through $102_N$, (e.g. "North Bridge") 102 such as the P4X333/P4X400 devices available from VIA Technologies, Inc.; the M1647 device available from Acer Labs, Inc. and the 824430X device available from Intel Corporation. The North Bridge IC 102 is coupled by means of a Front Side Bus ("FSB") to one or more microprocessors $104_{00}$ though $104_{03}$ and $104_{N0}$ through $104_{N3}$ such as one of the Pentium® series of processors also available from Intel Corporation.

The North Bridge ICs $102_0$ through $102_N$ are coupled to respective blocks of memory $106_0$ through $106_N$ as well as to a corresponding I/O bridge element $108_0$ through $108_N$. A network interface card ("NIC") $110_0$ through $210_N$ couples the I/O bus of the respective I/O bridge $108_0$ through $108_N$ to a cluster bus coupled to a common clustering hub (or Ethernet Switch) 112.

Since typically a maximum of four microprocessors 104, each with two or four functional units, can reside on a single Front Side Bus, any communication to more than four must pass over the Front Side Bus, inter-bridge bus, input/output ("I/O") bus, cluster interconnect (e.g. an Ethernet clustering hub 112) and then back again to the receiving processor 104. The I/O bus is typically an order of magnitude lower in bandwidth than the Front Side Bus, which means that any

processing involving more than the four processors 104 will be significantly throttled by the loose coupling caused by the interconnect. All of this is eliminated with a reconfigurable processor having hundreds or thousands of functional units per processor.

With reference additionally now to Fig. 2, a functional block diagram of an adaptive processor 200 communications path for implementing the technique of the present invention is shown. The adaptive processor 200 includes an adaptive processor chip 202 incorporates a large number of functional units ("FU") 204 interconnected by reconfigurable routing resources. The adaptive processor chip 202 is coupled to a memory element 206 as well as an interconnect 208 and a number of additional adaptive processor chips 210.

As shown, each adaptive processor chip 202 can contain thousands of functional units 204 dedicated to the particular problem at hand. Interconnect between these functional units is created by reconfigurable routing resources inside each chip 202. As a result, the functional units 204 can share or exchange data at much higher data rates and lower latencies than a standard microprocessor 104 (Fig. 1). In addition, the adaptive processor chips 202 can connect directly to the inter-processor interconnect 208 and do not require the data to be passed through multiple chips in a chipset in order to communicate. This is because the adaptive processor can implement whatever kind of interface is needed to accomplish this connection.

With reference additionally now to Fig. 3A, a graph of the actual performance improvement versus the number

of processors utilized in a conventional multi-processor computing system 100 (Fig. 1) is shown. In this figure, the deviation from perfect scalability of a particular application is illustrated for such a system.

With reference additionally now to Fig. 3B, a corresponding graph of the actual performance improvement versus the number of processors utilized in an adaptive processor-based computing system 200 (Fig. 2) is shown. In this figure, the performance improvement provided with an adaptive processor-based computing system 200 over that of a conventional multi-processor computing system 100 is illustrated.

With reference additionally now to Fig. 4A, a simplified logic flowchart is provided illustrating a conventional sequential processing operation 400 in which nested Loops A (first loop 402) and B (second loop 404) are alternately active on different phases of the process.

As shown, the standard implementation of applications that have a set of nested loops 402,404 is to complete the processing of the first loop 402 before proceeding to the second loop 404. The problem inherent in this approach, particularly when utilized in conjunction with field programmable gate arrays ("FPGAs") is that all of the logic that has been instantiated is not being completely utilized.

With reference additionally now to Fig. 4B, a comparative, simplified logic flowchart is shown illustrating a multi-dimensional process 410 in accordance with the technique of the present invention. The multi-dimensional process 410 is effectuated such

that multiple dimensions of data are processed by both Loops A (first loop 412) and B (second loop 414) such that the computing system logic is operative on every clock cycle.

In contrast to the sequential processing operation 400 (Fig. 4A) the solution to the problem of most effectively utilizing available resources is to have an application evaluate a problem in a data flow sense. That is, it will "pass" a subsequent dimension of a given problem through the first loop 412 of logic concurrently with the previous dimension of data being processed through the second loop 414. In practice, a "dimension" of data can be: multiple vectors of a problem, multiple planes of a problem, multiple time steps in a problem and so forth.

With reference additionally now to Fig. 5A, a general process for performing a representative multi-dimensional pipeline operation is shown in the form of a seismic migration imaging function 500. The process 500 can be adapted to utilize the parallelism available in the utilization of the adaptive processing techniques of the present invention in the form of a multi-adaptive processor (MAP™, a trademark of SRC Computers, Inc., assignee of the present invention) STEP3d routine 502. The MAP STEP3d routine 502 is operation to utilize velocity data 504, source data 506 and receiver data 508 to produce a resultant image 510 as will be more fully described hereinafter.

With reference additionally now to Fig. 5B, the MAP STEP3d routine 502 of the preceding figure is shown in

the various computational phases of: MAPTRI_x 520, MAPTRI_y 522, MAPTRI_d+ 524 and MAPTRI_d- 526.

With reference additionally now to Fig. 6A, a simplified logic flowchart for a particular seismic migration imaging application 600 is shown. The seismic migration imaging application 600 is illustrative of the parallelism provided in the use of an adaptive processor-based computing system 200 such as that shown in Fig. 2. The representative application 600 demonstrates a nested loop parallelism in the tri-diagonal solver and the same logic can be implemented for the multiple tri-diagonal solvers in the x, y, d+ and d- directions. The computational phases of: MAPTRI_x 520, MAPTRI_y 522, MAPTRI_d+ 524 and MAPTRI_d- 526 are again illustrated.

With reference additionally now to Fig. 6B, a computational process 610 is shown which may be employed by a microprocessor ("mP") in the execution of the seismic imaging application 600 of the preceding figure. The process 610 includes the step 612 of reading the source field [$S(Z_0)$] and receiver field [$R(Z_0)$] as well as the velocity field [$V(Z_0)$] at step 614. At step 616 values are computed for $S(Z_{nz}), R(Z_{nz})$ which step is followed by the phases MAPTRI_x 520 and MAPTRI_y 522. At step 618, the image of $Z_{1/2}$ is computed. This is followed by the phases MAPTRI_d+ 524 and MAPTRI_d- 526 to produce the resultant image Z at step 620. The process 610 loops over the depth slices as indicated by reference number 622 and loops over the shots as indicated by reference number 624.

With reference additionally now to Fig. 6C, the first step in a computational process 650 in accordance with the technique of the present invention is shown in which a first shot (S1) is started. The process 650 may be employed by an adaptive processor (e.g. a MAP™ adaptive processor) as disclosed herein in the execution of the seismic imaging application 600 of Fig. 6A. As indicated by the shaded block, the phase MAPTRI_x 520 is active.

With reference additionally now to Fig. 6D, the second step in the computational process 650 is shown at a point at which a second shot (S2) is started. Again, as indicated by the shaded blocks, the phase MAPTRI_x 520 is active for S2, the phase MAPTRI_y 522 is active for S1 and image $Z_{1/2}$ has been produced at step 618. As shown, adaptive processors in accordance with the disclosure of the present invention support computation pipelining in multiple dimensions and the parallelism in Z and shots is shown at step 612.

With reference additionally now to Fig. 6E, the third step in the computational process 650 is shown in which the operation on the first and second shots is continued through compute. As indicated by the shaded blocks, the phase MAPTRI_d+ 524 is active for S1, the phase MAPTRI_y 522 is active for S2 and image $Z_{1/2}$ has been produced at step 618.

With reference additionally now to Fig. 6F, the fourth step in the computational process 650 is shown illustrating the subsequent operation on shots S1 and S2. The phase MAPTRI_d+ 524 is active for S2, the phase

MAPTRI_d- 526 is active for S1 and image Z has been produced at step 620.

With reference additionally now to Fig. 6G, the fifth step in the computational process 650 is shown as followed by the continued downward propagation of shots S1 and S2 over all of the depth slices. The phase MAPTRI_x 520 is active for S1, the phase MAPTRI_d- 526 is active for S2 and image Z has been produced at step 620.

With reference additionally now to Fig. 7A, a process 700 for performing a representative systolic wavefront operation in the form of a reservoir simulation function is shown which utilizes the parallelism available in the adaptive processing techniques of the present invention. The process 700 includes a "k" loop 702, "j" loop 704 and "i" loop 706 as shown.

With reference additionally now to Fig. 7B, the general computation of fluid flow properties in the reservoir simulation process 700 of the preceding figure are illustrated as values are communicated between a group of neighboring cells 710. The group of neighboring cells 710 comprises, in the simplified illustration shown, first, second and third walls of cells 712, 714 and 716 respectively. Each of the walls of cells includes a corresponding number of first, second, third and fourth rows 718, 720, 722 and 724 respectively.

As shown, the computation of fluid flow properties are communicated to neighboring cells 710 and, importantly, this computation can be scheduled to

eliminate the need for data storage. In accordance with the technique of the present invention, a set of cells can reside in an adaptive processor and the pipeline of computation can extend across multiple adaptive processors. Communication overhead between multiple adaptive processors may be advantageously minimized through the use of MAP™ adaptive processor chain ports as disclosed in U.S. Patent No. 6,339,819 issued on January 15, 2002 for: "Multiprocessor With Each Processor Element Accessing Operands in Loaded Input Buffer and Forwarding Results to FIFO Output Buffer", assigned to SRC Computers, Inc., assignee of the present invention, the disclosure of which is herein specifically incorporated by this reference.

With reference additionally now to Fig. 7C, the creation of a systolic wall 712 of computation at Time Set 1 is shown. The systolic wall 712 has been started for a vertical wall of cells and communication of values between adjacent rows 718 through 724 in the vertical wall can occur without storing values to memory.

With reference additionally now to Fig. 7D, a follow on illustration of the creation of a systolic wall 712 of computation at Time Set 1 and a second systolic wall 714 at Time Set 2 is shown. In operation, a second vertical wall of cells is started after the computation for cells in the corresponding row of the first wall has been completed. Thus, for example, at time $t_0$, the first row 718 of systolic wall 712 is completed and the results passed to the first row 718 of the second systolic wall 714. At time $t_1$, the second row 720 of the first systolic wall 712 and the first row

718 of the second systolic wall 714 are computed. Thereafter, at time $t_2$, the third row 722 of the first systolic wall 712 and the second row 720 of the second systolic wall 714 are computed. The process continues in this manner for all rows and all walls.

With reference additionally now to Fig. 8A, yet another process 800 for performing a representative systolic wavefront operation is shown. The process 800 is in the form of the systolic processing of bioinformatics and also utilizes the parallelism available in the adaptive processing techniques of the present invention. As shown, systolic processing in the process 800 can pass previously computed data down within a column (e.g. one of columns 802, 804 and 806) as to subsequent columns as well (e.g. from column 802 to 804; from column 804 to 806 etc.) The computational advantage provided is the processing of the second column 804 can begin after only a few clock cycles following the start of the processing of the first column 802 to compute the first "match" state.

With reference additionally now to Fig. 8B, a systolic wavefront processing operation 810 is shown. The processing operation 810, comprising "i" loop 812 and "k" loop 814 now further incorporates a speculative processing strategy based upon an evaluation of the rate of change of XB.

A straightforward systolic processing operation could be used for performing the operation 810 but for the problem inherent in the computation of XB as its value XB[i] 816 can not be known until the completion of the entire "k" loop 814. After evaluating the rate of

change of XB, it was determined that a speculative processing strategy could be used for the problem. A normal systolic form is set up and the value of XB is held constant for the set of columns computed in the systolic set. At the bottom of each column, the value of XB[i] 816 is then computed.

With reference additionally now to Fig. 8C, a further illustration of the systolic wavefront processing operation 810 incorporating speculative processing of the preceding figure is shown. The speculative processing includes "j" columns $818_0$ through $818_j$ as shown. Each of the columns 818 assumes that XB[i+j] has a constant value. A test is conducted at the bottom of each of the columns 818 to determine with the XB value changes as indicated at steps $820_1$ through $820_j$. If the value of XB changes at the i+n column, the process is then restarted at that column 818. Since the rate of change of XB is relatively slow, the "cost" of the compute operation can be greatly reduced.

With reference additionally now to Fig. 9A, another process 900 for performing a representative systolic wavefront operation is shown in the form of structure codes calculating polynomials at grid intersections 902. The process 900 advantageously utilizes the parallelism available in the adaptive processing techniques of the present invention.

With reference additionally now to Figs. 9B and 9C, the computation start for a vertical wall 910 of grid points at Time Set 1 is shown for a polynomial evaluation performed on grid intersections 902 (Fig. 9A) wherein calculations between rows 912, 914, 016 and 918

are done in a stochastic fashion using values from a previous row. As shown, a polynomial evaluation is performed on the grid intersections 902 such that a second wall $910_1$ is started after the cells in the corresponding row of the first wall $910_0$ have been completed.

As can be determined from the foregoing, the multi-adaptive processing systems and techniques for enhancing parallelism and performance of computational functions disclosed herein can be employed in a myriad of applications including multi-dimensional pipeline computations for seismic applications, search algorithms, information security, chemical and biological applications, filtering and the like as well as for systolic wavefront computations for fluid flow and structures analysis, bioinformatics etc. Some applications may also employ both the multi-dimensional pipeline and systolic wavefront methodologies.

Following are representative applications of the techniques for adaptive processor based computation disclosed herein:

**Imaging**

Seismic: These applications, typically used in the oil and gas exploration industries, process echo data to produce detailed analysis of subsurface features. The applications use data collected at numerous points and consisting of many repeated parameters. Due to this, these programs are ideal candidates to take advantage of parallel computing. In addition, because the results of the computation on one data point are used in the computation of the next, these programs will

particularly benefit from the tight parallelism that can be found in the use of adaptive or reconfigurable processors.

Synthetic Aperture Radar ("SAR"): These applications are typically used in geographical imaging. The applications use data collected in swaths. Processing consists of repeated operations on data that has been sectioned in cells. These programs are also ideal candidates to take advantage of parallel computing and in particular to benefit from the tight parallelism that can be found in adaptive or reconfigurable processors.

JPEG Image compression: These applications partition an image into numerous blocks. These blocks then have a set of operations performed on them. The operations can be parallelized across numerous blocks. The combination of the set of operations and the parallelism will particularly benefit from the tight parallelism that can be found in adaptive or reconfigurable processors.

MPEG Image compression: These applications partition a frame into numerous blocks. These blocks then have a set of operations performed on them. The operations can be parallelized across numerous blocks. In addition, there are numerous operations that are performed on adjacent frames. The combination of the set of operations and the parallelism will particularly benefit from the tight parallelism that can be found in adaptive or reconfigurable processors.

**Fluid flow**

Reservoir Simulation: These applications, also typically used in the oil and gas production industries, process fluid flow data in the oil and gas subsurface reservoirs to produce extraction models. The application will define a three dimensional ("3d") set of cells that contain the oil and gas reservoir. These programs are ideal candidates to take advantage of parallel or adaptive computing because there are repeated operations on each cell. In addition, information computed for each cell is then passed to neighboring cells. These programs will particularly benefit from the tight parallelism that can be found in adaptive or reconfigurable processors.

Weather prediction: Such an application will partition the forecast area into logical grid cells. The computational algorithms will then perform calculations that have polynomials that have nodes associated with the grid cells. These programs are ideal candidates to take advantage of adaptive or parallel computing because there are repeated operations on each cell associated with the set of times computed in the forecast.

Automotive: These applications investigate the aerodynamics of automobile or other aerodynamic structures. The application generally divides the space surrounding the automobile structure into logical cells that are associated with nodes in computational polynomials. These programs are ideal candidates to take advantage of adaptive or parallel computing because there are repeated operations on each cell associated

with the set of wind velocities computed in the forecast. These programs will benefit from the tight parallelism that can be found in adaptive or reconfigurable processors.

Aerospace: These applications investigate the aerodynamics of aerospace/airplane structures. The application divides the space surrounding the aerospace/airplane structure into logical cells that are associated with nodes in computational polynomials. These programs are ideal candidates to take advantage of parallel computing because there are repeated operations on each cell associated with the set of wind velocities computed in the forecast. These programs will benefit from the tight parallelism that can be found in adaptive or reconfigurable processors.

Plastic Injection Molding: These applications investigate the molding parameters of injecting liquid plastic into molds. The application divides the space inside the mold into logical cells that are also associated with nodes in computational polynomials. These programs are ideal candidates to take advantage of parallel computing because there are repeated operations on each cell associated with the set of injection parameters. These programs will benefit from the tight parallelism that can be found in adaptive or reconfigurable processors.

**Structures**

Crash Analysis: These applications are typically used in the automotive or aviation industry. The application will partition the entire automobile into components. These components are then subdivided into

cells. The application will analyze the effect of a collision on the structure of the automobile. These programs are ideal candidates for parallel computing because there are repeated operations on each cell and they receive computed information from their neighboring cells. These programs will benefit from the tight parallelism that can be found in adaptive or reconfigurable processors.

Structural Analysis: These applications investigate the properties of structural integrity. The application divides the structure into logical cells that are associated with nodes in computational polynomials. These programs are ideal candidates to take advantage of parallel computing because there are repeated operations on each cell associated with load and stress. These programs will benefit from the tight parallelism that can be found in adaptive or reconfigurable processors.

**Search algorithms**

Image searches: These applications are typically used in the security industry for fingerprint matching, facial recognition and the like. The application seeks matches in either a collection of subsets of the total image or the total image itself. The process compares pixels of the model to pixels of a record from an image database. These programs are ideal candidates for parallel computing because of the correlation of comparison results that exist for each pixel in the subsets or entire image. These programs will benefit from the tight parallelism that can be found in adaptive or reconfigurable processors.

Data mining: These applications are typically used in commercial market spaces. The application seeks matches in a set of search information (e.g. character strings) in each record in a database. The application then produces a match correlation for all data records. A match correlation is produced from the comparison results for each set of search information with all characters in a database record. These programs are ideal candidates for parallel computing because of the repeated comparison operations that exist all character comparisons of the set of search information with each character in the database record. These programs will benefit from the tight parallelism that can be found in adaptive or reconfigurable processors.

**Finance**

Financial modeling: The application creates numerous strategies for each decision step in the modeling process. The results of a computational step are feed into another set of strategies for subsequence modeling steps. These programs are ideal candidates to take advantage of parallel computing because there are repeated operations on each strategy within a modeling step. These programs will benefit from the tight parallelism that can be found in adaptive or reconfigurable processors.

**Information Security**

Encryption/Decryption: The application applies an algorithm that converts the original data into an encrypted, or "protected", form. The process is applied to each set of N bits in the original data. Decryption reverses the process to deliver the original data.

These programs are ideal candidates for parallel computing because there are repeated operations on each N bits of data. These programs will benefit from the tight parallelism that can be found in adaptive or reconfigurable processors.

**Chemistry/Biology**

Genetic pattern matching: These applications are typically used in the bioinformatics industry. The application looks for matches of a particular genetic sequence (or model) to a database of genetic records. The application compares each character in the model to the characters in genetic record. These programs are ideal candidates for parallel computing because of the repeated comparison operations that exist for all character comparisons of the model with each character in the genetic record. These programs will benefit from the tight parallelism that can be found in adaptive or reconfigurable processors.

Protein Folding: These applications are typically used by pharmaceutical companies. The application investigates the dynamics of the deformation of the protein structure. The application uses a set of equations which are recomputed at various "time" intervals to model the protein folding. These programs are ideal candidates for parallel computing because of the repeated computations on a large set of time intervals in the modeling sequence. These programs will benefit from the tight parallelism that can be found in adaptive or reconfigurable processors

Organic structure interaction: These applications are typically used by chemical and drug companies. The

application investigates the dynamics of organic structures as they are interacting. The application uses a set of equations which are recomputed at various "time" intervals to model how the organic structure interact. These programs are ideal candidates for parallel computing because of the repeated computations on a large set of time intervals in the modeling sequence. These programs will benefit from the tight parallelism that can be found in adaptive or reconfigurable processors

**Signals**

Filtering: Applications often utilize filtering techniques to "clean-up" a recorded data sequence. This technique is utilized in a wide variety of industries. The application generally applies a set of filter coefficients to each data point in the recorded sequence. These programs are ideal candidates for parallel computing because of the repeated computations to all data points in the sequence and all sequences. These programs will benefit from the tight parallelism that can be found in adaptive or reconfigurable processors.

While there have been described above the principles of the present invention in conjunction with specific, exemplary applications for the use of adaptive processor-based systems in the implementation of multi-dimensional pipeline and systolic wavefront computations, it is to be clearly understood that the foregoing descriptions are made only by way of example and not as a limitation to the scope of the invention. Particularly, it is recognized that the teachings of the

foregoing disclosure will suggest other modifications to those persons skilled in the relevant art. Such modifications may involve other features which are already known per se and which may be used instead of or in addition to features already described herein. Although claims have been formulated in this application to particular combinations of features, it should be understood that the scope of the disclosure herein also includes any novel feature or any novel combination of features disclosed either explicitly or implicitly or any generalization or modification thereof which would be apparent to persons skilled in the relevant art, whether or not such relates to the same invention as presently claimed in any claim and whether or not it mitigates any or all of the same technical problems as confronted by the present invention. The applicants hereby reserve the right to formulate new claims to such features and/or combinations of such features during the prosecution of the present application or of any further application derived therefrom.

What is claimed is:

CLAIMS:

1. A method for data processing in a reconfigurable computing system, the reconfigurable computing system comprising at least one reconfigurable processor, the reconfigurable processor comprising a plurality of functional units, said method comprising:

transforming an algorithm into a data driven calculation that is implemented by said reconfigurable computing system at the at least one reconfigurable processor;

forming at least two of said functional units at the at least one reconfigurable processor to perform said calculation wherein only functional units needed to solve the calculation are formed and wherein each formed functional unit at the at least one reconfigurable processor interconnects with each other formed functional unit at the at least one reconfigurable processor based on reconfigurable routing resources within the at least one reconfigurable processor as established at formation, and wherein lines of code of said calculation are formed as clusters of functional units within the at least one reconfigurable processor;

utilizing a first of said formed functional units to operate upon a subsequent data dimension of said calculation forming a first computational loop; and

substantially concurrently utilizing a second of said formed functional units to operate upon a previous data dimension of said calculation generating a second computational loop wherein said implementation of said calculation enables said first computational loop and said second computational loop execute concurrently and

pass computed data seamlessly between said computational loops.

2. The method of claim 1 wherein said subsequent and previous data dimensions of said calculation comprise multiple vectors in said calculation.

3. The method of claim 1 wherein said subsequent and previous data dimensions of said calculation comprise multiple planes in said calculation.

4. The method of claim 1 wherein said subsequent and previous data dimensions of said calculation comprise multiple time steps in said calculation.

5. The method of claim 1 wherein said subsequent an previous data dimensions of said calculation comprise multiple grid points in said calculation.

6. The method of claim 1 wherein said calculation comprises a seismic imaging calculation.

7. The method of claim 1 wherein said calculation comprises a synthetic aperture radar imaging calculation.

8. The method of claim 1 wherein said calculation comprises a JPEG image compression calculation.

9. The method of claim 1 wherein said calculation comprises an MPEG image compression calculation.

10. The method of claim 1 wherein said calculation comprises a fluid flow calculation for a reservoir simulation.

11. The method of claim 1 wherein said calculation comprises a fluid flow calculation for weather prediction.

12. The method of claim 1 wherein said calculation comprises a fluid flow calculation for automotive applications.

13. The method of claim 1 wherein said calculation comprises a fluid flow calculation for aerospace applications.

14. The method of claim 1 wherein said calculation comprises a fluid flow calculation for an injection molding application.

15. The method of claim 1 wherein instantiating includes establishing a stream communication connection between functional units.

16. The method of claim 1 wherein said calculation is comprises a structures calculation for structural analysis.

17. The method of claim 1 wherein said calculation comprises a search algorithm for an image search.

18. The method of claim 1 wherein said calculation comprises a search algorithm for data mining.

19. The method of claim 1 wherein said calculation comprises a financial modeling application.

20. The method of claim 1 wherein said calculation comprises an encryption algorithm.

21. The method of claim 1 wherein said calculation comprises a genetic pattern matching function.

22. The method of claim 1 wherein said calculation comprises a protein folding function.

23. The method of claim 1 wherein said calculation comprises an organic structure interaction function.

24. The method of claim 1 wherein said calculation comprises a signal filtering application.

25. A method for data processing in a reconfigurable computing system, the reconfigurable computing system comprising at least one reconfigurable processor comprising a plurality of functional units, said method comprising:

transforming an algorithm into a data driven calculation that is implemented by said reconfigurable computing system at the at least one reconfigurable processor wherein linked lines of code of said calculation are fashioned as walls of functional units within the at least one reconfigurable processor;

defining a first wall comprising rows of cells forming a subset of said plurality of functional units;

computing at the at least one reconfigurable processor a value at each of said cells in at least a first row of said first wall substantially concurrently;

communicating said values between cells in said first row of said cells to produce updated values, wherein communicating said values is based on reconfigurable routing resources within the at least one reconfigurable processor;

communicating said updated values substantially concurrently to a second row of said first wall, wherein communicating said updated values is based on reconfigurable routing resources within the at least one reconfigurable processor; and

communicating said updated values substantially concurrently to a first row of a second wall of rows of cells in said subset of said plurality of functional units, wherein communicating said updated values is based on reconfigurable routing resources within the at least one reconfigurable processor and wherein said first wall of rows of cells and said second wall of rows of cells execute substantially concurrently and pass computed data seamlessly between said walls.

26. The method of claim 25 wherein said values correspond to vectors in a computation.

27. The method of claim 25 wherein said values correspond to planes in a computation.

28. The method of claim 25 wherein said values correspond to time steps in a computation.

29. The method of claim 25 wherein said values correspond to grid points in a computation.

30. The method of claim 25 wherein said step of communicating said updated values to a second row of said first systolic wall is carried out without storing said updated values in an extrinsic memory.

31. The method of claim 25 wherein said values correspond to a seismic imaging calculation.

32. The method of claim 25 wherein said values correspond to a synthetic aperture radar imaging calculation.

33. The method of claim 25 wherein said values correspond to a JPEG image compression calculation.

34. The method of claim 25 wherein said values correspond to an MPEG image compression calculation.

35. The method of claim 25 wherein said values correspond to a fluid flow calculation for a reservoir simulation.

36. The method of claim 25 wherein said values correspond to a fluid flow calculation for weather prediction.

37. The method of claim 25 wherein said values correspond to a fluid flow calculation for automotive applications.

38. The method of claim 25 wherein said values correspond to a fluid flow calculation for aerospace applications.

39. The method of claim 25 wherein said values correspond to a fluid flow calculation for an injection molding application.

40. The method of claim 25 wherein defining includes establishing a stream communication connection between functional units and wherein only functional units needed to solve the calculations are instantiated.

41. The method of claim 25 wherein said values correspond to a structures calculation for structural analysis.

42. The method of claim 25 wherein said values correspond to a search algorithm for an image search.

43. The method of claim 25 wherein said values correspond to a search algorithm for data mining.

44. The method of claim 25 wherein said values correspond to a financial modeling application.

45. The method of claim 25 wherein said values correspond to an encryption algorithm.

46. The method of claim 25 wherein said values correspond to a genetic pattern matching function.

47. The method of claim 25 wherein said values correspond to a protein folding function.

48. The method of claim 25 wherein said values correspond to an organic structure interaction function.

49. The method of claim 25 wherein said values correspond to a signal filtering application.

50. The method of claim 25 wherein said reconfigurable computing system comprises at least one microprocessor.

51. A method for data processing in a reconfigurable computing system, the reconfigurable computer system comprising at least one reconfigurable processor

comprising a plurality of functional units, said method comprising:

transforming an algorithm into a calculation implemented by said reconfigurable computing system at the at least one reconfigurable processor and driven by data propagation wherein lines of code of said calculation are linked based on said data propagation and fashioned as subsets of said plurality of functional units within the at least one reconfigurable processor forming columns of said calculation;

performing said calculation at the at least one reconfigurable processor by said subsets of said plurality of functional units to produce computed data;

exchanging said computed data between a first column of said calculation and a next column in said calculation, wherein said exchanging is based on reconfigurable routing resources within the at least one reconfigurable processor and wherein execution of said subsets of said plurality of function units occurs concurrently and said computed data is seamlessly passed between said first column of said calculation and said second column of said calculation;

evaluating a rate of change in at least one variable for each of said columns in said calculation;

continuing said calculation when said variable does not change for a particular column of said calculation; and

restarting said calculation at said column of said calculation where said variable does change.

52. The method of claim 51 wherein how many functional units comprise the subset and functional type of each

functional unit in said subset is based on the calculation.

ABSTRACT OF THE DISCLOSURE

Multi-adaptive processing systems and techniques for enhancing parallelism and performance of computational functions are disclosed which can be employed in a myriad of applications including multi-dimensional pipeline computations for seismic applications, search algorithms, information security, chemical and biological applications, filtering and the like as well as for systolic wavefront computations for fluid flow and structures analysis, bioinformatics etc. Some applications may also employ both the multi-dimensional pipeline and systolic wavefront methodologies disclosed.

# DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☐ Declaration Submitted with Initial Filing OR ☒ Declaration Submitted after Initial Filing--surcharge 37 CFR 1.16(e) required

| | |
|---|---|
| Attorney Docket No. | SRC015 |
| First Named Inventor | Jon M. Huppenthal et al. |
| *COMPLETE IF KNOWN* | |
| Application Number | 10/285,318 |
| Filing Date | October 31, 2002 |
| Group Art Unit | 2121 |
| Examiner Name | Not yet assigned |

As a below named Inventor, I hereby declare that:

My residence, mailing address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS

the specification of which

☐ is attached hereto

OR

☒ was filed on (MM/DD/YYYY) 10/31/2002

and was amended on (MM/DD/YYYY)

as U.S. Application No. or PCT International Application No. 10/285,318 (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C § 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

| Prior Foreign Appl. No.(s) | Country | Foreign Filing Date (MM/DD/YYYY) | Priority Not Claimed | Certified Copy Attached? Yes | No |
|---|---|---|---|---|---|
| | | | ☐ | ☐ | ☐ |
| | | | ☐ | ☐ | ☐ |

☐ Additional foreign application nos. are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below.

| Application Number(s) | Filing Date (MM/DD/YYYY) |
|---|---|
| | |

# DECLARATION – Utility or Design Patent Application

I hereby claim the benefit under 35 U.S.C. 120 of any U.S. application(s) or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application

| U.S. Parent Application or PCT Parent No. | Parent Filing Date (MM/DD/YY) | Parent Patent No. (if applicable) |
|---|---|---|
| | | |

☐ Additional U.S. or PCT international application nos. listed on PTO/SB/02B attached hereto.

As a named inventor, I hereby appoint the following registered practitioner(s) to prosecute this application and to transact all business in the Patent Trademark Office connected therewith:

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OR

☐ Registered practitioner(s) name/registration number listed below

| Name | Registration Number | Name | Registration Number |
|---|---|---|---|
| | | | |

☐ Additional registered practitioner(s) named on supplemental sheet PTO/SB/02C attached hereto.

Direct all correspondence to: ☒ Customer Number **25235** OR ☐ Correspondence address below

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| **City** | | **State** | | **ZIP** | |
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and such willful false statements may jeopardize the validity of the application or any patent issued thereon.

**Name of Sole or First Inventor:** ☐ A petition has been filed for this unsigned inventor.

| Given Name (first and middle [if any]) | Family Name or Surname |
|---|---|
| **Jon M.** | **Huppenthal** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Inventor's Signature | Jon Huppenthal | | | | Date 1/6/03 | | |
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☒Additional inventors are named on _1__supplemental additional inventor(s) sheet(s) PTO/SB/02A attached

| DECLARATION | ADDITIONAL INVENTOR(S)<br>Supplemental Sheet<br>Page __1__ of __1___ |
|---|---|

| Name of Additional Joint Inventor, if any: | ☐ A petition has been filed for this unsigned inventor |
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| **David E.** | **Caliga** |

| Inventor's Signature | D E. Caliga | | | | | Date | 1/6/2003 |
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| Given Name (first and middle [if any]) | Family Name or Surname |
| | |

| Inventor's Signature | | | | | | Date | |
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| Residence: City | | State | | Country | | Citizenship | |
| Mailing Address | | | | | | | |
| City | | State | | ZIP | | Country | |

| Name of Additional Joint Inventor, if any: | ☐ A petition has been filed for this unsigned inventor |
|---|---|
| Given Name (first and middle [if any]) | Family Name or Surname |
| | |

| Inventor's Signature | | | | | | Date | |
|---|---|---|---|---|---|---|---|
| Residence: City | | State | | Country | | Citizenship | |
| Mailing Address | | | | | | | |
| City | | State | | ZIP | | Country | |

EFS-Web
Attorney Docket No. SRC015 CON
Client/Matter No. 80404.0018.001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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| Serial No. -----<br>Application of: Jon M. Huppenthal and David E. Caliga<br>Filed: Herewith<br>Attorney Docket No. SRC015 CON<br>For: MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS | Art Unit:<br>Confirmation No.:<br>Examiner:<br>Customer No.: **25235** |

INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. § 1.97

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to 37 C.F.R. § 1.97, the Examiner may wish to consider the references listed on the attached Form PTO/SB/08A. In submitting these references, no representation is made or implied that the references are or are not material to the examination of this application. Pursuant to 37 C.F.R. 1.98(d), copies of the references are not enclosed, as each reference was either provided or cited in U.S. Patent Application Serial No. 10/285,318, which is related to U.S. Patent Application Serial No. 09/755,744, which is related to U.S. Patent Application Serial No. 09/888,276, now U.S. Patent No. 6,434,687, from which priority under 35 U.S.C. 120 was claimed.

This Information Disclosure Statement is filed before mailing of a first Office Action in the above case. Accordingly, no fee is believed due. However, any fee associated herewith may be charged to Deposit Account No. 50-1123.

Respectfully submitted,

9 April 2009
Date

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PTO/SB/08a(08/03)
Approved for use through 07/31/2006. OMB 0651-0031
Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE


| Substitute for form 1449A/PTO | | | | Application Number | |
|---|---|---|---|---|---|
| | | | | Filing Date | **Herewith** |
| **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** | | | | First Named Inventor | **Jon M. Huppenthal et al.** |
| | | | | Art Unit | |
| *(Use as many sheets as necessay)* | | | | Examiner Name | |
| Sheet | 1 | of | 8 | Attorney Docket No. | **SRC015 CON** |

**U.S. PATENT DOCUMENTS**

| Examiner Initials | Cite No.[1] | Document No. No. – Kind Code[2] | Publication Date MM-DD-YYYY | Name of Patentee or Applicant of Cited Doc | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |
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| | | US-6,215,898 | 04/10/2001 | Woodfill et al. | Fig. 3 and col. 9, line 32-col. 16, line 45, and col. 57, line 6-col.67, line 23. |
| | | US-5,020,059 | 05/28/1991 | Gorin et al. | Figs. 5, 9 and col. 7, line 28-col. 9, line 53. |
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**FOREIGN PATENT DOCUMENTS**

| Examiner Initials | Cite No.[1] | Foreign Patent Document Country Code[3] Number[4] Kind Code[5] | Publication Date MM-DD-YYYY | Name of Patentee or Applicant of Cited Doc | Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear | T[6] |
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This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) and application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

PTO/SB/08a(08/03)
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| | | | | Filing Date | **Herewith** |
| **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** | | | | First Named Inventor | **Jon M. Huppenthal et al.** |
| | | | | Art Unit | |
| *(Use as many sheets as necessary)* | | | | Examiner Name | |
| Sheet | 2 | of | 8 | Attorney Docket No. | **SRC015 CON** |

**U.S. PATENT DOCUMENTS**

| Examiner Initials | Cite No.[1] | Document No. No. – Kind Code[2] | Publication Date MM-DD-YYYY | Name of Patentee or Applicant of Cited Doc | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |
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| Examiner Initials | Cite No.[1] | Foreign Patent Document Country Code[3] Number[4] Kind Code[5] | Publication Date MM-DD-YYYY | Name of Patentee or Applicant of Cited Doc | Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear | T[6] |
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| **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** | | | | First Named Inventor | Jon M. Huppenthal et al. |
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| Sheet | 3 | of | 8 | Attorney Docket No. | SRC015 CON |

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| | | | | First Named Inventor | **Jon M. Huppenthal et al.** |
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| | FIRST NAMED INVENTOR<br>Jon M. Huppenthal et al. | |
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| Application Data Sheet 37 CFR 1.76 | Attorney Docket Number | SRC015 CON |
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| | Application Number | |
| Title of Invention | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS | |

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## Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

## Applicant Information:

**Applicant 1** Remove

**Applicant Authority** ◉ Inventor ○ Legal Representative under 35 U.S.C. 117 ○ Party of Interest under 35 U.S.C. 118

| Prefix | Given Name | Middle Name | Family Name | Suffix |
|---|---|---|---|---|
| | Jon | M. | Huppenthal | |

**Residence Information (Select One)** ◉ US Residency ○ Non US Residency ○ Active US Military Service

| City | Colorado Springs | State/Province | CO | Country of Residence i | US |
|---|---|---|---|---|---|

**Citizenship under 37 CFR 1.41(b)** i: US

**Mailing Address of Applicant:**

| Address 1 | 10015 Burgess Road | | |
|---|---|---|---|
| Address 2 | | | |
| City | Colorado Springs | State/Province | CO |
| Postal Code | 80908 | Country i | |

**Applicant 2** Remove

**Applicant Authority** ◉ Inventor ○ Legal Representative under 35 U.S.C. 117 ○ Party of Interest under 35 U.S.C. 118

| Prefix | Given Name | Middle Name | Family Name | Suffix |
|---|---|---|---|---|
| | David | E. | Caliga | |

**Residence Information (Select One)** ◉ US Residency ○ Non US Residency ○ Active US Military Service

| City | Colorado Springs | State/Province | CO | Country of Residence i | US |
|---|---|---|---|---|---|

**Citizenship under 37 CFR 1.41(b)** i: US

**Mailing Address of Applicant:**

| Address 1 | 8445 Lauralwood Lane | | |
|---|---|---|---|
| Address 2 | | | |
| City | Colorado Springs | State/Province | CO |
| Postal Code | 80919 | Country i | US |

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

## Correspondence Information:

**Enter either Customer Number or complete the Correspondence Information section below.**
**For further information see 37 CFR 1.33(a).**

☐ **An Address is being provided for the correspondence Information of this application.**

PTO/SB/14 (02-07)
Approved for use through 02/28/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE


| Application Data Sheet 37 CFR 1.76 | Attorney Docket Number | SRC015 CON |
|---|---|---|
| | Application Number | |
| Title of Invention | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS | |

| | | | |
|---|---|---|---|
| **Customer Number** | 25235 | | |
| **Email Address** | | Add Email | Remove Email |

## Application Information:

| | | | |
|---|---|---|---|
| **Title of the Invention** | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS | | |
| **Attorney Docket Number** | SRC015 CON | **Small Entity Status Claimed** | ☐ |
| **Application Type** | Nonprovisional | | |
| **Subject Matter** | Utility | | |
| **Suggested Class (if any)** | | **Sub Class (if any)** | |
| **Suggested Technology Center (if any)** | | | |
| **Total Number of Drawing Sheets (if any)** | 20 | **Suggested Figure for Publication (if any)** | |

**Publication Information:**

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ Request Not to Publish. I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application has not been and will not be the subject of an application filed in another country, or under a multilateral agreement, that requires publication at eighteen months after filing.

## Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Enter either Customer Number or complete the Representative Name section below. If both sections are completed the Customer Number will be used for the Representative Information during processing.

| Please Select One: | ◉ Customer Number | ○ US Patent Practitioner | ○ US Representative (37 CFR 11.9) |
|---|---|---|---|
| Customer Number | 25235 | | |

## Domestic Priority Information:

This section allows for the applicant to claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c). Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification.

| Prior Application Status | Pending | | Remove |
|---|---|---|---|
| Application Number | Continuity Type | Prior Application Number | Filing Date (YYYY-MM-DD) |
| | Continuation of | 10285318 | 2002-10-31 |

Additional Domestic Priority Data may be generated within this form by selecting the **Add** button. Add

## Foreign Priority Information:

PTO/SB/14 (02-07)
Approved for use through 02/28/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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| **Application Data Sheet 37 CFR 1.76** | Attorney Docket Number | SRC015 CON |
|---|---|---|
| | Application Number | |
| Title of Invention | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS | |

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).

Remove

| Application Number | Country [i] | Parent Filing Date (YYYY-MM-DD) | Priority Claimed |
|---|---|---|---|
| | | | ○ Yes ◉ No |

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

## Assignee Information:

Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office.

**Assignee 1** Remove

If the Assignee is an Organization check here. ☒

| Organization Name | SRC Computers, Inc. | | |
|---|---|---|---|
| **Mailing Address Information:** | | | |
| **Address 1** | 4240 N. Nevada Ave. | | |
| Address 2 | | | |
| **City** | Colorado Springs | **State/Province** | CO |
| **Country** [i] US | | Postal Code | 80907 |
| Phone Number | | Fax Number | |
| Email Address | | | |

Additional Assignee Data may be generated within this form by selecting the **Add** button. Add

## Signature:

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.

| **Signature** | /michael martensen/ | | | Date (YYYY-MM-DD) | 2007-04-09 |
|---|---|---|---|---|---|
| First Name | Michael | Last Name | Martensen | Registration Number | 46901 |

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

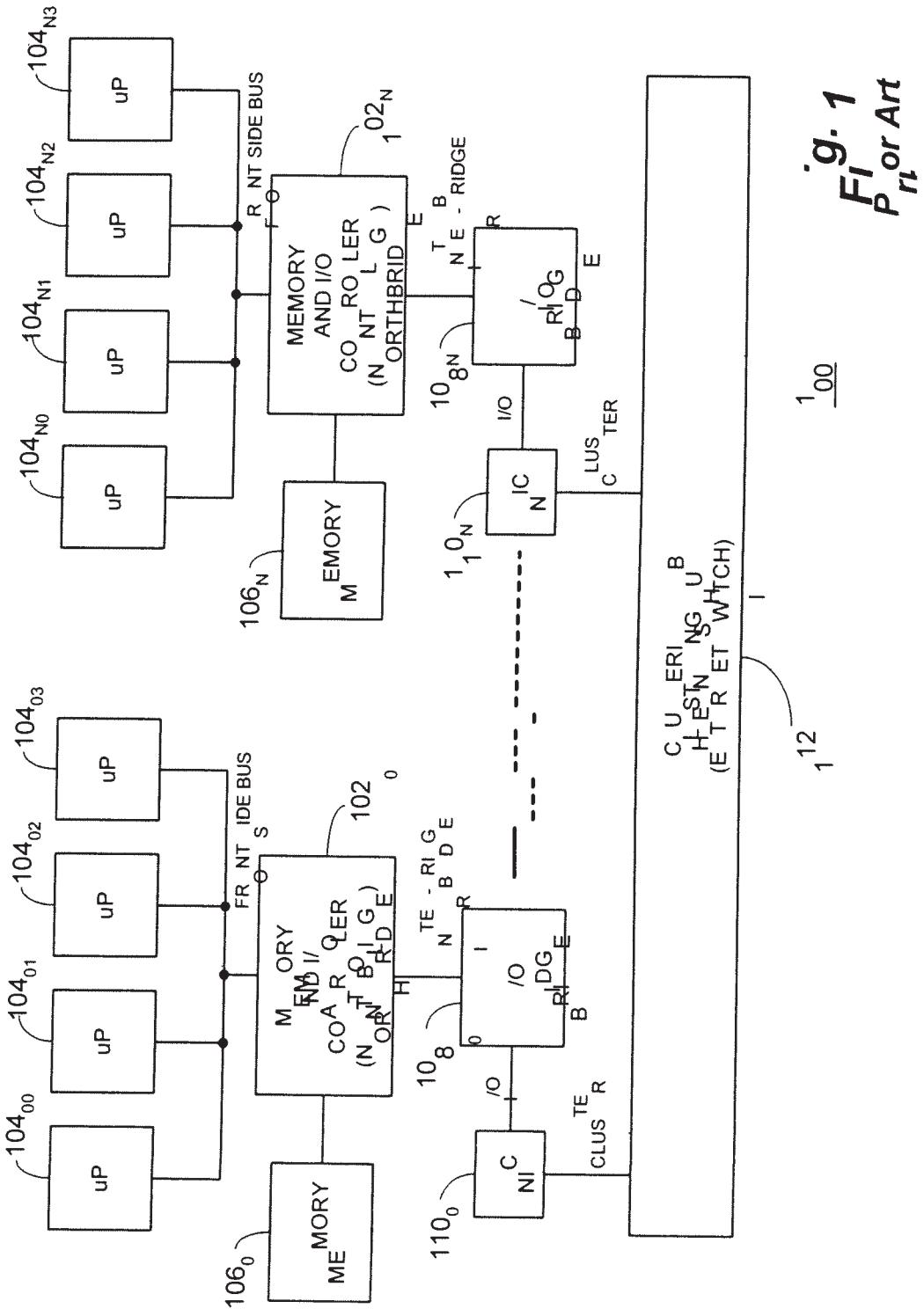



Fig. 1
Prior Art

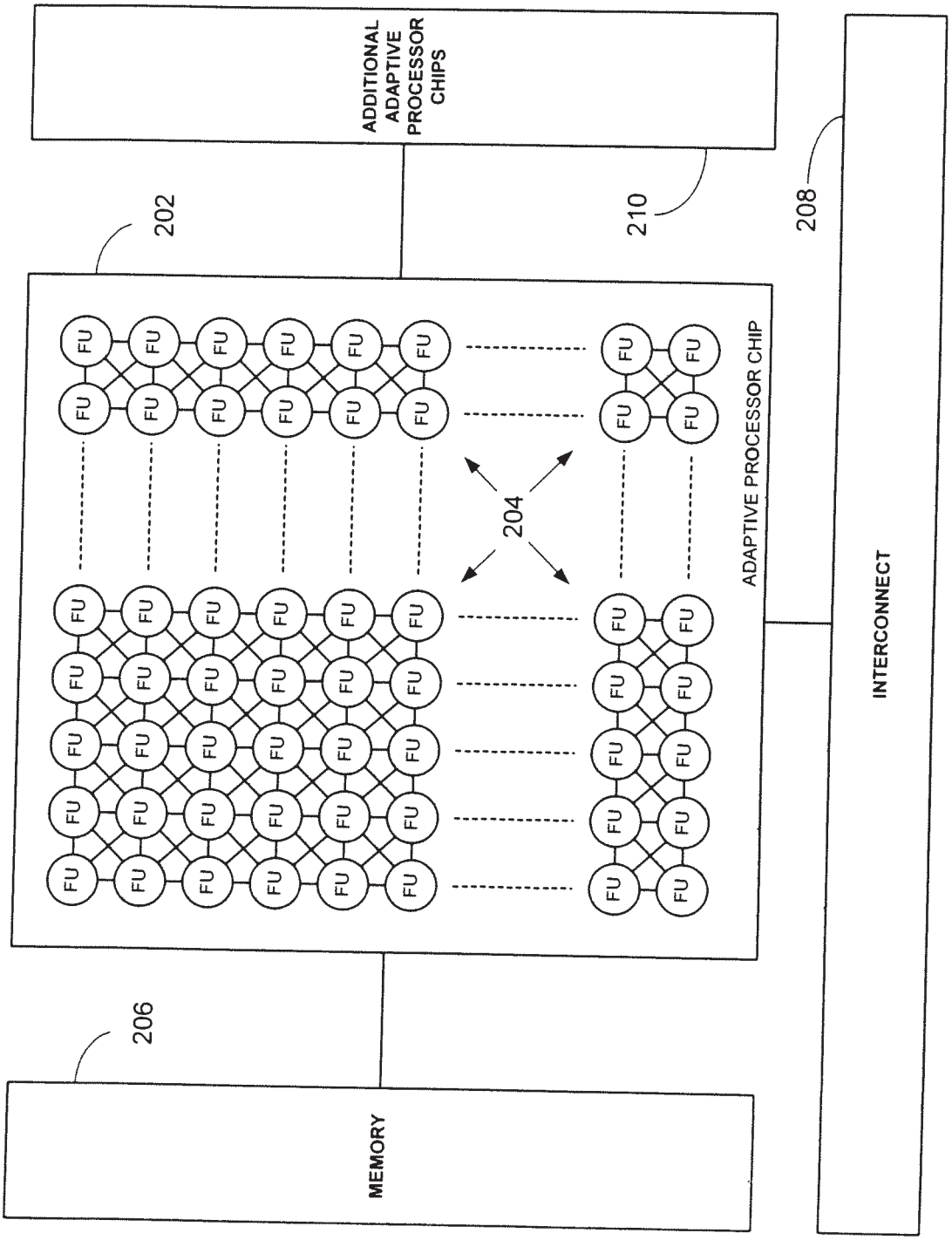

ADDITIONAL ADAPTIVE PROCESSOR CHIPS
202
210
208
200
ADAPTIVE PROCESSOR CHIP
FU
204
INTERCONNECT
206
MEMORY

Fig. 2

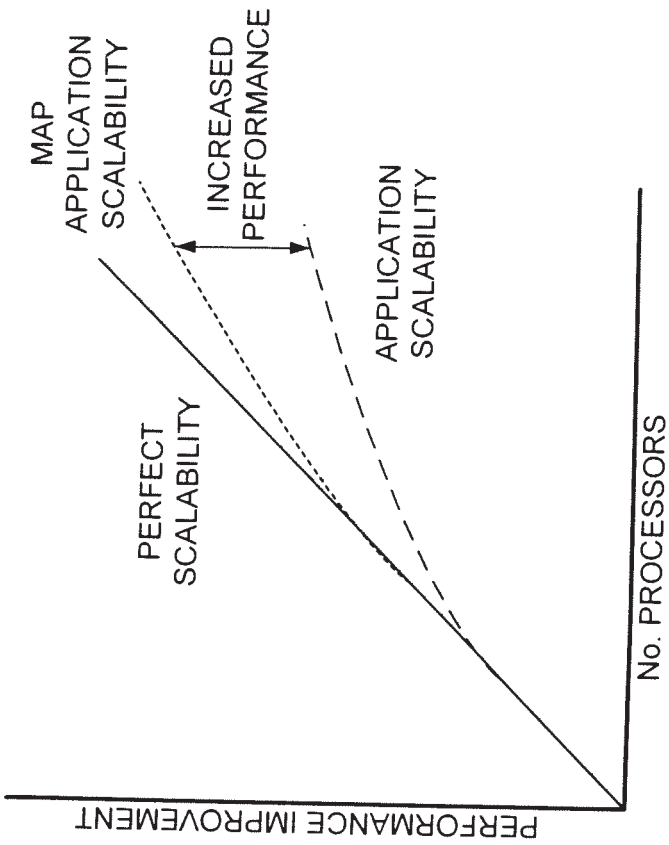



*Fig. 3B*

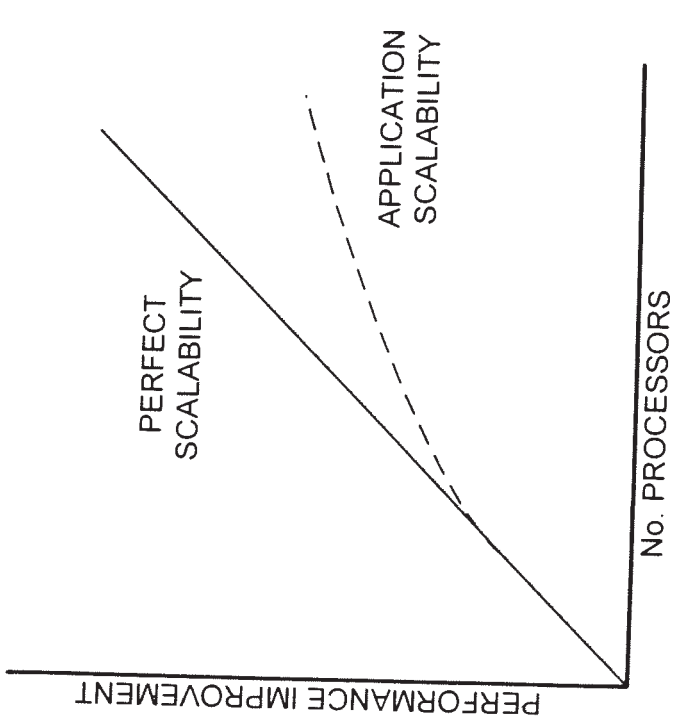



*Fig. 3A*
*PRIOR ART*

Fig. 4A
Prior Art




Fig. 4B

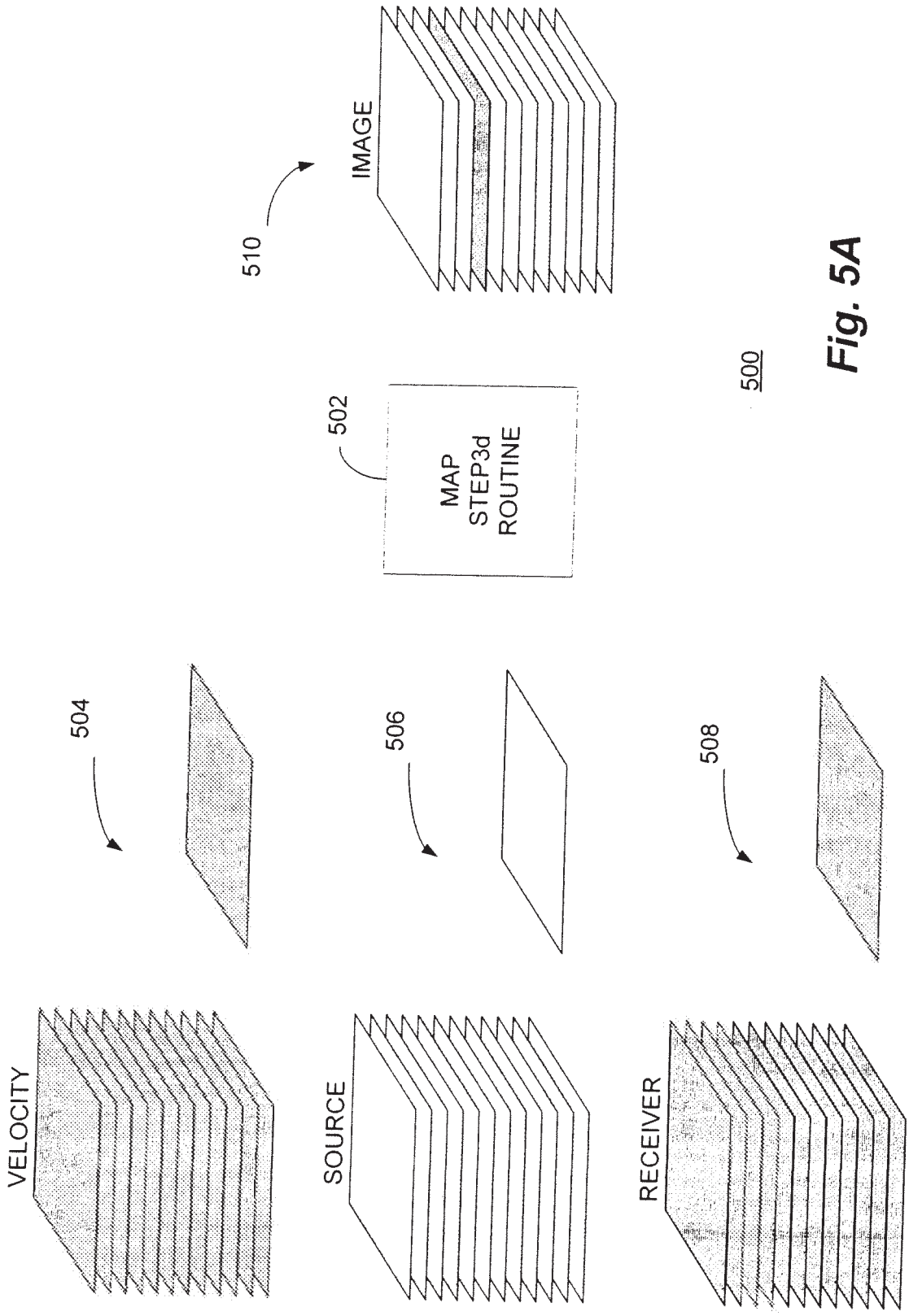

500
510
IMAGE
502
MAP
STEP3d
ROUTINE
504
506
508
VELOCITY
SOURCE
RECEIVER

Fig. 5A

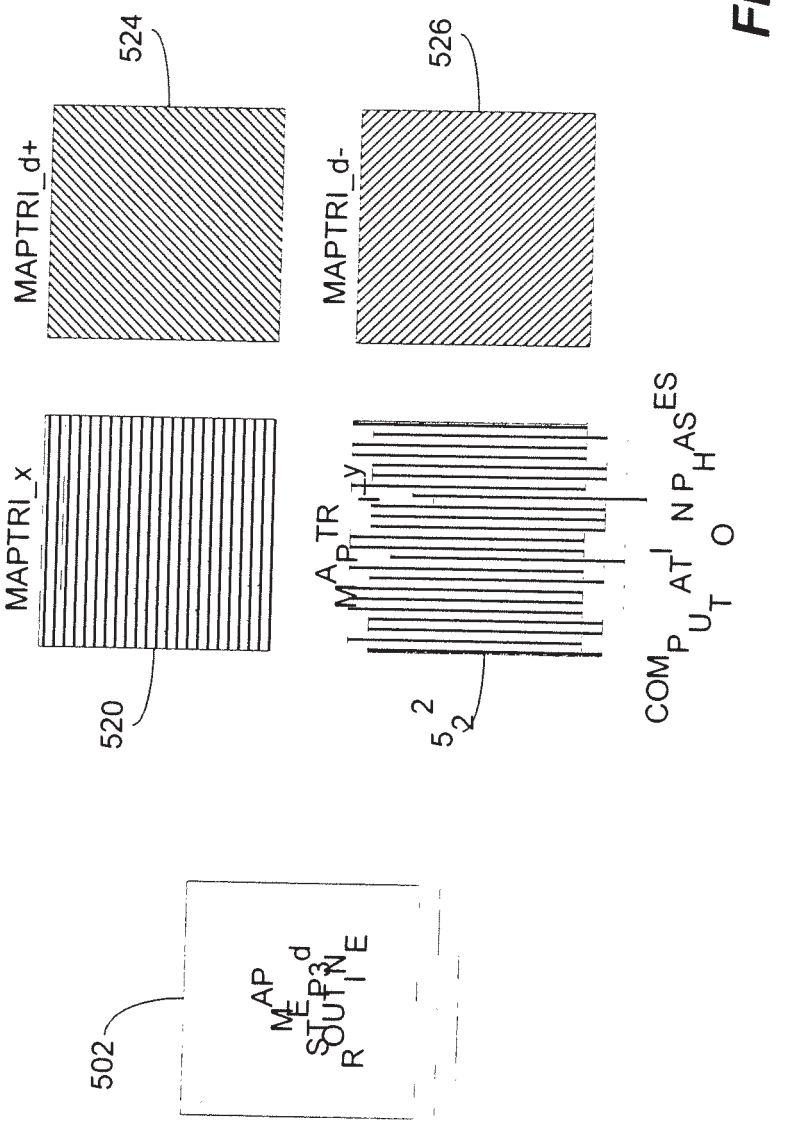

524
526
MAPTRI_d+
MAPTRI_d-
MAPTRI_x
520
502
COMPUTATIONAL PHASES

Fig. 5B

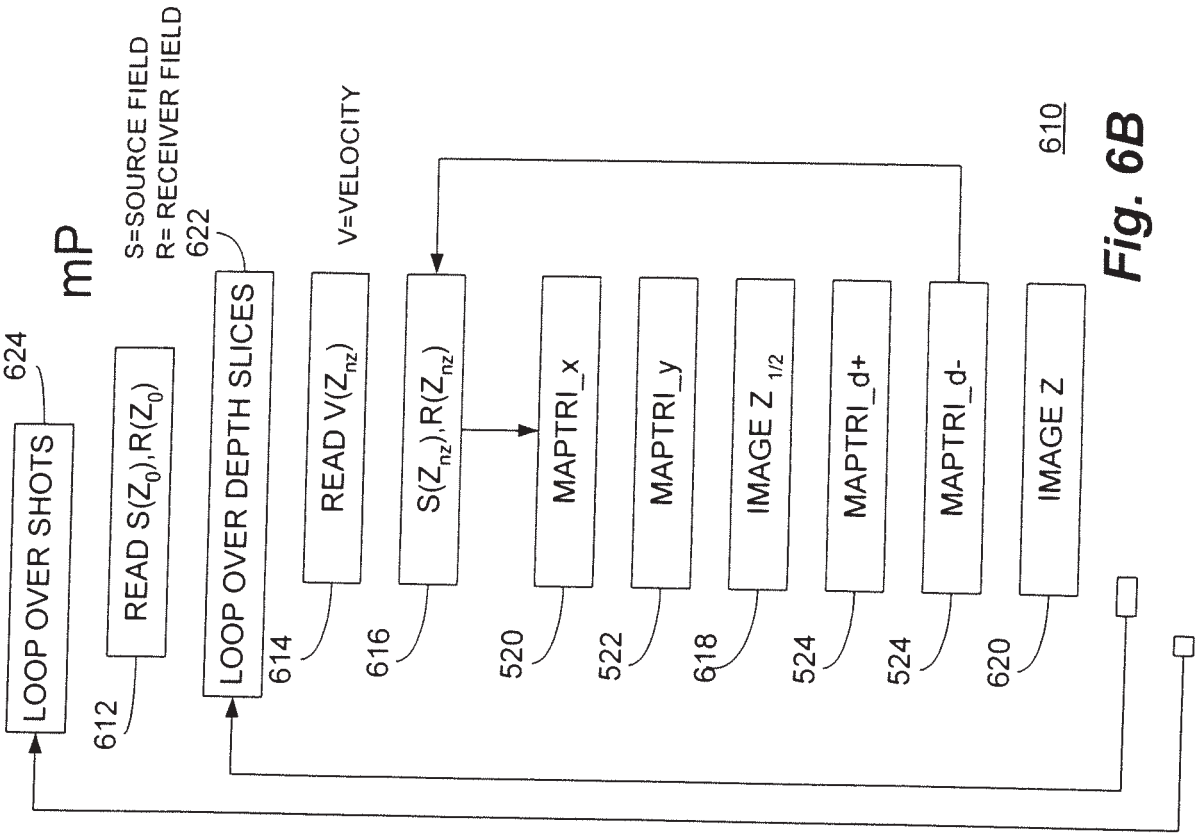

mP
S=SOURCE FIELD
R= RECEIVER FIELD
V=VELOCITY
LOOP OVER SHOTS
624
READ S(Z0),R(Z0)
612
LOOP OVER DEPTH SLICES
622
READ V(Znz)
614
S(Znz),R(Znz)
616
MAPTRI_x
520
MAPTRI_y
522
IMAGE Z 1/2
618
MAPTRI_d+
524
MAPTRI_d-
524
IMAGE Z
620
610

Fig. 6B

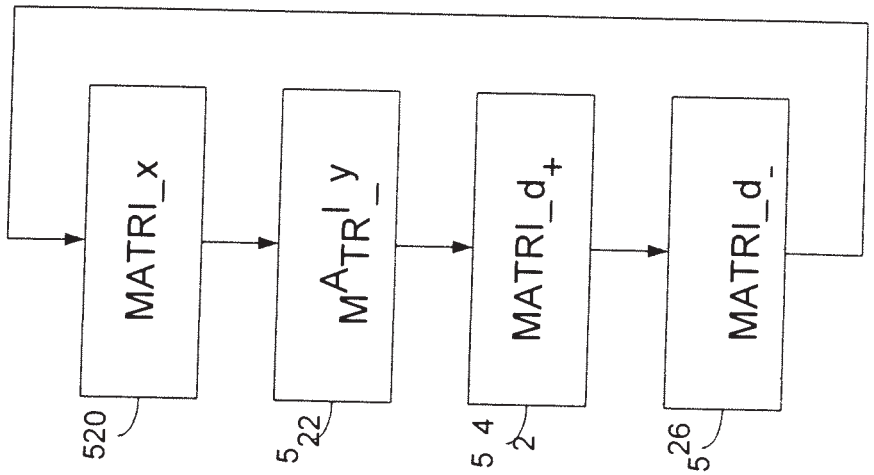

MATRI_x
520
MATRI_y
522
MATRI_d+
524
MATRI_d-
526
600

Fig. 6A

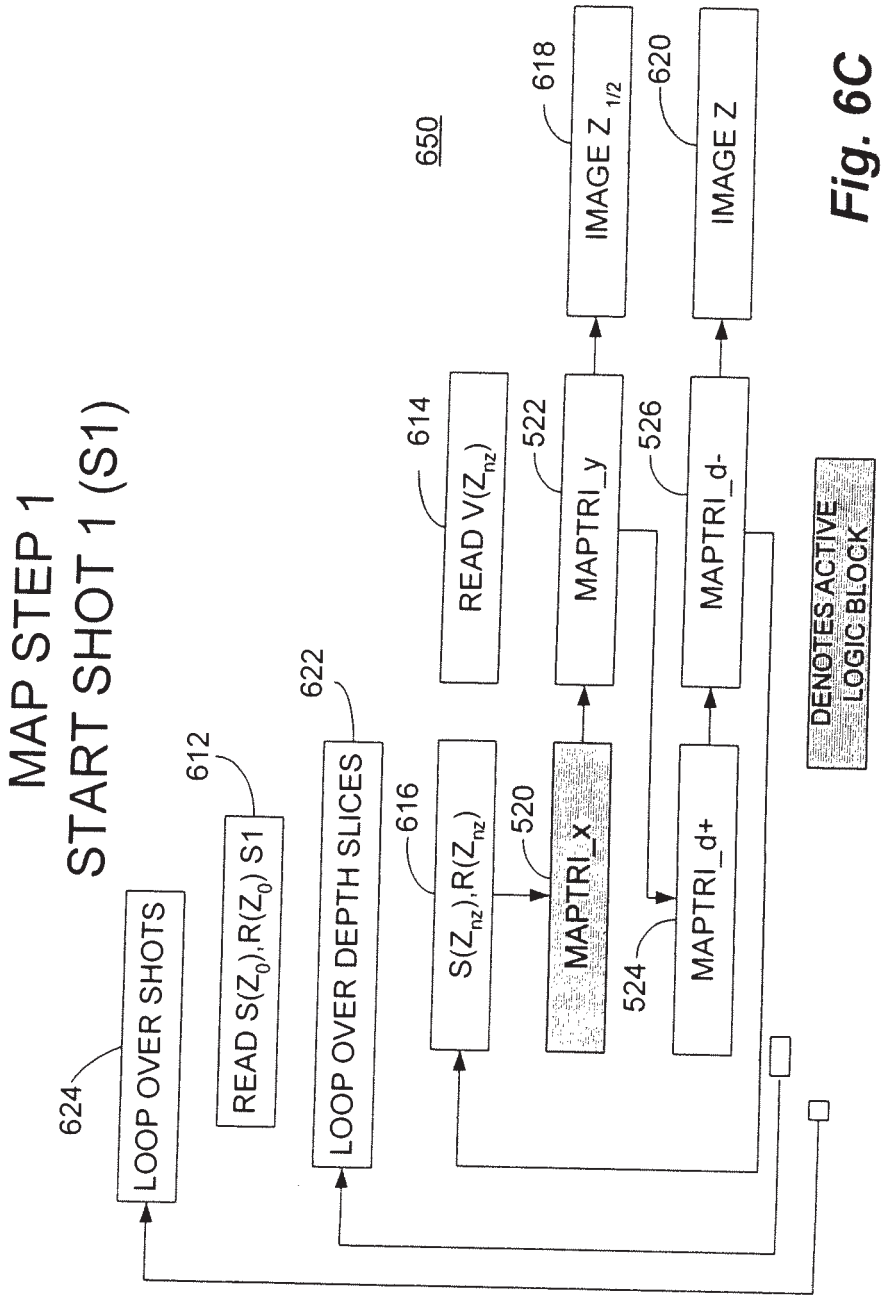

MAP STEP 1
START SHOT 1 (S1)
624
LOOP OVER SHOTS
612
READ S(Z0),R(Z0) S1
622
LOOP OVER DEPTH SLICES
616
S(Znz),R(Znz)
520
MAPTRI_x
524
MAPTRI_d+
614
READ V(Znz)
522
MAPTRI_y
526
MAPTRI_d-
650
618
IMAGE Z 1/2
620
IMAGE Z
DENOTES ACTIVE LOGIC BLOCK

Fig. 6C

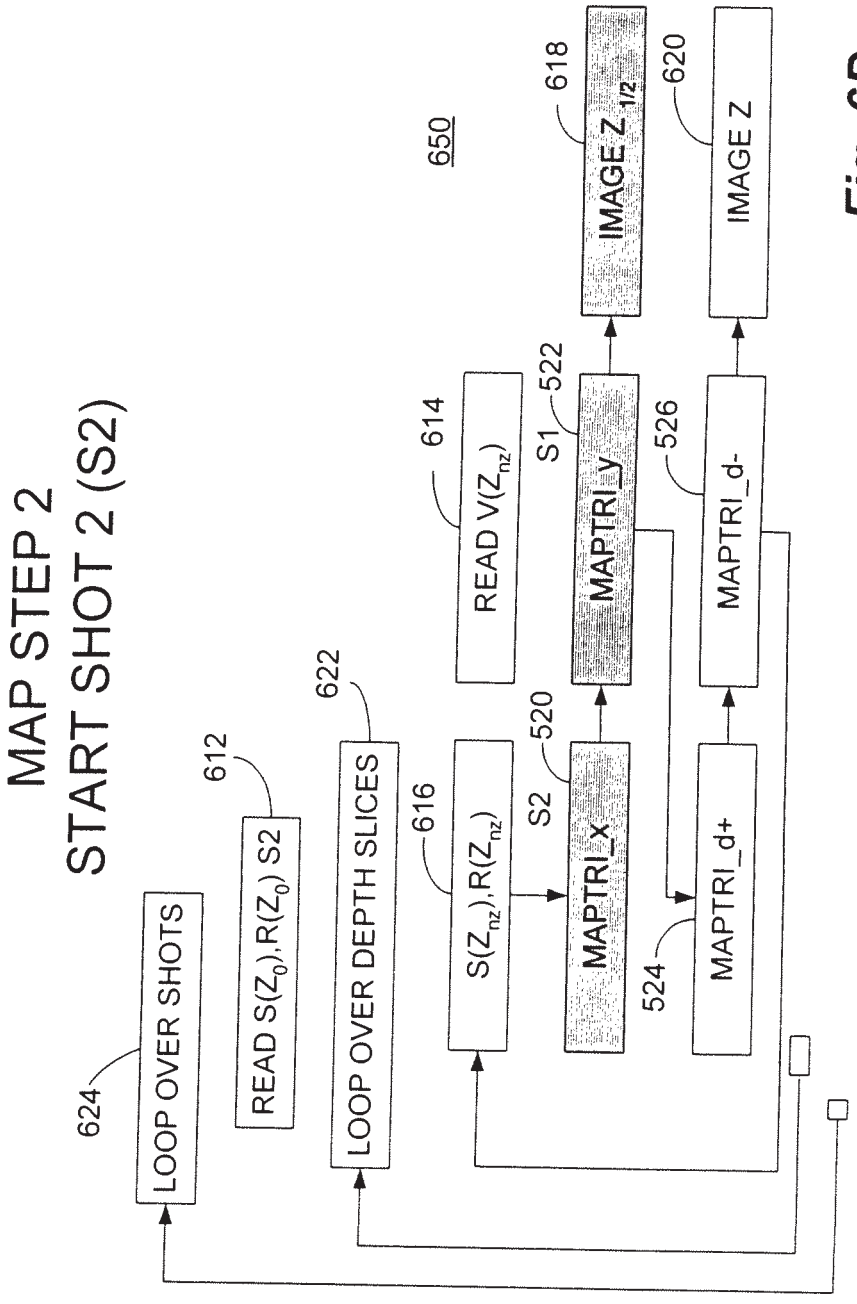

MAP STEP 2
START SHOT 2 (S2)
650
624
LOOP OVER SHOTS
612
READ $S(Z_0)$,$R(Z_0)$ S2
622
LOOP OVER DEPTH SLICES
616
$S(Z_{nz})$,$R(Z_{nz})$
S2
520
MAPTRI_x
524
MAPTRI_d+
614
READ $V(Z_{nz})$
S1
522
MAPTRI_y
526
MAPTRI_d-
618
IMAGE $Z_{1/2}$
620
IMAGE Z

*Fig. 6D*

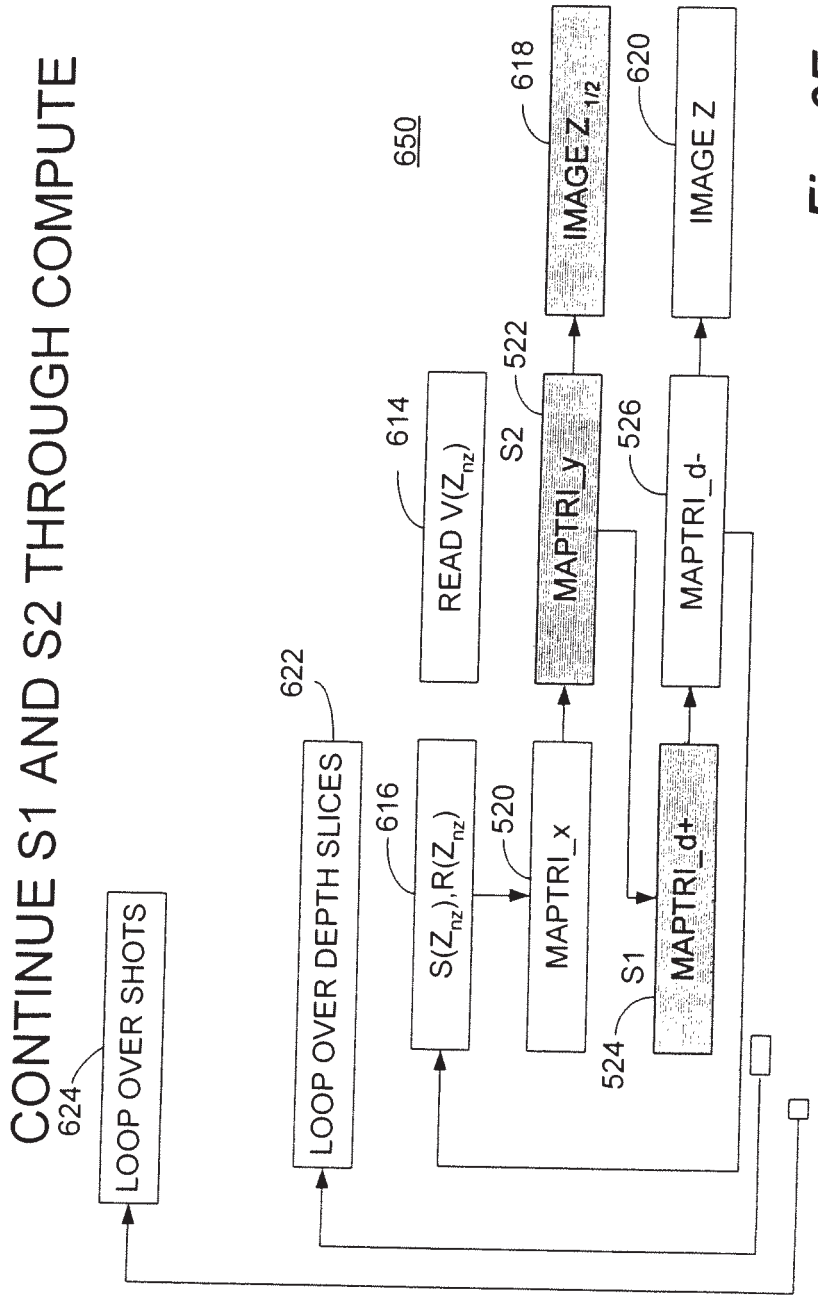

CONTINUE S1 AND S2 THROUGH COMPUTE
650
624
LOOP OVER SHOTS
622
LOOP OVER DEPTH SLICES
616
$S(Z_{nz}),R(Z_{nz})$
520
MAPTRI_x
524
S1
MAPTRI_d+
614
READ $V(Z_{nz})$
S2
522
MAPTRI_y
526
MAPTRI_d-
618
IMAGE $Z_{1/2}$
620
IMAGE Z

*Fig. 6E*

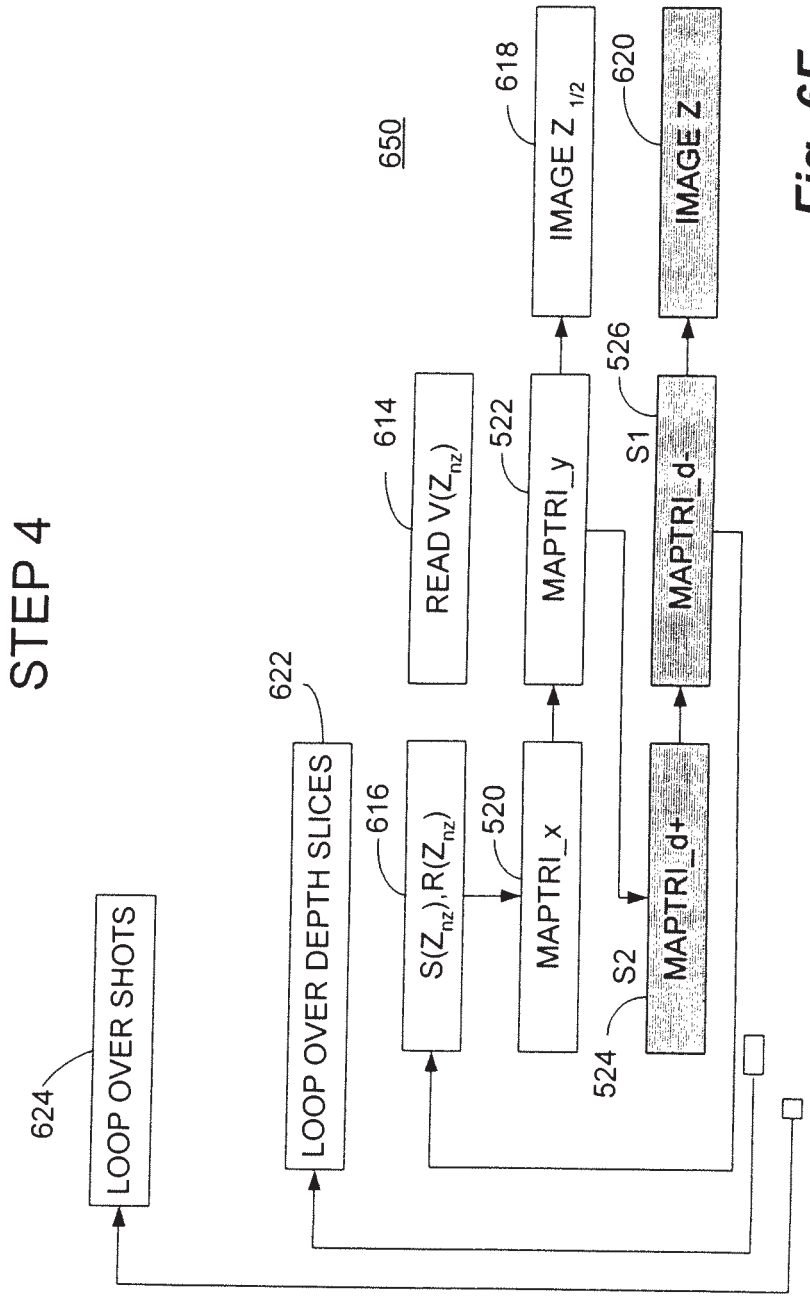

STEP 4
650
624
LOOP OVER SHOTS
622
LOOP OVER DEPTH SLICES
616
S(Znz),R(Znz)
614
READ V(Znz)
520
MAPTRI_x
522
MAPTRI_y
618
IMAGE Z 1/2
S2
MAPTRI_d+
524
S1
MAPTRI_d-
526
620
IMAGE Z

Fig. 6F

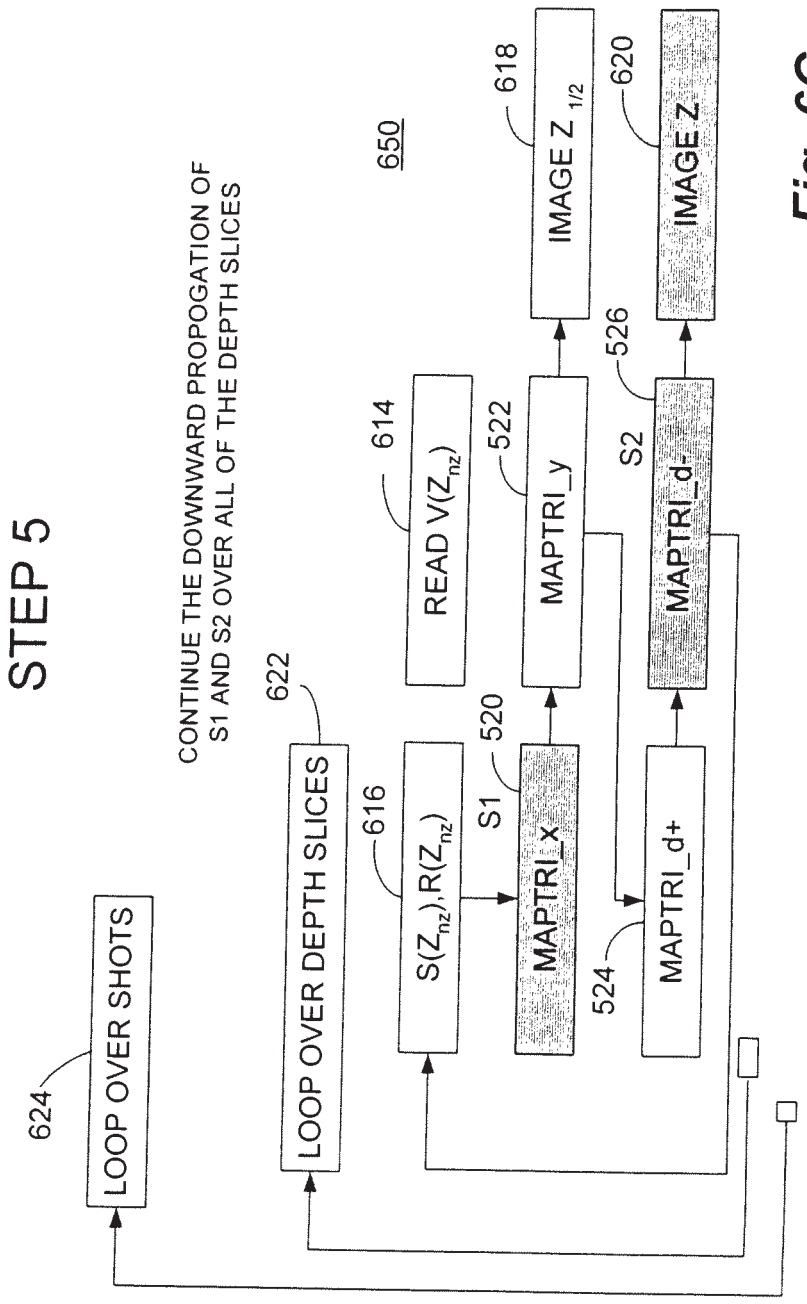

STEP 5
CONTINUE THE DOWNWARD PROPOGATION OF
S1 AND S2 OVER ALL OF THE DEPTH SLICES
650
624
LOOP OVER SHOTS
622
LOOP OVER DEPTH SLICES
616
S(Z_nz),R(Z_nz)
S1
520
MAPTRI_x
524
MAPTRI_d+
614
READ V(Z_nz)
522
MAPTRI_y
S2
526
MAPTRI_d-
618
IMAGE Z 1/2
620
IMAGE Z

*Fig. 6G*

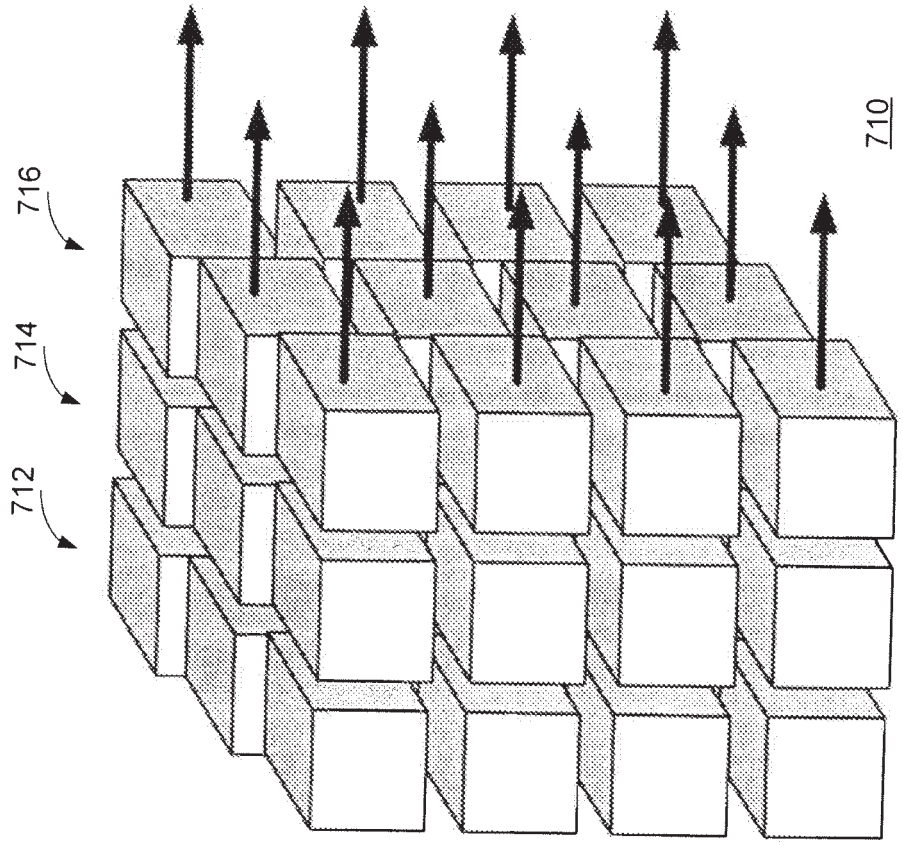

716
714
712
710
718
720
722
724
VALUES USED IN THE COMPUTE FROM NEIGHBORING CELLS IN i,j,k

Fig. 7B

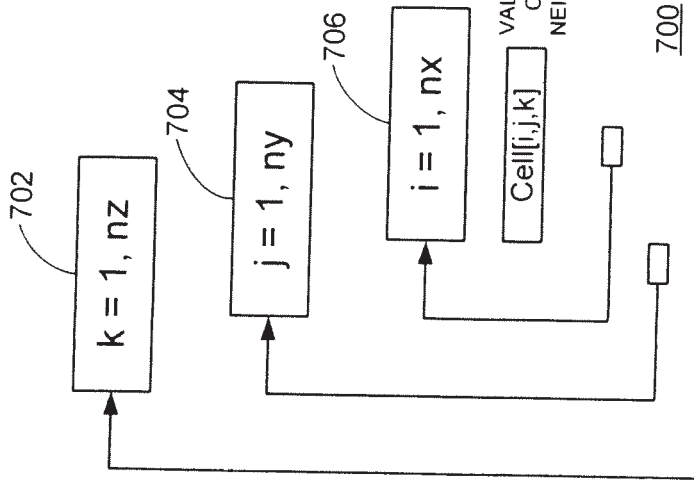

702
k = 1, nz
704
j = 1, ny
706
i = 1, nx
Cell[i,j,k]
700

Fig. 7A

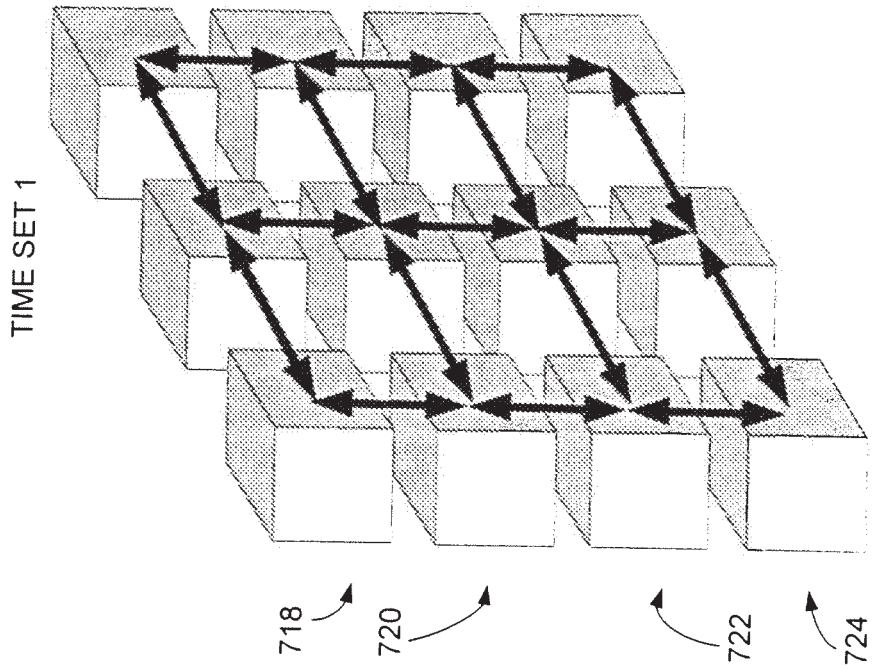



Fig.7C

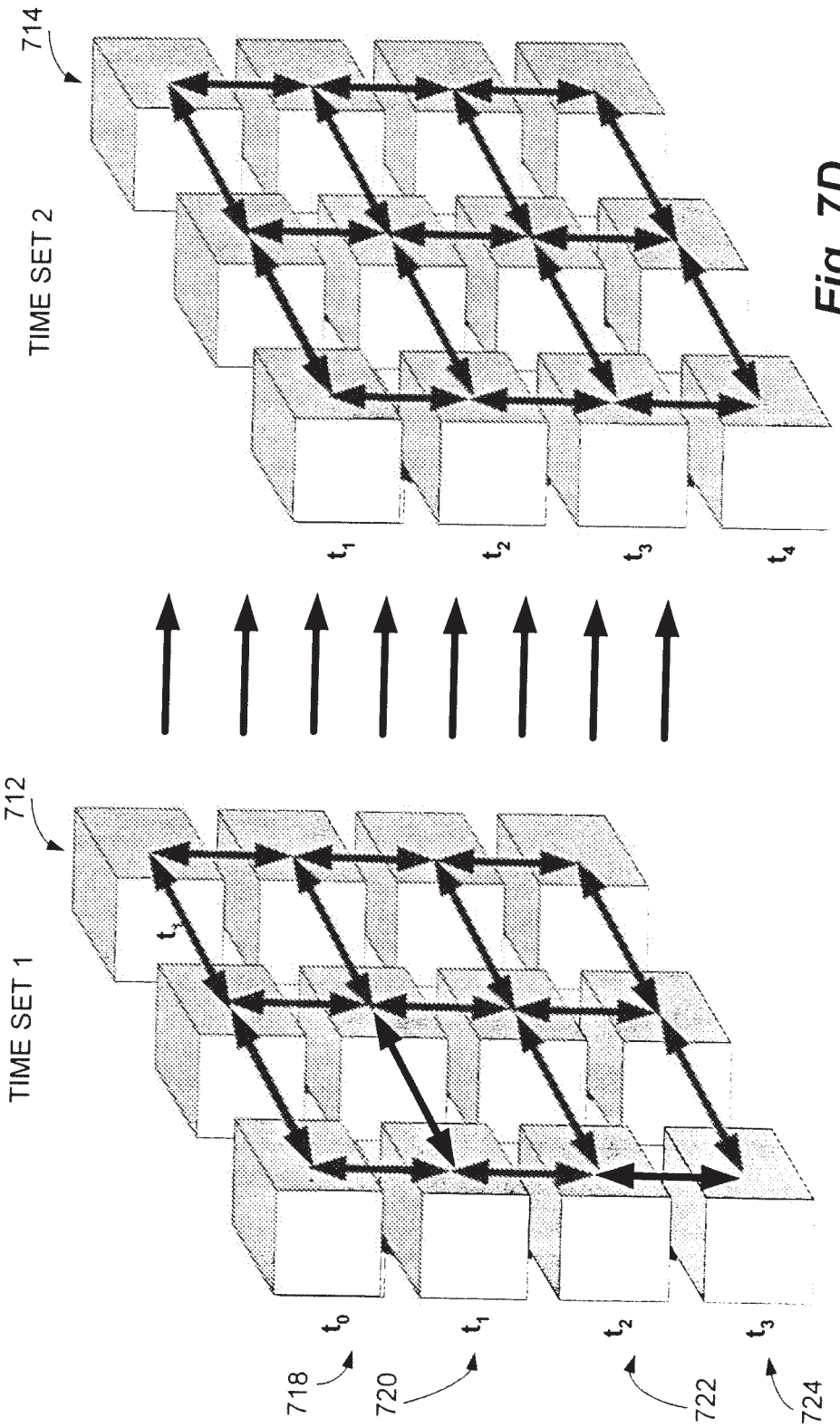

714
TIME SET 2
$t_1$
$t_2$
$t_3$
$t_4$
712
TIME SET 1
$t_0$
$t_1$
$t_2$
$t_3$
718
720
722
724

Fig. 7D

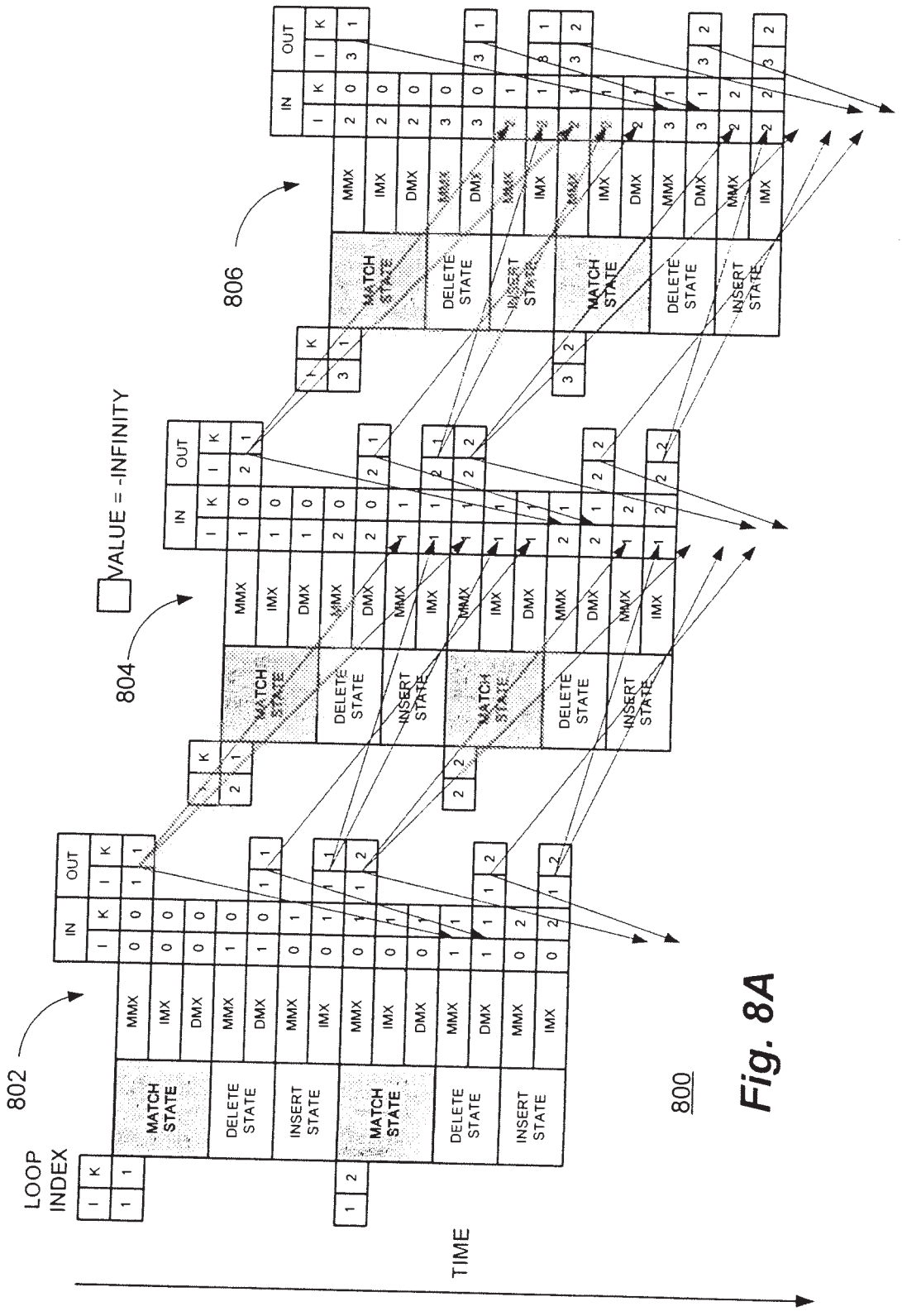

802
804
806
800
LOOP INDEX
TIME
VALUE = -INFINITY
MATCH STATE
DELETE STATE
INSERT STATE
MMX
IMX
DMX
IN
OUT
K

Fig. 8A

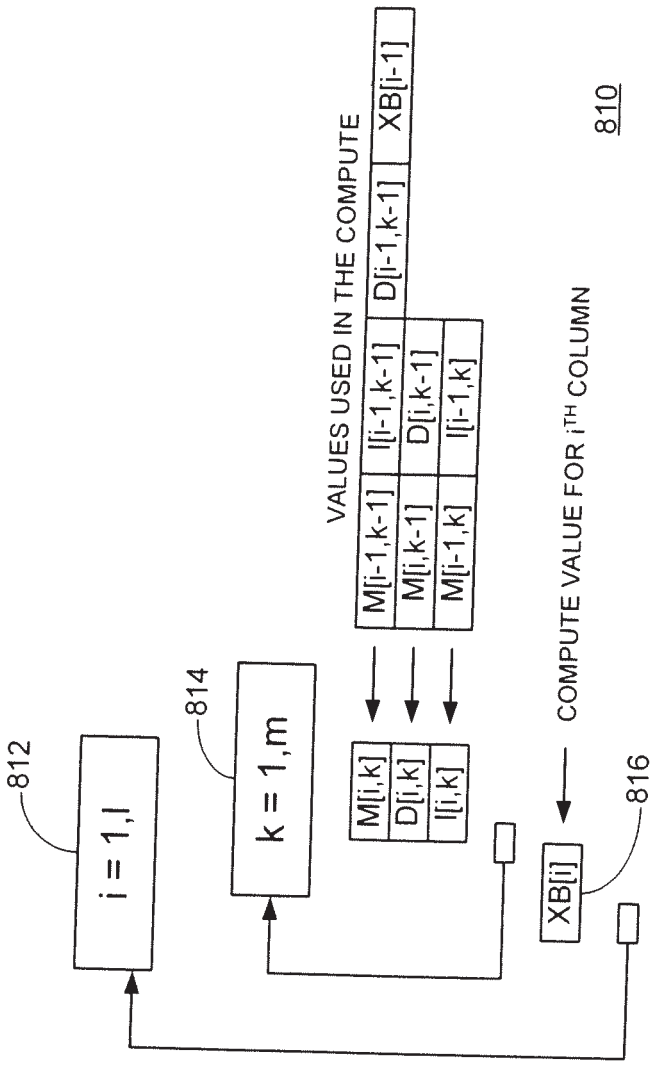
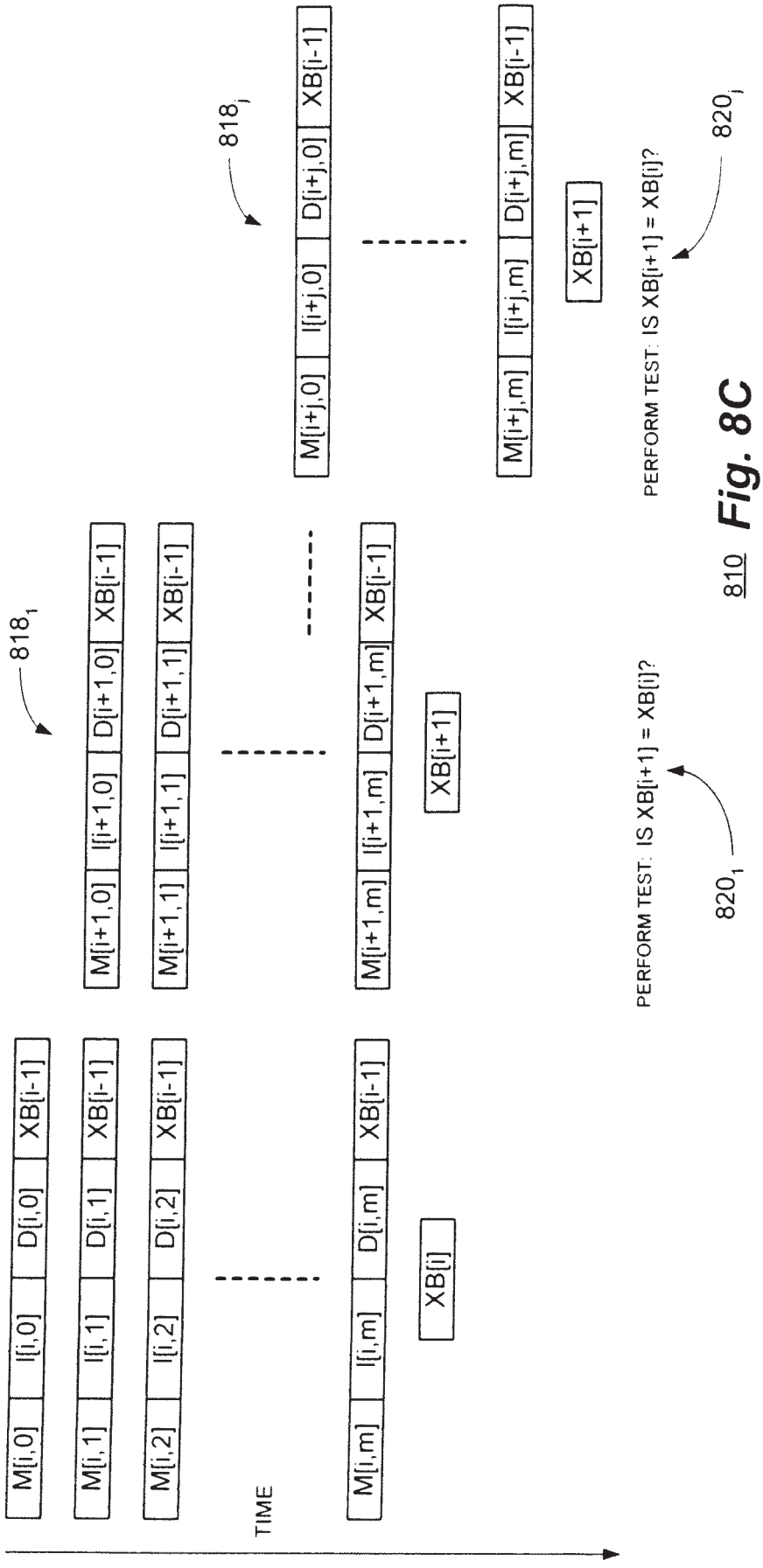

810
812
i = 1,I
814
k = 1,m
M[i,k]
D[i,k]
I[i,k]
VALUES USED IN THE COMPUTE
M[i-1,k-1]
I[i-1,k-1]
D[i-1,k-1]
XB[i-1]
M[i,k-1]
D[i,k-1]
M[i-1,k]
I[i-1,k]
COMPUTE VALUE FOR iTH COLUMN
XB[i]
816

*Fig. 8B*


818_0
M[i,0] I[i,0] D[i,0] XB[i-1]
M[i,1] I[i,1] D[i,1] XB[i-1]
M[i,2] I[i,2] D[i,2] XB[i-1]
M[i,m] I[i,m] D[i,m] XB[i-1]
XB[i]
818_1
M[i+1,0] I[i+1,0] D[i+1,0] XB[i-1]
M[i+1,1] I[i+1,1] D[i+1,1] XB[i-1]
M[i+1,m] I[i+1,m] D[i+1,m] XB[i-1]
XB[i+1]
818_j
M[i+j,0] I[i+j,0] D[i+j,0] XB[i-1]
M[i+j,m] I[i+j,m] D[i+j,m] XB[i-1]
XB[i+1]
TIME
PERFORM TEST: IS XB[i+1] = XB[i]?
820_1
PERFORM TEST: IS XB[i+1] = XB[i]?
820_j

810 *Fig. 8C*

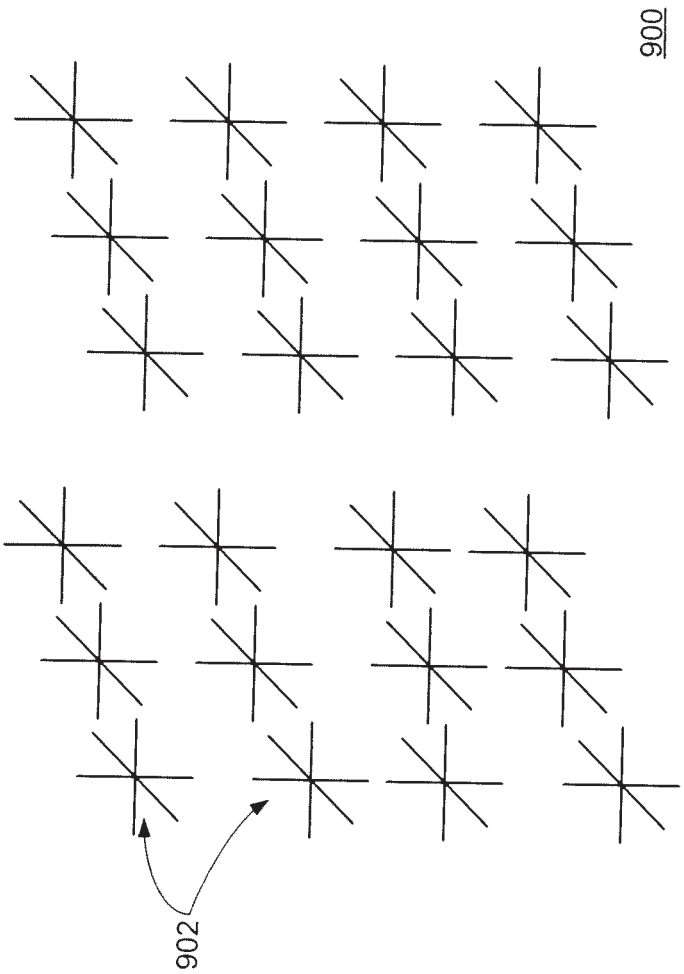



Fig. 9A

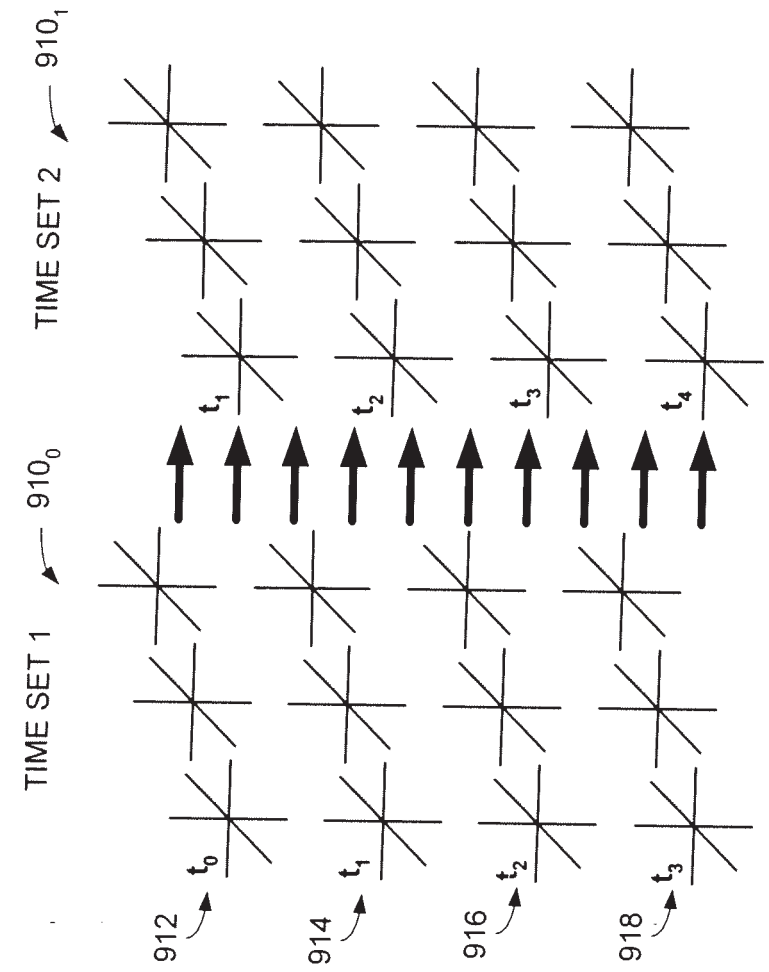

TIME SET 1
$910_0$
TIME SET 2
$910_1$
912
914
916
918
$t_0$
$t_1$
$t_2$
$t_3$
$t_4$

Fig. 9C

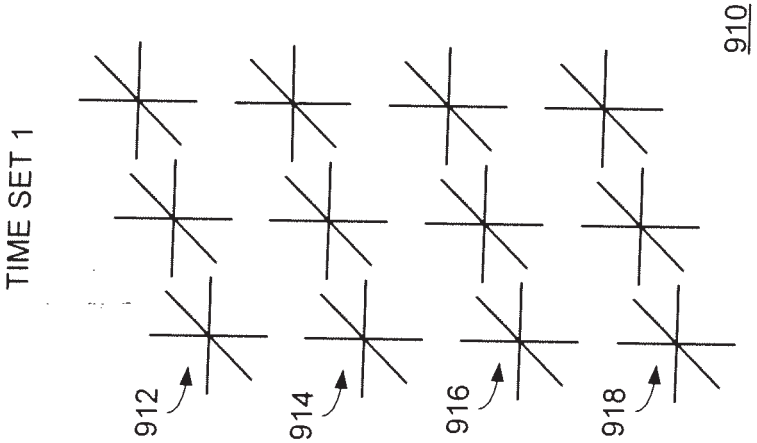

TIME SET 1
910
912
914
916
918

Fig. 9B

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 1666458 |
| **Application Number:** | 11733064 |
| **International Application Number:** | |
| **Confirmation Number:** | 7527 |
| **Title of Invention:** | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS |
| **First Named Inventor/Applicant Name:** | Jon M. Huppenthal |
| **Customer Number:** | 25235 |
| **Filer:** | Michael Christian Martensen/Julie Lange |
| **Filer Authorized By:** | Michael Christian Martensen |
| **Attorney Docket Number:** | SRC015 CON |
| **Receipt Date:** | 09-APR-2007 |
| **Filing Date:** | |
| **Time Stamp:** | 18:04:50 |
| **Application Type:** | Utility |

## Payment information:

| | |
|---|---|
| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes) | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | | DOC090.PDF | 215641 | yes | 39 |

| | | | | | |
|---|---|---|---|---|---|
| | **Multipart Description/PDF files in .zip description** | | | | |
| | **Document Description** | | **Start** | **End** | |
| | Transmittal of New Application | | 1 | 1 | |
| | Specification | | 2 | 29 | |
| | Claims | | 30 | 38 | |
| | Abstract | | 39 | 39 | |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Oath or Declaration filed | DOC093.PDF | 92982 | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | | DOC094.PDF | 209537 | yes | 9 |
| | **Multipart Description/PDF files in .zip description** | | | | |
| | **Document Description** | | **Start** | **End** | |
| | Miscellaneous Incoming Letter | | 1 | 1 | |
| | Information Disclosure Statement (IDS) Filed | | 2 | 9 | |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Application Data Sheet | SRC015CONADS.pdf | 984957 | no | 4 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 5 | Drawings | DOC095.PDF | 362633 | no | 20 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 1865750 | | |

**This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.**

**New Applications Under 35 U.S.C. 111**

**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**

**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**

**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

PTO/SB/06 (12-04)
Approved for use through 7/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

| **PATENT APPLICATION FEE DETERMINATION RECORD**<br>Substitute for Form PTO-875 | Application or Docket Number<br>11/733,064 |
|---|---|

## APPLICATION AS FILED – 04/09/07

| FOR | (Column 1) NUMBER FILED | (Column 2) NUMBER EXTRA | SMALL ENTITY RATE ($) | SMALL ENTITY FEE ($) | OR | OTHER THAN SMALL ENTITY RATE ($) | OTHER THAN SMALL ENTITY FEE ($) |
|---|---|---|---|---|---|---|---|
| BASIC FEE (37 CFR 1.16(a), (b), or (c)) | N/A | N/A | N/A | | | N/A | 300 |
| SEARCH FEE (37 CFR 1.16(k), (i), or (m)) | N/A | N/A | N/A | | | N/A | 500 |
| EXAMINATION FEE (37 CFR 1.16(o), (p), or (q)) | N/A | N/A | N/A | | | N/A | 200 |
| TOTAL CLAIMS (37 CFR 1.16(i)) | 52 minus 20 = | * 32 | X$ 25= | | OR | X$50= | 1600 |
| INDEPENDENT CLAIMS (37 CFR 1.16(h)) | 3 minus 3 = | * | X$100= | | | X$200= | |
| APPLICATION SIZE FEE (37 CFR 1.16(s)) | If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR | | | | | | |
| MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j)) | | | N/A | | | N/A | |
| | | | TOTAL | | | TOTAL | 2600 |

* If the difference in column 1 is less than zero, enter "0" in column 2.

## APPLICATION AS AMENDED – PART II

### AMENDMENT A

| | (Column 1) CLAIMS REMAINING AFTER AMENDMENT | | (Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR | (Column 3) PRESENT EXTRA | SMALL ENTITY RATE ($) | SMALL ENTITY ADDITIONAL FEE ($) | OR | OTHER THAN SMALL ENTITY RATE ($) | OTHER THAN SMALL ENTITY ADDITIONAL FEE ($) |
|---|---|---|---|---|---|---|---|---|---|
| Total (37 CFR 1.16(i)) | * | Minus | ** | = | x = | | OR | x = | |
| Independent (37 CFR 1.16(h)) | * | Minus | *** | = | x = | | OR | x = | |
| Application Size Fee (37 CFR 1.16(s)) | | | | | | | | | |
| FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | N/A | | OR | N/A | |
| | | | | | TOTAL ADD'T FEE | | OR | TOTAL ADD'T FEE | |

1,251

### AMENDMENT B

| | (Column 1) CLAIMS REMAINING AFTER AMENDMENT | | (Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR | (Column 3) PRESENT EXTRA | RATE ($) | ADDITIONAL FEE ($) | OR | RATE ($) | ADDITIONAL FEE ($) |
|---|---|---|---|---|---|---|---|---|---|
| Total (37 CFR 1.16(i)) | * | Minus | ** | = | x = | | OR | x = | |
| Independent (37 CFR 1.16(h)) | * | Minus | *** | = | x = | | OR | x = | |
| Application Size Fee (37 CFR 1.16(s)) | | | | | | | | | |
| FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | N/A | | OR | N/A | |
| | | | | | TOTAL ADD'T FEE | | OR | TOTAL ADD'T FEE | |

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

*If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.*

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NUMBER | FILING or 371(c) DATE | GRP ART UNIT | FIL FEE REC'D | ATTY.DOCKET.NO | TOT CLAIMS | IND CLAIMS |
|---|---|---|---|---|---|---|
| 11/733,064 | 04/09/2007 | 2183 | 0.00 | SRC015 CON | 52 | 3 |

**CONFIRMATION NO. 7527**

**FILING RECEIPT**

25235
HOGAN & HARTSON LLP
ONE TABOR CENTER, SUITE 1500
1200 SEVENTEENTH ST
DENVER, CO80202

Date Mailed: 04/23/2007

Receipt is acknowledged of this regular Patent Application. It will be considered in its order and you will be notified as to the results of the examination. Be sure to provide the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please mail to the Commissioner for Patents P.O. Box 1450 Alexandria Va 22313-1450. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections (if appropriate).**

**Applicant(s)**

Jon M. Huppenthal, Colorado Springs, CO;
David E. Caliga, Colorado Springs, CO;

**Assignment For Published Patent Application**

SRC COMPUTERS, INC., Colorado Springs, CO

**Power of Attorney:** The patent practitioners associated with Customer Number 25235

**Domestic Priority data as claimed by applicant**

This application is a CON of 10/285,318 10/31/2002

**Foreign Applications**

**If Required, Foreign Filing License Granted:** 04/20/2007

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US11/733,064**

**Projected Publication Date:** To Be Determined - pending completion of Missing Parts

**Non-Publication Request:** No

**Early Publication Request:** No

**Title**

MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING

**Preliminary Class**

712

## PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

---

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## Title 35, United States Code, Section 184

## Title 37, Code of Federal Regulations, 5.11 & 5.15

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United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NUMBER | FILING OR 371 (c) DATE | FIRST NAMED APPLICANT | ATTORNEY DOCKET NUMBER |
|---|---|---|---|
| 11/733,064 | 04/09/2007 | Jon M. Huppenthal | SRC015 CON |

**CONFIRMATION NO. 7527**

**FORMALITIES LETTER**

25235
HOGAN & HARTSON LLP
ONE TABOR CENTER, SUITE 1500
1200 SEVENTEENTH ST
DENVER, CO 80202

Date Mailed: 04/23/2007

# NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

## FILED UNDER 37 CFR 1.53(b)

***Filing Date Granted***

**Items Required To Avoid Abandonment:**

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing.
  *Applicant must submit $* **300** *to complete the basic filing fee for a non-small entity. If appropriate, applicant may make a written assertion of entitlement to small entity status and pay the small entity filing fee (37 CFR 1.27).*

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- Additional claim fees of $**1600** as a non-small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.
- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of $130 for a non-small entity, must be submitted with the missing items identified in this letter.

**SUMMARY OF FEES DUE:**

Total additional fee(s) required for this application is **$2730** for a non-small entity

- **$300** Statutory basic filing fee.
- **$130** Surcharge.

- The application search fee has not been paid. Applicant must submit **$500** to complete the search fee.

- The application examination fee has not been paid. Applicant must submit $**200** to complete the examination fee for a non-small entity.

- Total additional claim fee(s) for this application is $**1600**
  - $**1600** for **32** total claims over 20.

Replies should be mailed to: Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

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Office of Initial Patent Examination (571) 272-4000, or 1-800-PTO-9199
PART 3 - OFFICE COPY

Client/Matter No. 80404.0018.001
EFS - Web

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | |
|---|---|
| Serial No. 11/733,064 | Confirmation No.: 7527 |
| Application of: Jon M. Huppenthal and David E. Caliga | Art Unit: 2183 |
| Filed: April 9, 2007 | Examiner: Not Yet Assigned |
| Attorney Docket No. SRC015 CON | Customer No.: **25235** |
| For: MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS | |

RESPONSE TO NOTICE TO FILE MISSING PARTS

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

In response to the Notice to File Missing Parts of Application, Filing Date Granted, mailed April 23, 2007, submitted herewith is the filing fee of $2,600 and a copy of the PTO Notice form. In addition, please charge deposit account no. 50-1123 $130 to cover the surcharge for a large entity.

Any fee deficiency associated with this communication may be charged to Deposit Account No. 50-1123.

Date: 17 May 2007

Michael C. Martensen, Reg. No. 46901
HOGAN & HARTSON LLP
One Tabor Center
1200 17th Street, Suite 1500
Denver, Colorado 80202
(719) 448-5910 Tel
(303) 899-7333 Fax

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NUMBER | FILING OR 371 (c) DATE | FIRST NAMED APPLICANT | ATTORNEY DOCKET NUMBER |
|---|---|---|---|
| 11/733,064 | 04/09/2007 | Jon M. Huppenthal | SRC015 CON |

**CONFIRMATION NO. 7527**

**FORMALITIES LETTER**

25235
HOGAN & HARTSON LLP
ONE TABOR CENTER, SUITE 1500
1200 SEVENTEENTH ST
DENVER, CO 80202

Date Mailed: 04/23/2007

## NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

**FILED UNDER 37 CFR 1.53(b)**

***Filing Date Granted***

**Items Required To Avoid Abandonment:**

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing.
  *Applicant must submit $* **300** *to complete the basic filing fee for a non-small entity. If appropriate, applicant may make a written assertion of entitlement to small entity status and pay the small entity filing fee (37 CFR 1.27).*

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- Additional claim fees of $**1600** as a non-small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.
- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of $130 for a non-small entity, must be submitted with the missing items identified in this letter.

**SUMMARY OF FEES DUE:**

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- $**300** Statutory basic filing fee.
- $**130** Surcharge.

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- The application examination fee has not been paid. Applicant must submit $**200** to complete the examination fee for a non-small entity.

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  - $**1600** for **32** total claims over 20.

Replies should be mailed to: Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
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Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

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PART 2 - COPY TO BE RETURNED WITH RESPONSE

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 11733064 |
| **Filing Date:** | 09-Apr-2007 |
| **Title of Invention:** | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS |
| First Named Inventor/Applicant Name: | Jon M. Huppenthal |
| **Filer:** | Michael Christian Martensen/Julie Lange |
| **Attorney Docket Number:** | SRC015 CON |

Filed as Large Entity

**Utility Filing Fees**

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Basic Filing:** | | | | |
| Utility application filing | 1011 | 1 | 300 | 300 |
| Utility Search Fee | 1111 | 1 | 500 | 500 |
| Utility Examination Fee | 1311 | 1 | 200 | 200 |
| **Pages:** | | | | |
| **Claims:** | | | | |
| Claims in excess of 20 | 1202 | 32 | 50 | 1600 |
| **Miscellaneous-Filing:** | | | | |
| Late filing fee for oath or declaration | 1051 | 1 | 130 | 130 |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |
| Post-Allowance-and-Post-Issuance: | | | | |
| **Extension-of-Time:** | | | | |
| **Miscellaneous:** | | | | |
| | | **Total in USD ($)** | | **2730** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 1792246 |
| **Application Number:** | 11733064 |
| **International Application Number:** | |
| **Confirmation Number:** | 7527 |
| **Title of Invention:** | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS |
| **First Named Inventor/Applicant Name:** | Jon M. Huppenthal |
| **Customer Number:** | 25235 |
| **Filer:** | Michael Christian Martensen/Julie Lange |
| **Filer Authorized By:** | Michael Christian Martensen |
| **Attorney Docket Number:** | SRC015 CON |
| **Receipt Date:** | 19-MAY-2007 |
| **Filing Date:** | 09-APR-2007 |
| **Time Stamp:** | 11:00:11 |
| **Application Type:** | Utility |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment was successfully received in RAM | $2730 |
| RAM confirmation Number | 1465 |
| Deposit Account | 501123 |
| The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:<br>Charge any Additional Fees required under 37 C.F.R. Section 1.16 and 1.17 | |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes) | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | | DOC020.PDF | 34966 | yes | 3 |

| Multipart Description/PDF files in .zip description | | |
|---|---|---|
| **Document Description** | **Start** | **End** |
| Miscellaneous Incoming Letter | 1 | 1 |
| Examination support document | 2 | 3 |

| | | | | | |
|---|---|---|---|---|---|
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Fee Worksheet (PTO-06) | fee-info.pdf | 8689 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 43655 | | |

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**New Applications Under 35 U.S.C. 111**
**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**
**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**
**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

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| APPLICATION NUMBER | FILING or 371(c) DATE | GRP ART UNIT | FIL FEE REC'D | ATTY.DOCKET.NO | TOT CLAIMS | IND CLAIMS |
|---|---|---|---|---|---|---|
| 11/733,064 | 04/09/2007 | 2183 | 2730 | SRC015 CON | 52 | 3 |

**CONFIRMATION NO. 7527**

**UPDATED FILING RECEIPT**

25235
HOGAN & HARTSON LLP
ONE TABOR CENTER, SUITE 1500
1200 SEVENTEENTH ST
DENVER, CO80202

Date Mailed: 05/24/2007

Receipt is acknowledged of this regular Patent Application. It will be considered in its order and you will be notified as to the results of the examination. Be sure to provide the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please mail to the Commissioner for Patents P.O. Box 1450 Alexandria Va 22313-1450. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections (if appropriate).**

**Applicant(s)**

Jon M. Huppenthal, Colorado Springs, CO;
David E. Caliga, Colorado Springs, CO;

**Assignment For Published Patent Application**

SRC COMPUTERS, INC., Colorado Springs, CO

**Power of Attorney:** The patent practitioners associated with Customer Number 25235

**Domestic Priority data as claimed by applicant**

This application is a CON of 10/285,318 10/31/2002 PAT 7,225,324

**Foreign Applications**

**If Required, Foreign Filing License Granted:** 04/20/2007

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US11/733,064**

**Projected Publication Date:** 08/30/2007

**Non-Publication Request:** No

**Early Publication Request:** No

**Title**

MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING

**Preliminary Class**

712

## PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

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Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

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| APPLICATION NUMBER | FILING OR 371(c) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|---|---|---|---|
| 11/733,064 | 04/09/2007 | Jon M. Huppenthal | SRC015 CON |

**CONFIRMATION NO. 7527**

25235
HOGAN & HARTSON LLP
ONE TABOR CENTER, SUITE 1500
1200 SEVENTEENTH ST
DENVER, CO80202

**Title:** MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS

**Publication No.** US-2007-0204131-A1
**Publication Date:** 08/30/2007

## NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Pre-Grant Publication Division, 703-605-4283

PTO/SB/08a (05-07)
Approved for use through 11/30/2007. OMB 0651-0031
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# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 11733064 |
| Filing Date | 2007-04-09 |
| First Named Inventor | Jon M. Huppenthal et al. |
| Art Unit | 2183 |
| Examiner Name | Not Yet Assigned |
| Attorney Docket Number | SRC015CON |

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| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
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|---|---|---|---|---|---|---|---|---|
| | 1 | 63-086079 | | | 1988-04-16 | Nippon Telegr & Teleph Corp. | | ☐ |
| | 2 | 59-206972 | | | 1984-11-22 | Toshiba Corp. | | ☐ |

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| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 11733064 |
| | Filing Date | 2007-04-09 |
| | First Named Inventor | Jon M. Huppenthal et al. |
| | Art Unit | 2183 |
| | Examiner Name | Not Yet Assigned |
| | Attorney Docket Number | SRC015CON |

| Examiner Initials* | Cite No | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published. | T[5] |
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**EXAMINER SIGNATURE**

| Examiner Signature | | Date Considered | |
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[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 11733064 |
| Filing Date | 2007-04-09 |
| First Named Inventor | Jon M. Huppenthal et al. |
| Art Unit | 2183 |
| Examiner Name | Not Yet Assigned |
| Attorney Docket Number | SRC015CON |

## CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ None

## SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

| | | | |
|---|---|---|---|
| Signature | /william j. kubida/ | Date (YYYY-MM-DD) | 2008-03-19 |
| Name/Print | William J. Kubida | Registration Number | 29664 |

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 3025628 |
| **Application Number:** | 11733064 |
| **International Application Number:** | |
| **Confirmation Number:** | 7527 |
| **Title of Invention:** | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS |
| **First Named Inventor/Applicant Name:** | Jon M. Huppenthal |
| **Customer Number:** | 25235 |
| **Filer:** | William J. Kubida/Julie Lange |
| **Filer Authorized By:** | William J. Kubida |
| **Attorney Docket Number:** | SRC015 CON |
| **Receipt Date:** | 19-MAR-2008 |
| **Filing Date:** | 09-APR-2007 |
| **Time Stamp:** | 18:41:53 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes) /Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Foreign Reference | DOC096.PDF | 133819<br>34a5f972325e1b3b52830326361a61b4562e42da | no | 7 |

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|---|---|
| **Warnings:** | |
| **Information:** | |

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| 2 | Information Disclosure Statement (IDS) Filed | SRC015CONIDSform.pdf | 573642<br>a27be57325830cb005b243a5f381eae8c90bf449 | no | 4 |

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**Information:**

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**National Stage of an International Application under 35 U.S.C. 371**
**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

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Mailed January 8, 2008

# NOTICE OF GROUNDS OF REJECTION

| | |
|---|---|
| Patent Application No. | 539441/2000 |
| Drafting Date | December 26, 2007 |
| Patent Office Examiner | Masanori KUBO (9642 5B00) |
| Attorney | Mr. Hisao Fukami (et al.) |
| Applied Provision | Paragraph 2 of Article 29, Article 36 |

The present application is recognized as rejected on the following ground. It is required that any remarks be submitted within three months from the date on which the present NOTICE was mailed.

## GROUNDS

1. It is recognized that, because the invention described in Claim(s) of SCOPE OF CLAIMS FOR PATENT of the present application could have been invented readily by a person having ordinary knowledge in the field of the art to which the present invention pertains prior to the filing of the present application based on the invention as described in the following publication(s) distributed or the invention as made available to the public through electric telecommunication lines in Japan and/or foreign countries prior to the filing of the present application, a patent cannot be granted thereto under the provision of Paragraph 2 of Article 29 of the Patent Law.

2. It is recognized that the present application does not satisfy the conditions prescribed in Paragraph 6 (ii) of Article 36 of the Patent Law because of the defectiveness of the description in SCOPE OF CLAIMS FOR PATENT on the following point.

REMARKS (See the list of the cited references.)

With regard to Ground 1

- Claims 1-81
- Cited References 1-2
- Note

Cited references 1 and 2 each describe that the processing instruction is given from a main control unit to a plurality of processors through a memory. Cited reference 1 also describes that the processing result is transferred to a different processor. There is no particular difficulty in constructing each processor with a well-known reconfigurable circuit and providing a plurality of main control units.

With regard to Ground 2

The description of the "improvement" in claims 1 to 7 is unclear since it cannot be specified whether it is the "product invention" or the "method invention".

Therefore, the invention according to claims 1 to 7 is unclear.

If any grounds of rejection are newly found, the grounds of rejection will be noticed.

LIST OF CITED REFERENCES

(1) Japanese Patent Laying-Open No. 63-086079

(2) Japanese Patent Laying-Open No. 59-206972

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Record of Search for Prior Art Documents

* Searched Technical Field IPC G06F15/80

G06F15/16-15/177

* Prior Art Documents

Japanese Patent Laying-Open No. 11-015773

This record of search for prior art documents does not form any grounds of rejection.

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 59-206972
(43)Date of publication of application : 22.11.1984

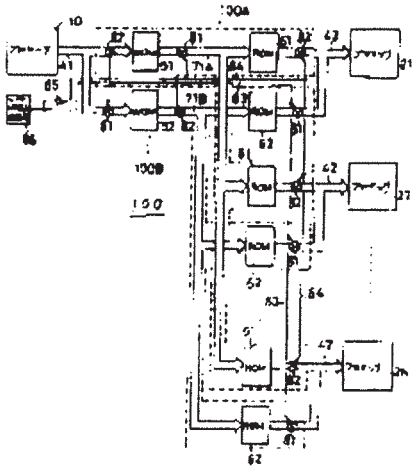
(51)Int.Cl. G06F 15/16

(21)Application number : 58-081318
(22)Date of filing : 10.05.1983

(71)Applicant : TOSHIBA CORP
(72)Inventor : FUJII MAKOTO

## (54) SHARED MEMORY

(57)Abstract:
PURPOSE: To eliminate interruption of processors at the time of data transfer between processors by providing plural write-only memories in the input port of a public memory and plural read-only memories in the output port.
CONSTITUTION: Write-only memories 51, 52 that write data from a processor 10 are provided in the input port of a shared memory 100, and read-only memories 61, 62 that read data to processors 21W2N are provided in output ports. Gates 81, 82 that determine transfer mode of data are provided in an A port 100A and a B port 100B. The gate 81 is connected to a change-over signal generating circuit 86, and the gate 82 is connected to a mode changing signal generating circuit 86 through a controlling line 84 and an invertor 85 for inverting signals. By this way, transfer mode of the A port 100A and B port 100B become reverse.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's

decision of rejection]
[Date of extinction of right]

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 63-086079

(43)Date of publication of application : 16.04.1988

(51)Int.Cl. G06F 15/60
G06F 15/16
G06F 15/347

(21)Application number : 61-232436

(22)Date of filing : 30.09.1986

(71)Applicant : NIPPON TELEGR & TELEPH CORP <NTT>

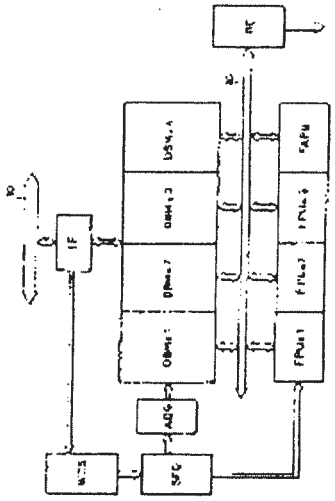
(72)Inventor : TAMAMURA YOSHIAKI
MITSUYA EIJI
AKIMOTO TAKAAKI

## (54) THREE-DIMENSIONAL SHADOW IMAGE FORMING PROCESSING DEVICE

(57)Abstract:

PURPOSE: To attain a highly speedy three-dimensional shadow image forming processing by executing a three-dimensional vector operation and a matrix operation with 3W4 floating point arithmetic units in parallel and in a pipeline way.

CONSTITUTION: Object shape data and a processing parameter used for image forming processing are stored into data memories DBM#1W#4. By floating point arithmetic units FPU#1W#3 and an arithmetic unit FAPU to combine a floating point computing element and an arithmetic and logic computing element in parallel, the three-dimensional vector operation and the matrix operation are executed in parallel and in a pipeline way. The prepared image data are written through a data collector DC to a display memory.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 11/733,064 | 04/09/2007 | Jon M. Huppenthal | SRC015 CON | 7527 |

25235 7590 01/12/2009

HOGAN & HARTSON LLP
ONE TABOR CENTER, SUITE 1500
1200 SEVENTEENTH ST
DENVER, CO 80202

| EXAMINER | |
|---|---|
| COLEMAN, ERIC | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2183 | |

| MAIL DATE | DELIVERY MODE |
|---|---|
| 01/12/2009 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 11/733,064 | HUPPENTHAL ET AL. | |
| | Examiner | Art Unit | |
| | Eric Coleman | 2183 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) 1-52 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-52 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 4/9/07,3/19/08.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 30 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 20 recites the limitation "said first systolic wall" in line 3. There is insufficient antecedent basis for this limitation in the claim.

### *Double Patenting*

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-52 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-52 of U.S. Patent No. 7,225,324 in view of Gaudiot IEEE article entitled Data Driven Multicomputers in Digital Signal processing. The side by showing of the corresponding independent claims 1,25,51 show that the corresponding independent claims are substantially similar.

| Instant application | Patent No. 7,225, 324 |
|---|---|
| 1. A method for data processing in a reconfigurable computing system, the reconfigurable computing system comprising at least one reconfigurable processor, the reconfigurable processor comprising a plurality of functional units, said method comprising: transforming an algorithm into a **data driven** calculation that is implemented by said reconfigurable computing system at the at least one reconfigurable processor; **forming** at least two of said functional units at the at least one reconfigurable processor to perform said calculation wherein only functional units needed to solve the calculation are **formed** and wherein each **formed** functional unit at the at least one reconfigurable processor interconnects with each other **formed** functional unit at the at least one reconfigurable processor based | 1. A method for data processing in a reconfigurable computing system, the reconfigurable computing system comprising at least one reconfigurable processor, the reconfigurable processor comprising a plurality of functional units, said method comprising: transforming an algorithm into a calculation that is systolically implemented by said reconfigurable computing system at the at least one reconfigurable processor; instantiating at least two of said functional units at the at least one reconfigurable processor to perform said calculation wherein only functional units needed to solve the calculation are instantiated and wherein each instantiated functional unit at the at least one reconfigurable processor interconnects with each other instantiated functional unit at the at least one reconfigurable processor based |

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| on reconfigurable routing resources within the at least one reconfigurable processor as established at **formation**, and wherein lines of code of said calculation are **formed** as clusters of functional units within the at least one reconfigurable processor; utilizing a first of said instantiated functional units to operate upon a subsequent data dimension of said calculation forming a first computational loop; and substantially concurrently utilizing a second of said formed functional units to operate upon a previous data dimension of said calculation **generating** a second computational loop wherein said implementation of said calculation enables said first computational loop and said second computational loop execute concurrently and pass computed data seamlessly between said computational loops. | on reconfigurable routing resources within the at least one reconfigurable processor as established at instantiation, and wherein **systolically linked** lines of code of said calculation are instantiated as clusters of functional units within the at least one reconfigurable processor; utilizing a first of said instantiated functional units to operate upon a subsequent data dimension of said calculation forming a first computational loop; and substantially concurrently utilizing a second of said instantiated functional units to operate upon a previous data dimension of said calculation forming a second computational loop wherein said **systolic** implementation of said calculation enables said first computational loop and said second computational loop execute concurrently and pass computed data seamlessly between said computational loops. |
| 25. A method for data processing in a reconfigurable computing system, the reconfigurable computing system comprising at least one | 25. A method for data processing in a reconfigurable computing system, the reconfigurable computing system comprising at least one |

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| reconfigurable processor comprising a plurality of functional units, said method comprising: transforming an algorithm into a **data driven** calculation that is implemented by said reconfigurable computing system at the at least one reconfigurable processor wherein linked lines of code of said calculation are **fashioned** as walls of functional units within the at least one reconfigurable processor; defining a first wall comprising rows of cells forming a subset of said plurality of functional units; computing at the at least one reconfigurable processor a value at each of said cells in at least a first row of said first substantially concurrently; communicating said values between cells in said first row of said cells to produce updated values, wherein communicating said values is based on reconfigurable routing resources within the at least one reconfigurable processor; communicating said updated values substantially concurrently to a second row of said first wall, wherein communicating said updated values is based on reconfigurable routing | reconfigurable processor comprising a plurality of functional units, said method comprising: transforming an algorithm into a calculation that is **systolically** implemented by said reconfigurable computing system at the at least one reconfigurable processor wherein **systolically** linked lines of code of said calculation are instantiated as walls of functional units within the at least one reconfigurable processor; defining a first **systolic** wall comprising rows of cells forming a subset of said plurality of functional units; computing at the at least one reconfigurable processor a value at each of said cells in at least a first row of said first **systolic wall** substantially concurrently; communicating said values between cells in said first row of said cells to produce updated values, wherein communicating said values is based on reconfigurable routing resources within the at least one reconfigurable processor; communicating said updated values substantially concurrently to a second row of said first **systolic** wall, wherein communicating said updated values is based on reconfigurable routing |

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| resources within the at least one reconfigurable processor; and communicating said updated values substantially concurrently to a first row of a second wall of rows of cells in said subset of said plurality of functional units, wherein communicating said updated values is based on reconfigurable routing resources within the at least one reconfigurable processor and wherein said first wall of rows of cells and said second wall of rows of cells execute substantially concurrently and pass computed data seamlessly between said walls. | resources within the at least one reconfigurable processor; and communicating said updated values substantially concurrently to a first row of a second systolic wall of rows of cells in said subset of said plurality of functional units, wherein communicating said updated values is based on reconfigurable routing resources within the at least one reconfigurable processor and wherein said first **systolic** wall of rows of cells and said second wall of rows of **systolic** cells execute substantially concurrently and pass computed data seamlessly between said **systolic** walls. |
| 51. A method for data processing in a reconfigurable computing system, the reconfigurable computer system comprising at least one reconfigurable processor comprising a plurality of functional units, said method comprising: transforming an algorithm into a calculation that is implemented by said reconfigurable computing system at the at least one reconfigurable processor **and driven by data propagation** wherein lines of code of said calculation are | 51. A method for data processing in a reconfigurable computing system, the reconfigurable computer system comprising at least one reconfigurable processor comprising a plurality of functional units, said method comprising: transforming an algorithm into a calculation that is **systolically** implemented by said reconfigurable computing system at the at least one reconfigurable processor wherein **systolically** linked lines of code of said calculation are |

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| linked **based on said data propagation and fashioned** as subsets of said plurality of functional units within the at least one reconfigurable processor forming columns of said calculation;<br>performing said calculation at the at least one reconfigurable processor by<br>said subsets of said plurality of functional units to produce computed data;<br>exchanging said computed data between a first column of said calculation and a<br>next column in said calculation, wherein said exchanging is based on reconfigurable routing resources within the at least one reconfigurable<br>processor and wherein execution of said subsets of said plurality of function<br>units occurs concurrently and said computed data is seamlessly passed between said first column of said calculation and said second column of said<br>calculation; evaluating a rate of change in at least one variable for each of<br>said columns in said calculation; continuing said calculation when said variable does not change for a particular column of said calculation; and<br>restarting said calculation at said column of said calculation where said<br>variable does change. | **instantiated**<br>as subsets of<br>said plurality of functional units within the at<br>least one reconfigurable<br>processor forming columns of<br>said calculation;<br>performing said calculation at the at least one reconfigurable processor by<br>said subsets of said plurality of functional units to produce computed data;<br>exchanging said computed data between a first column of said calculation and a<br>next column in said calculation, wherein said exchanging is based on reconfigurable routing resources within the at least one reconfigurable<br>processor and wherein execution of said subsets of said plurality of function<br>units occurs concurrently and said computed data is seamlessly passed between said first column of said calculation and said second column of said<br>calculation; evaluating a rate of change in at least one variable for each of<br>said columns in said calculation; continuing said calculation when said variable does not change for a particular column of said calculation; and<br>restarting said calculation at said column of said calculation where said<br>variable does change. |

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The claims in the 7,722,324 patent did not expressly detail that the method included *data driven* calculation or propagation of data. However Gaudiot taught that data driven processing and calculations includes systolic processing (e.g., see page 1224 (section IV) and page 1230 (section H). Therefore since patent 7,722,324 claims systolic calculation and propagation and linking of data and the instant application claims data driven calculation and data propagation it would have been obvious to one of ordinary skill in the DP system that the claimed calculation and data propagation are of the same type. Gaudiot taught that the use of one of the several types of data driven processing or calculation would have been more advantageous depending on the features of the calculation however each is considered data driven (e.g., see page 1230 (section H)). The patent 722,324 used forms of the word “instantiate” versus forms of the words “form” or “fashioned“ in the instant claims . The claimed instantiating or representing by a concrete instance is not different from the claimed forming because the fashioning or forming (claimed in the instant application) is done by representing data or functional unit by concrete references to data or functional units or other system elements. Claims 2-24, 25-50 and 52 provide the same corresponding limitations in the Patent 7,224,324 and the instant application and therefore are also rejected. It would have been obvious to one of ordinary skill in the DP art to combine the claims of patent No. 7,722,324 and Gaudiot. Both references were directed toward processing data parallel processing of data in a DP system. The addition of the Gaudiot teaching

would have provided ways for optimizing the processing of calculations depending on the attributes of the calculation that was performed by systolic means considering that the systolic processing is a subset of data driven processing. Also the addition of the Gaudiot teachings would have yielded predictable results.

***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Dennis,J.B. (IEEE Computer chapter on DataFlow Supercomputers).

Quinn, M et al., (IEEE article entitled Data-Parallel Programming on Multicomputers).

Treleaven,P.C et al., Computing Surveys article entitled Data-Driven and Demand-Driven Computer Architecture.

Webster's Ninth New Collegiate Dictionary, (definition of instantiate),p. 627.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric Coleman whose telephone number is (571) 272-4163. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Chan can be reached on (571) 272-4162. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

EC
/Eric Coleman/
Primary Examiner, Art Unit 2183

| Notice of References Cited | Application/Control No. 11/733,064 | Applicant(s)/Patent Under Reexamination HUPPENTHAL ET AL. | |
|---|---|---|---|
| | Examiner Eric Coleman | Art Unit 2183 | Page 1 of 2 |

**U.S. PATENT DOCUMENTS**

| * | | Document Number Country Code-Number-Kind Code | Date MM-YYYY | Name | Classification |
|---|---|---|---|---|---|
| | A | US- | | | |
| | B | US- | | | |
| | C | US- | | | |
| | D | US- | | | |
| | E | US- | | | |
| | F | US- | | | |
| | G | US- | | | |
| | H | US- | | | |
| | I | US- | | | |
| | J | US- | | | |
| | K | US- | | | |
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**FOREIGN PATENT DOCUMENTS**

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**NON-PATENT DOCUMENTS**

| * | | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
|---|---|---|
| | U | Gaudiot, Jean-Luc, Data-Driven Multicomputers in Digital Signal Processing,1987, IEEE, Proceedings of the IEEE, vol. 75,No. 9, pp.1220-1234., |
| | V | Dennis,J. B., Data Flow Supercomputers, November 1980, IEEE, Computer, pp. 48-56. |
| | W | Qunnn M.J., et al., Data-Parallel Programming on Multicomputers, Sept. 1990, IEEE, pp 69-76. |
| | X | Trevleaven, P.C., et al., Data-Driven and Demand-Driven Computer Architecture, 1982, ACM, Computiing Surveys Vol. 14, No. 1, pp. 93-143. |

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

| Notice of References Cited | Application/Control No. 11/733,064 | Applicant(s)/Patent Under Reexamination HUPPENTHAL ET AL. | |
|---|---|---|---|
| | Examiner Eric Coleman | Art Unit 2183 | Page 2 of 2 |

**U.S. PATENT DOCUMENTS**

| * | | Document Number Country Code-Number-Kind Code | Date MM-YYYY | Name | Classification |
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**FOREIGN PATENT DOCUMENTS**

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**NON-PATENT DOCUMENTS**

| * | | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
|---|---|---|
| | U | Webster. M., Webster's Ninth New Collegiate Dictionary, 1985, Merriam-Webster pub., p. 627. |
| | V | |
| | W | |
| | X | |

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

## EAST Search History

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | Time Stamp |
|---|---|---|---|---|---|---|
| L1 | 68701 | data adj (driven or flow) | US-PGPUB; USPAT | OR | OFF | 2009/01/08 17:24 |
| L2 | 16456 | systolic | US-PGPUB; USPAT | OR | OFF | 2009/01/08 17:24 |
| L3 | 84354 | 1 or 2 | US-PGPUB; USPAT | OR | OFF | 2009/01/08 17:24 |
| L4 | 76322 | process$3 adj element$1 or (function$2 adj unit $1) | US-PGPUB; USPAT | OR | OFF | 2009/01/08 17:25 |
| L5 | 30708 | multple or plural$3 near3 dimens$5 | US-PGPUB; USPAT | OR | OFF | 2009/01/08 17:26 |
| L6 | 43135 | (multiple or plural $3) near3 dimens $5 | US-PGPUB; USPAT | OR | OFF | 2009/01/08 17:26 |
| L7 | 1465 | 4 and 6 | US-PGPUB; USPAT | OR | OFF | 2009/01/08 17:26 |
| L8 | 1410 | (concurrent$3 or simultaneous$1) near3 loop$3 | US-PGPUB; USPAT | OR | OFF | 2009/01/08 17:27 |
| L9 | 4 | 7 and 8 | US-PGPUB; USPAT | OR | OFF | 2009/01/08 17:27 |
| L10 | 3 | 1 and 9 | US-PGPUB; USPAT | OR | OFF | 2009/01/08 17:27 |
| L11 | 559 | 712/226.ccls. | US-PGPUB; USPAT | OR | OFF | 2009/01/08 17:28 |
| L12 | 267 | 712/15.ccls. | US-PGPUB; USPAT | OR | OFF | 2009/01/08 17:28 |
| L13 | 56 | 712/19.ccls. | US-PGPUB; USPAT | OR | OFF | 2009/01/08 17:28 |

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|---|---|---|---|---|---|---|
| L15 | 580 | 712/215.ccls. | US-PGPUB; USPAT | OR | OFF | 2009/01/08 17:28 |
| L16 | 1435 | 11 or 12 or 13 or 15 | US-PGPUB; USPAT | OR | OFF | 2009/01/08 17:29 |
| L17 | 289 | 1 and 16 | US-PGPUB; USPAT | OR | OFF | 2009/01/08 17:29 |
| L18 | 3 | 8 and 17 | US-PGPUB; USPAT | OR | OFF | 2009/01/08 17:29 |

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| Index of Claims | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 11733064 | HUPPENTHAL ET AL. |
| | Examiner | Art Unit |
| | Eric Coleman | 2183 |

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| ✓ | Rejected | - | Cancelled | N | Non-Elected | A | Appeal |
| = | Allowed | ÷ | Restricted | I | Interference | O | Objected |

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

| CLAIM | | DATE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Final | Original | 01/08/2009 | | | | | | | | |
| | 1 | ✓ | | | | | | | | |
| | 2 | ✓ | | | | | | | | |
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| | 32 | ✓ | | | | | | | | |
| | 33 | ✓ | | | | | | | | |
| | 34 | ✓ | | | | | | | | |
| | 35 | ✓ | | | | | | | | |
| | 36 | ✓ | | | | | | | | |

| Index of Claims | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 11733064 | HUPPENTHAL ET AL. |
| | Examiner | Art Unit |
| | Eric Coleman | 2183 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ✓ | Rejected | - | Cancelled | N | Non-Elected | A | Appeal |
| = | Allowed | ÷ | Restricted | I | Interference | O | Objected |

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

| CLAIM | | DATE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Final | Original | 01/08/2009 | | | | | | | | |
| | 37 | ✓ | | | | | | | | |
| | 38 | ✓ | | | | | | | | |
| | 39 | ✓ | | | | | | | | |
| | 40 | ✓ | | | | | | | | |
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| | 42 | ✓ | | | | | | | | |
| | 43 | ✓ | | | | | | | | |
| | 44 | ✓ | | | | | | | | |
| | 45 | ✓ | | | | | | | | |
| | 46 | ✓ | | | | | | | | |
| | 47 | ✓ | | | | | | | | |
| | 48 | ✓ | | | | | | | | |
| | 49 | ✓ | | | | | | | | |
| | 50 | ✓ | | | | | | | | |
| | 51 | ✓ | | | | | | | | |
| | 52 | ✓ | | | | | | | | |

PTO/SB/08a (05-07)
Approved for use through 11/30/2007. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE


# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 11733064 |
| Filing Date | 2007-04-09 |
| First Named Inventor | Jon M. Huppenthal et al. |
| Art Unit | 2183 |
| Examiner Name | Not Yet Assigned |
| Attorney Docket Number | SRC015CON |

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| Application Number | 11733064 |
| Filing Date | 2007-04-09 |
| First Named Inventor | Jon M. Huppenthal et al. |
| Art Unit | 2183 |
| Examiner Name | Not Yet Assigned |
| Attorney Docket Number | SRC015CON |

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Client/Matter No. 80404.0018.001

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| Serial No. -----<br>Application of: Jon M. Huppenthal and David E. Caliga<br>Filed: Herewith<br>Attorney Docket No. SRC015 CON<br>For: MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS | Art Unit:<br>Confirmation No.:<br>Examiner:<br>Customer No.: **25235** |

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This Information Disclosure Statement is filed before mailing of a first Office Action in the above case. Accordingly, no fee is believed due. However, any fee associated herewith may be charged to Deposit Account No. 50-1123.

Respectfully submitted,

9 April 2009
Date

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| **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** | | | | First Named Inventor | **Jon M. Huppenthal et al.** |
| | | | | Art Unit | |
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| **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** | | | | First Named Inventor | **Jon M. Huppenthal et al.** |
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| **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** | | | | Filing Date | **Herewith** |
| | | | | First Named Inventor | **Jon M. Huppenthal et al.** |
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| | FIRST NAMED INVENTOR<br>Jon M. Huppenthal et al. | |
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| EXAMINER | /Eric Coleman/ | DATE CONSIDERED 01/08/2009 |

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 11733064 | HUPPENTHAL ET AL. |
| | Examiner | Art Unit |
| | Eric Coleman | 2183 |

## SEARCHED

| Class | Subclass | Date | Examiner |
|---|---|---|---|
| 712 | 226,15,19,215 | 1/8/09 | EC |

## SEARCH NOTES

| Search Notes | Date | Examiner |
|---|---|---|
| | | |
| Searched East US Pat file US PG pub file | 1/8/09 | EC |
| inventor name search | 1/8/09 | EC |
| Searched Google Scholar | 1/8/09 | EC |
| Consulted WQAS Padmanabhan Mano on possible 101 (mathematical algorithm) | 1/8/09 | EC |

## INTERFERENCE SEARCH

| Class | Subclass | Date | Examiner |
|---|---|---|---|
| | | | |

Client Matter No. 80404.0018.001
EFS-Web

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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|---|---|
| Serial No. 11/733,064<br>Application of: Jon M. Huppenthal and David E. Caliga<br>Filed: April 9, 2007<br>Attorney Docket No. SRC015 CON<br>For: MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS | Confirmation No.: 7527<br>Art Unit: 2183<br>Examiner: Coleman, Eric<br>Customer No.: **25235** |

AMENDMENT

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the office communication mailed January 12, 2009, please amend the above-identified application as follows:

**Amendments to the Claims** are reflected in the listing of claims which begins on page 2 of this paper.

**Remarks/Arguments** begin on page 10 of this paper.

A **Terminal Disclaimer** is attached following page 11 of this paper.

**Amendments to the Claims:**

This listing of claims will replace all prior versions and listings of claims in the application:

**Listing of Claims:**

1. (original) A method for data processing in a reconfigurable computing system, the reconfigurable computing system comprising at least one reconfigurable processor, the reconfigurable processor comprising a plurality of functional units, said method comprising:

transforming an algorithm into a data driven calculation that is implemented by said reconfigurable computing system at the at least one reconfigurable processor;

forming at least two of said functional units at the at least one reconfigurable processor to perform said calculation wherein only functional units needed to solve the calculation are formed and wherein each formed functional unit at the at least one reconfigurable processor interconnects with each other formed functional unit at the at least one reconfigurable processor based on reconfigurable routing resources within the at least one reconfigurable processor as established at formation, and wherein lines of code of said calculation are formed as clusters of functional units within the at least one reconfigurable processor;

utilizing a first of said formed functional units to operate upon a subsequent data dimension of said calculation forming a first computational loop; and

substantially concurrently utilizing a second of said formed functional units to operate upon a previous data dimension of said calculation generating a

second computational loop wherein said implementation of said calculation enables said first computational loop and said second computational loop execute concurrently and pass computed data seamlessly between said computational loops.

2. (original) The method of claim 1 wherein said subsequent and previous data dimensions of said calculation comprise multiple vectors in said calculation.

3. (original) The method of claim 1 wherein said subsequent and previous data dimensions of said calculation comprise multiple planes in said calculation.

4. (original) The method of claim 1 wherein said subsequent and previous data dimensions of said calculation comprise multiple time steps in said calculation.

5. (original) The method of claim 1 wherein said subsequent an previous data dimensions of said calculation comprise multiple grid points in said calculation.

6. (original) The method of claim 1 wherein said calculation comprises a seismic imaging calculation.

7. (original) The method of claim 1 wherein said calculation comprises a synthetic aperture radar imaging calculation.

8. (original) The method of claim 1 wherein said calculation comprises a JPEG image compression calculation.

9. (original) The method of claim 1 wherein said calculation comprises an MPEG image compression calculation.

10. (original) The method of claim 1 wherein said calculation comprises a fluid flow calculation for a reservoir simulation.

11. (original) The method of claim 1 wherein said calculation comprises a fluid flow calculation for weather prediction.

12. (original) The method of claim 1 wherein said calculation comprises a fluid flow calculation for automotive applications.

13. (original) The method of claim 1 wherein said calculation comprises a fluid flow calculation for aerospace applications.

14. (original) The method of claim 1 wherein said calculation comprises a fluid flow calculation for an injection molding application.

15. (original) The method of claim 1 wherein instantiating includes establishing a stream communication connection between functional units.

16. (original) The method of claim 1 wherein said calculation is comprises a structures calculation for structural analysis.

17. (original) The method of claim 1 wherein said calculation comprises a search algorithm for an image search.

18. (original) The method of claim 1 wherein said calculation comprises a search algorithm for data mining.

19. (original) The method of claim 1 wherein said calculation comprises a financial modeling application.

20. (original) The method of claim 1 wherein said calculation comprises an encryption algorithm.

21. (original) The method of claim 1 wherein said calculation comprises a genetic pattern matching function.

22. (original) The method of claim 1 wherein said calculation comprises a protein folding function.

23. (original) The method of claim 1 wherein said calculation comprises an organic structure interaction function.

24. (original) The method of claim 1 wherein said calculation comprises a signal filtering application.

25. (original) A method for data processing in a reconfigurable computing system, the reconfigurable computing system comprising at least one reconfigurable processor comprising a plurality of functional units, said method comprising:

transforming an algorithm into a data driven calculation that is implemented by said reconfigurable computing system at the at least one reconfigurable processor wherein linked lines of code of said calculation are fashioned as walls of functional units within the at least one reconfigurable processor;

defining a first wall comprising rows of cells forming a subset of said plurality of functional units;

computing at the at least one reconfigurable processor a value at each of said cells in at least a first row of said first wall substantially concurrently;

communicating said values between cells in said first row of said cells to produce updated values, wherein communicating said values is based on reconfigurable routing resources within the at least one reconfigurable processor;

communicating said updated values substantially concurrently to a second row of said first wall, wherein communicating said updated values is based on reconfigurable routing resources within the at least one reconfigurable processor; and

communicating said updated values substantially concurrently to a first row of a second wall of rows of cells in said subset of said plurality of functional units, wherein communicating said updated values is based on reconfigurable routing resources within the at least one reconfigurable processor and wherein said first wall of rows of cells and said second wall of rows of cells execute substantially concurrently and pass computed data seamlessly between said walls.

26. (original) The method of claim 25 wherein said values correspond to vectors in a computation.

27. (original) The method of claim 25 wherein said values correspond to planes in a computation.

28. (original) The method of claim 25 wherein said values correspond to time steps in a computation.

29. (original) The method of claim 25 wherein said values correspond to grid points in a computation.

30. (currently amended) The method of claim 25 wherein said step of communicating said updated values to a second row of said first ~~systolic~~ wall is carried out without storing said updated values in an extrinsic memory.

31. (original) The method of claim 25 wherein said values correspond to a seismic imaging calculation.

32. (original) The method of claim 25 wherein said values correspond to a synthetic aperture radar imaging calculation.

33. (original) The method of claim 25 wherein said values correspond to a JPEG image compression calculation.

34. (original) The method of claim 25 wherein said values correspond to an MPEG image compression calculation.

35. (original) The method of claim 25 wherein said values correspond to a fluid flow calculation for a reservoir simulation.

36. (original) The method of claim 25 wherein said values correspond to a fluid flow calculation for weather prediction.

37. (original) The method of claim 25 wherein said values correspond to a fluid flow calculation for automotive applications.

38. (original) The method of claim 25 wherein said values correspond to a fluid flow calculation for aerospace applications.

39. (original) The method of claim 25 wherein said values correspond to a fluid flow calculation for an injection molding application.

40. (original) The method of claim 25 wherein defining includes establishing a stream communication connection between functional units and wherein only functional units needed to solve the calculations are instantiated.

41. (original) The method of claim 25 wherein said values correspond to a structures calculation for structural analysis.

42. (original) The method of claim 25 wherein said values correspond to a search algorithm for an image search.

43. (original) The method of claim 25 wherein said values correspond to a search algorithm for data mining.

44. (original) The method of claim 25 wherein said values correspond to a financial modeling application.

45. (original) The method of claim 25 wherein said values correspond to an encryption algorithm.

46. (original) The method of claim 25 wherein said values correspond to a genetic pattern matching function.

47. (original) The method of claim 25 wherein said values correspond to a protein folding function.

48. (original) The method of claim 25 wherein said values correspond to an organic structure interaction function.

49. (original) The method of claim 25 wherein said values correspond to a signal filtering application.

50. (original) The method of claim 25 wherein said reconfigurable computing system comprises at least one microprocessor.

51. (original) A method for data processing in a reconfigurable computing system, the reconfigurable computer system comprising at least one reconfigurable processor comprising a plurality of functional units, said method comprising:

transforming an algorithm into a calculation implemented by said reconfigurable computing system at the at least one reconfigurable processor and driven by data propagation wherein lines of code of said calculation are linked based on said data propagation and fashioned as subsets of said plurality of functional units within the at least one reconfigurable processor forming columns of said calculation;

performing said calculation at the at least one reconfigurable processor by said subsets of said plurality of functional units to produce computed data;

exchanging said computed data between a first column of said calculation and a next column in said calculation, wherein said exchanging is based on reconfigurable routing resources within the at least one reconfigurable processor and wherein execution of said subsets of said plurality of function units occurs concurrently and said computed data is seamlessly passed between said first column of said calculation and said second column of said calculation;

evaluating a rate of change in at least one variable for each of said columns in said calculation;

continuing said calculation when said variable does not change for a particular column of said calculation; and

restarting said calculation at said column of said calculation where said variable does change.

52. (original) The method of claim 51 wherein how many functional units comprise the subset and functional type of each functional unit in said subset is based on the calculation.

## REMARKS/ARGUMENTS

Claims 1-52 were presented for examination and are pending in this application. In an Official Office Action dated January 12, 2009, claims 1-52 were rejected. The Applicant thanks the Examiner for his consideration and addresses the Examiner's comments concerning the claims pending in this application below.

Applicant herein amends claim 30 and respectfully traverses the Examiner's rejections. No claims are presently cancelled and no new claims are added. These changes are believed not to introduce new matter, and their entry is respectfully requested. The claims have been amended to expedite the prosecution and issuance of the application. In making this amendment, the Applicant has not and is not narrowing the scope of the protection to which the Applicant considers the claimed invention to be entitled and does not concede, directly or by implication, that the subject matter of such claims was in fact disclosed or taught by the cited prior art. Rather, the Applicant reserves the right to pursue such protection at a later point in time and merely seeks to pursue protection for the subject matter presented in this submission.

Based on the above amendment and the following remarks, Applicant respectfully requests that the Examiner reconsider all outstanding rejections and withdraw them.

### 35 U.S.C. §112 Rejection of Claims

Claim 30 was rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicant regards as the invention. Specifically claim 30 refers to "said first systolic wall" which lacks proper antecedent basis. Claim 30 is herein amended deleting the reference to "systolic." The Applicant contends that

claim 30 now possesses proper antecedent basis for all claim elements and meets the requirements set forth in 35 U.S.C. § 112 second paragraph.

**Double Patenting.**

Claims 1-52 were rejected under the judicially created doctrine of obviousness-type double patenting over commonly owned U.S. Patent No. 7,225,324.

Although the claims as presented are believed to be distinct with respect to U.S. Patent 7,225,324, a Terminal Disclaimer is herein supplied together with the required fee to expedite the allowance of patentable subject matter.

**Conclusion**

In view of all of the above, the claims are now believed to be allowable and the case in condition for allowance which action is respectfully requested. Should the Examiner be of the opinion that a telephone conference would expedite the prosecution of this case, the Examiner is requested to contact Applicant's attorney at the telephone number listed below.

Other than the Terminal Disclaimer fee, no fee is believed due for this submittal. However, any fee deficiency associated with this submittal may be charged to Deposit Account No. 50-1123.

Respectfully submitted,

13 April, 2009

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| **TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT** | Docket Number (optional) SRC015 CON |
|---|---|

In re Application of:

Application Number: 11/733,064

Filed: April 9, 2007

For: MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS

The owner*, SRC Computers, Inc., of 100% percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term **prior patent** No. 7,225,324 as the term of said prior patent is defined in 35 U.S.C. 154 and 173, and as the term of said **prior patent** is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the **prior patent** are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. 154 and 173 of the **prior patent**, "as the term of said **prior patent** is presently shortened by any terminal disclaimer," in the event that said **prior patent** later:

expires for failure to pay a maintenance fee;
is held unenforceable;
is found invalid by a court of competent jurisdiction;
is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
has all claims canceled by a reexamination certificate;
is reissued; or
is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ For submissions on behalf of a business/organization (e.g., corporation, partnership, university, government agency, etc.), the undersigned is empowered to act on behalf of the business/organization.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2. ☒ The undersigned is an attorney or agent of record. Reg. No. 46,901

/M C Martensen/ — Signature

13 April 2009 — Date

Michael C. Martensen
Typed or printed name

(719) 448-5910
Telephone

☒ Terminal disclaimer fee under 37 CFR 1.20(d) is included.

**WARNING: Information in this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**
*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
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SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 11733064 |
| **Filing Date:** | 09-Apr-2007 |
| **Title of Invention:** | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS |
| **First Named Inventor/Applicant Name:** | Jon M. Huppenthal |
| **Filer:** | Michael Christian Martensen/Julie Lange |
| **Attorney Docket Number:** | SRC015 CON |

Filed as Large Entity

## Utility under 35 USC 111(a) Filing Fees

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Basic Filing:** | | | | |
| **Pages:** | | | | |
| **Claims:** | | | | |
| **Miscellaneous-Filing:** | | | | |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |
| **Post-Allowance-and-Post-Issuance:** | | | | |
| **Extension-of-Time:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| Statutory disclaimer | 1814 | 1 | 140 | 140 |
| | | **Total in USD ($)** | | **140** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 5145907 |
| **Application Number:** | 11733064 |
| **International Application Number:** | |
| **Confirmation Number:** | 7527 |
| **Title of Invention:** | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS |
| **First Named Inventor/Applicant Name:** | Jon M. Huppenthal |
| **Customer Number:** | 25235 |
| **Filer:** | Michael Christian Martensen/Julie Lange |
| **Filer Authorized By:** | Michael Christian Martensen |
| **Attorney Docket Number:** | SRC015 CON |
| **Receipt Date:** | 13-APR-2009 |
| **Filing Date:** | 09-APR-2007 |
| **Time Stamp:** | 18:46:46 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | Deposit Account |
| Payment was successfully received in RAM | $140 |
| RAM confirmation Number | 4482 |
| Deposit Account | 501123 |
| Authorized User | |

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | | DOC059.PDF | 431122<br>4955d43acbda2ac2c5324e477a23eeca6c2607c6 | yes | 13 |

| Multipart Description/PDF files in .zip description | | |
|---|---|---|
| **Document Description** | **Start** | **End** |
| Amendment/Req. Reconsideration-After Non-Final Reject | 1 | 1 |
| Claims | 2 | 10 |
| Applicant Arguments/Remarks Made in an Amendment | 11 | 12 |
| Terminal Disclaimer Filed | 13 | 13 |

**Warnings:**

The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing

**Information:**

| | | | | | |
|---|---|---|---|---|---|
| 2 | Fee Worksheet (PTO-06) | fee-info.pdf | 30439<br>4c9a2e695917ec3783ba4f74aa0ae3eb1c243091 | no | 2 |

**Warnings:**

**Information:**

| **Total Files Size (in bytes):** | 461561 |
|---|---|

**This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.**

**New Applications Under 35 U.S.C. 111**
**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**
**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**
**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE


# PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

| Application or Docket Number | Filing Date | ☐ To be Mailed |
|---|---|---|
| 11/733,064 | 04/09/2007 | |

## APPLICATION AS FILED – PART I

| FOR | (Column 1) NUMBER FILED | (Column 2) NUMBER EXTRA | SMALL ENTITY ☐ RATE ($) | SMALL ENTITY ☐ FEE ($) | OR | OTHER THAN SMALL ENTITY RATE ($) | OTHER THAN SMALL ENTITY FEE ($) |
|---|---|---|---|---|---|---|---|
| ☐ BASIC FEE (37 CFR 1.16(a), (b), or (c)) | N/A | N/A | N/A | | | N/A | |
| ☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m)) | N/A | N/A | N/A | | | N/A | |
| ☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q)) | N/A | N/A | N/A | | | N/A | |
| TOTAL CLAIMS (37 CFR 1.16(i)) | minus 20 = | * | X $ = | | OR | X $ = | |
| INDEPENDENT CLAIMS (37 CFR 1.16(h)) | minus 3 = | * | X $ = | | | X $ = | |
| ☐ APPLICATION SIZE FEE (37 CFR 1.16(s)) | If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s). | | | | | | |
| ☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j)) | | | | | | | |
| | | | TOTAL | | | TOTAL | |

* If the difference in column 1 is less than zero, enter "0" in column 2.

## APPLICATION AS AMENDED – PART II

AMENDMENT 04/13/2009

| | (Column 1) CLAIMS REMAINING AFTER AMENDMENT | | (Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR | (Column 3) PRESENT EXTRA | SMALL ENTITY RATE ($) | SMALL ENTITY ADDITIONAL FEE ($) | OR | OTHER THAN SMALL ENTITY RATE ($) | OTHER THAN SMALL ENTITY ADDITIONAL FEE ($) |
|---|---|---|---|---|---|---|---|---|---|
| Total (37 CFR 1.16(i)) | * 52 | Minus | ** 52 | = 0 | X $ = | | OR | X $52= | 0 |
| Independent (37 CFR 1.16(h)) | * 3 | Minus | ***3 | = 0 | X $ = | | OR | X $220= | 0 |
| ☐ Application Size Fee (37 CFR 1.16(s)) | | | | | | | | | |
| ☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | OR | | |
| | | | | | TOTAL ADD'L FEE | | OR | TOTAL ADD'L FEE | 0 |

AMENDMENT

| | (Column 1) CLAIMS REMAINING AFTER AMENDMENT | | (Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR | (Column 3) PRESENT EXTRA | RATE ($) | ADDITIONAL FEE ($) | | RATE ($) | ADDITIONAL FEE ($) |
|---|---|---|---|---|---|---|---|---|---|
| Total (37 CFR 1.16(i)) | * | Minus | ** | = | X $ = | | OR | X $ = | |
| Independent (37 CFR 1.16(h)) | * | Minus | *** | = | X $ = | | OR | X $ = | |
| ☐ Application Size Fee (37 CFR 1.16(s)) | | | | | | | | | |
| ☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | OR | | |
| | | | | | TOTAL ADD'L FEE | | OR | TOTAL ADD'L FEE | |

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/FREDERICK E. BRISCOE/

| Application Number | Application/Control No. | Applicant(s)/Patent under Reexamination | |
|---|---|---|---|
| | 11/733,064 | HUPPENTHAL ET AL. | |

| Document Code - DISQ | Internal Document – DO NOT MAIL |
|---|---|

| TERMINAL DISCLAIMER | ☒ APPROVED | ☐ DISAPPROVED |
|---|---|---|
| Date Filed : 4/13/09 | This patent is subject to a Terminal Disclaimer | |

| Approved/Disapproved by: |
|---|
| debbie |

U.S. Patent and Trademark Office

PATENT
Attorney Docket No. SRC015 CON
Client/Matter No. 80404.0018.001
EFS-Web

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | |
|---|---|
| In re Application of: Jon M. Huppenthal and David E. Caliga | |
| Serial No. 11/733,064 | Art Unit: 2183 |
| Filed: April 9, 2007 | Examiner: Eric Coleman |
| For: MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS | Confirmation No.: 7527 |

## 2nd SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

The Applicant submits the additional references noted on the enclosed forms PTO/SB/08A and PTO/SB/08B for the Examiner's consideration pursuant to the Applicant's duty of disclosure under 37 C.F.R. 1.97(b)(3). Because an office action has been mailed in this case, please charge deposit account no 50-1123 $180, the fee believed required. Authorization is hereby granted to credit any overpayment or debit any underpayment of any fee required pursuant to this Supplemental Information Disclosure Statement to Deposit Account No. 50-1123.

Submission of the instant Supplemental Information Disclosure Statement is not a representation that a search has been made or that the cited information is, or is considered to be, material to patentability of the above application. A copy of the references listed on the enclosed form are attached.

Respectfully submitted,

13 April 2009
Date

Michael C. Martensen, Reg. No. 46901
HOGAN & HARTSON
One Tabor Center
1200 17th Street, Suite 1500
Denver, Colorado 80202
(719) 448-59XX Tel
(303) 899-7333 Fax

PTO/SB/08a (03-09)
Approved for use through 04/30/2009. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE



# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 11733064 |
| Filing Date | 2007-04-09 |
| First Named Inventor | Jon M. Huppenthal et al. |
| Art Unit | 2183 |
| Examiner Name | Eric Coleman |
| Attorney Docket Number | SRC015 CON |

| U.S.PATENTS | | | | | | |
|---|---|---|---|---|---|---|
| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
| | 1 | 5802290 | | 1998-09-01 | Casselman, Steven M. | |
| | 2 | 4763294 | | 1998-08-09 | Fong, Anthony S. | |
| | 3 | 5966534 | | 1999-10-12 | Cooke, et al. | |
| | 4 | 6721884 | | 2004-04-13 | De Oliveira Kastrup Pereira, et al. | |
| | 5 | 6704816 | | 2004-03-09 | Burke, David | |
| | 6 | 5509134 | | 1996-04-16 | Fandrich, et al. | |
| | 7 | 5953502 | | 1999-09-14 | Helbig, Sr., Walter A. | |
| | 8 | 6128663 | | 2000-10-03 | Thomas | |

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 11733064 |
| | Filing Date | 2007-04-09 |
| | First Named Inventor | Jon M. Huppenthal et al. |
| | Art Unit | 2183 |
| | Examiner Name | Eric Coleman |
| | Attorney Docket Number | SRC015 CON |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 9 | 5715453 | | 1998-02-03 | Stewart | |

If you wish to add additional U.S. Patent citation information please click the Add button.

**U.S.PATENT APPLICATION PUBLICATIONS**

| Examiner Initial* | Cite No | Publication Number | Kind Code[1] | Publication Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1 | | | | | |

If you wish to add additional U.S. Published Application citation information please click the Add button.

**FOREIGN PATENT DOCUMENTS**

| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] i | Kind Code[4] | Publication Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear | T[5] |
|---|---|---|---|---|---|---|---|---|
| | 1 | | | | | | | ☐ |

If you wish to add additional Foreign Patent Document citation information please click the Add button

**NON-PATENT LITERATURE DOCUMENTS**

| Examiner Initials* | Cite No | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published. | T[5] |
|---|---|---|---|
| | 1 | HASTIE, NEIL, et al., "The Implementation of Hardware Subroutines on Field Programmable Gate Arrays", XP010005485, Plessey Semiconductors, Tamerton Rd., Plymouth, Devon, England, IEEE, 13 MAY 1990, Custom Integrated Circuits Conference, pgs. 314. 1-4. *the whole document* | ☐ |
| | 2 | HARBAUM, TILL, et al., "Design of a Flexible Coprocessor Unit", Institute of Operating Systems and Computer Networks, XP000879556TU Braunschweig, Germany, Proceedings of the Euromicro Conference, September 1999, pgs. 335-342. *whole document* | ☐ |
| | 3 | MATHIAS P C; PATNAIK L M: "Systolic Evaluation of Polynomial Expressions," IEEE Transactions on Computers, vol. 39, no. 5, 1 May 1990, pgs. 653-665, XP000116659 | ☐ |

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 11733064 |
| **Filing Date:** | 09-Apr-2007 |
| **Title of Invention:** | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS |
| **First Named Inventor/Applicant Name:** | Jon M. Huppenthal |
| **Filer:** | Michael Christian Martensen/Julie Lange |
| **Attorney Docket Number:** | SRC015 CON |

Filed as Large Entity

## Utility under 35 USC 111(a) Filing Fees

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Basic Filing:** | | | | |
| **Pages:** | | | | |
| **Claims:** | | | | |
| **Miscellaneous-Filing:** | | | | |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |
| **Post-Allowance-and-Post-Issuance:** | | | | |
| **Extension-of-Time:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| Submission- Information Disclosure Stmt | 1806 | 1 | 180 | 180 |
| | | **Total in USD ($)** | | **180** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 5176625 |
| **Application Number:** | 11733064 |
| **International Application Number:** | |
| **Confirmation Number:** | 7527 |
| **Title of Invention:** | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS |
| **First Named Inventor/Applicant Name:** | Jon M. Huppenthal |
| **Customer Number:** | 25235 |
| **Filer:** | Michael Christian Martensen/Julie Lange |
| **Filer Authorized By:** | Michael Christian Martensen |
| **Attorney Docket Number:** | SRC015 CON |
| **Receipt Date:** | 17-APR-2009 |
| **Filing Date:** | 09-APR-2007 |
| **Time Stamp:** | 17:30:06 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | Deposit Account |
| Payment was successfully received in RAM | $180 |
| RAM confirmation Number | 3472 |
| Deposit Account | 501123 |
| Authorized User | |

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Information Disclosure Statement (IDS) Filed (SB/08) | DOC069.PDF | 103559<br>d83626f7b43997221f68befdde46a15771d78256 | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| This is not an USPTO supplied IDS fillable form | | | | | |
| 2 | NPL Documents | DOC070.PDF | 224326<br>cf07ff87ac69101d9a0c957de82acee30d024654 | no | 4 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | NPL Documents | DOC071.PDF | 400966<br>8624b0f51a9ef8aed94c0bdcb934c438c272a097 | no | 8 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | NPL Documents | DOC072.PDF | 687215<br>6e1393f62664463b2ec734407045f66d1bd0bbac | no | 13 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 5 | Fee Worksheet (PTO-06) | fee-info.pdf | 30689<br>ff12f71b751cd5d07957786c01cf2820de3ca5dd | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 1446755 | | |

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**New Applications Under 35 U.S.C. 111**

**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**

**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**

**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

# NOTICE OF ALLOWANCE AND FEE(S) DUE

25235 7590 06/30/2009

HOGAN & HARTSON LLP
ONE TABOR CENTER, SUITE 1500
1200 SEVENTEENTH ST
DENVER, CO 80202

| EXAMINER | |
|---|---|
| COLEMAN, ERIC | |
| ART UNIT | PAPER NUMBER |
| 2183 | |

DATE MAILED: 06/30/2009

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 11/733,064 | 04/09/2007 | Jon M. Huppenthal | SRC015 CON | 7527 |

TITLE OF INVENTION: MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS

| APPLN. TYPE | SMALL ENTITY | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE |
|---|---|---|---|---|---|---|
| nonprovisional | NO | $1510 | $300 | $0 | $1810 | 09/30/2009 |

**THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.**

**THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.**

**HOW TO REPLY TO THIS NOTICE:**

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.**



PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

# PART B - FEE(S) TRANSMITTAL

**Complete and send this form, together with applicable fee(s), to: Mail** **Mail Stop ISSUE FEE**
**Commissioner for Patents**
**P.O. Box 1450**
**Alexandria, Virginia 22313-1450**
**or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

25235 7590 06/30/2009

HOGAN & HARTSON LLP
ONE TABOR CENTER, SUITE 1500
1200 SEVENTEENTH ST
DENVER, CO 80202

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

**Certificate of Mailing or Transmission**

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

| |
|---|
| (Depositor's name) |
| (Signature) |
| (Date) |

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 11/733,064 | 04/09/2007 | Jon M. Huppenthal | SRC015 CON | 7527 |

TITLE OF INVENTION: MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS

| APPLN. TYPE | SMALL ENTITY | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE |
|---|---|---|---|---|---|---|
| nonprovisional | NO | $1510 | $300 | $0 | $1810 | 09/30/2009 |

| EXAMINER | ART UNIT | CLASS-SUBCLASS |
|---|---|---|
| COLEMAN, ERIC | 2183 | 712-226000 |

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:

❑ Issue Fee

❑ Publication Fee (No small entity discount permitted)

❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): (**Please first reapply any previously paid issue fee shown above**)

❑ A check is enclosed.

❑ Payment by credit card. Form PTO-2038 is attached.

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

❑ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

❑ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 11/733,064 | 04/09/2007 | Jon M. Huppenthal | SRC015 CON | 7527 |

25235 7590 06/30/2009

HOGAN & HARTSON LLP
ONE TABOR CENTER, SUITE 1500
1200 SEVENTEENTH ST
DENVER, CO 80202

| EXAMINER | |
|---|---|
| COLEMAN, ERIC | |
| ART UNIT | PAPER NUMBER |
| 2183 | |

DATE MAILED: 06/30/2009

**Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)**
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 212 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 212 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

| Interview Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 11/733,064 | HUPPENTHAL ET AL. | |
| | Examiner | Art Unit | |
| | Eric Coleman | 2183 | |

All participants (applicant, applicant's representative, PTO personnel):

(1) *Eric Coleman*. (3)_____.

(2) *Michael C. Martensen (Reg. No. 46,901)*. (4)_____.

Date of Interview: *24 June 2009*.

Type: a)☒ Telephonic b)☐ Video Conference
c)☐ Personal [copy given to: 1)☐ applicant 2)☐ applicant's representative]

Exhibit shown or demonstration conducted: d)☐ Yes e)☒ No.
If Yes, brief description: _____.

Claim(s) discussed: *None*.

Identification of prior art discussed: *NA*.

Agreement with respect to the claims f)☒ was reached. g)☐ was not reached. h)☐ N/A.

Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: *Examiner indicated that the text of literal legends of drawing figure 1 were not aligned. Counsel indicated the problem was probably due to a problem with the electronic submission of the drawing and agreed to resubmit the drawing* .

(A fuller description, if necessary, and a copy of the amendments which the examiner agreed would render the claims allowable, if available, must be attached. Also, where no copy of the amendments that would render the claims allowable is available, a summary thereof must be attached.)

THE FORMAL WRITTEN REPLY TO THE LAST OFFICE ACTION MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP Section 713.04). If a reply to the last Office action has already been filed, APPLICANT IS GIVEN A NON-EXTENDABLE PERIOD OF THE LONGER OF ONE MONTH OR THIRTY DAYS FROM THIS INTERVIEW DATE, OR THE MAILING DATE OF THIS INTERVIEW SUMMARY FORM, WHICHEVER IS LATER, TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW. See Summary of Record of Interview requirements on reverse side or on attached sheet.

| /Eric Coleman/<br>Primary Examiner, Art Unit 2183 | |
|---|---|

| Notice of Allowability | Application No. | Applicant(s) | |
|---|---|---|---|
| | 11/733,064 | HUPPENTHAL ET AL. | |
| | Examiner | Art Unit | |
| | Eric Coleman | 2183 | |

***-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--***

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *terminal disclaimer filed 4/13/09* .

2. ☒ The allowed claim(s) is/are *1-52*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE**.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   **Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 4/17/09
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

/Eric Coleman/
Primary Examiner, Art Unit 2183

## EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The following changes to the drawings have been approved by the examiner and agreed upon by applicant: Correction of the alignment of the text of literal legends in figure 1 is required. In order to avoid abandonment of the application, applicant must make these above agreed upon drawing changes.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric Coleman whose telephone number is (571) 272-4163. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Chan can be reached on (571) 272-4162. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

EC

/Eric Coleman/
Primary Examiner, Art Unit 2183

# Issue Classification

| Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|
| 11733064 | HUPPENTHAL ET AL. |
| **Examiner** | **Art Unit** |
| Eric Coleman | 2183 |

| ORIGINAL | | INTERNATIONAL CLASSIFICATION | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLASS | SUBCLASS | CLAIMED | | | | | NON-CLAIMED | | | | | |
| 712 | 226 | G | 0 | 6 | F | 15 / 82 (2006.01.01) | | | | | | |

| CROSS REFERENCE(S) | | | | | |
|---|---|---|---|---|---|
| CLASS | SUBCLASS (ONE SUBCLASS PER BLOCK) | | | | |
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☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☒ T.D. ☐ R.1.47

| Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 17 | 17 | 33 | 33 | 49 | 49 | | | | | | | | |
| 2 | 2 | 18 | 18 | 34 | 34 | 50 | 50 | | | | | | | | |
| 3 | 3 | 19 | 19 | 35 | 35 | 51 | 51 | | | | | | | | |
| 4 | 4 | 20 | 20 | 36 | 36 | 52 | 52 | | | | | | | | |
| 5 | 5 | 21 | 21 | 37 | 37 | | | | | | | | | | |
| 6 | 6 | 22 | 22 | 38 | 38 | | | | | | | | | | |
| 7 | 7 | 23 | 23 | 39 | 39 | | | | | | | | | | |
| 8 | 8 | 24 | 24 | 40 | 40 | | | | | | | | | | |
| 9 | 9 | 25 | 25 | 41 | 41 | | | | | | | | | | |
| 10 | 10 | 26 | 26 | 42 | 42 | | | | | | | | | | |
| 11 | 11 | 27 | 27 | 43 | 43 | | | | | | | | | | |
| 12 | 12 | 28 | 28 | 44 | 44 | | | | | | | | | | |
| 13 | 13 | 29 | 29 | 45 | 45 | | | | | | | | | | |
| 14 | 14 | 30 | 30 | 46 | 46 | | | | | | | | | | |
| 15 | 15 | 31 | 31 | 47 | 47 | | | | | | | | | | |
| 16 | 16 | 32 | 32 | 48 | 48 | | | | | | | | | | |

| | | | |
|---|---|---|---|
| NONE<br><br>(Assistant Examiner) | (Date) | **Total Claims Allowed:**<br>52 | |
| /Eric Coleman/<br>Primary Examiner.Art Unit 2183<br><br>(Primary Examiner) | 6/24/09<br><br>(Date) | O.G. Print Claim(s)<br>1 | O.G. Print Figure<br>2 |

## EAST Search History

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | Time Stamp |
|---|---|---|---|---|---|---|
| L1 | 72759 | data adj (driven or flow) | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:23 |
| L2 | 17352 | systolic | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:23 |
| L3 | 89264 | 1 or 2 | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:23 |
| L4 | 81191 | process$3 adj element$1 or (function$2 adj unit $1) | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:24 |
| L5 | 1922448 | multiple or plural $3 near3 dimens $5 | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:24 |
| L6 | 45503 | (multiple or plural $3) near3 dimens $5 | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:24 |
| L7 | 1551 | 4 and 6 | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:25 |
| L8 | 1450 | (concurrent$3 or simultaneous$1) near3 loop$3 | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:25 |
| L9 | 4 | 7 and 8 | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:25 |
| L10 | 3 | 1 and 9 | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:25 |
| L11 | 591 | 712/226.ccls. | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:25 |
| L12 | 282 | 712/15.ccls. | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:26 |
| L13 | 57 | 712/19.ccls. | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:26 |
| L14 | 588 | 712/215.ccls. | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:26 |
| L15 | 1490 | 11 or 12 or 13 or 14 | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:26 |
| L16 | 297 | 1 and 15 | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:27 |
| L17 | 3 | 8 and 16 | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:27 |

| | | | | | | |
|---|---|---|---|---|---|---|
| L18 | 8453 | cluster$3 and 1 | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:27 |
| L19 | 3812 | column$3 and 18 | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:28 |
| L20 | 34 | wavefront and 19 | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:28 |
| L21 | 4971 | routing near3 resource$1 | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:29 |
| L22 | 8 | 20 and 21 | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:29 |
| L23 | 0 | variable adj2 "not" adj change | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:30 |
| L24 | 31 | 16 and 19 | US-PGPUB; USPAT | OR | OFF | 2009/06/23 17:31 |
| L25 | 113600 | column$1 | EPO; JPO; IBM_TDB | OR | OFF | 2009/06/23 17:33 |
| L26 | 3184 | data adj (driven or flow) | EPO; JPO; IBM_TDB | OR | OFF | 2009/06/23 17:33 |
| L27 | 62 | 25 and 26 | EPO; JPO; IBM_TDB | OR | OFF | 2009/06/23 17:33 |
| L28 | 4 | rout$3 and 27 | EPO; JPO; IBM_TDB | OR | OFF | 2009/06/23 17:34 |
| L29 | 0 | variable and 28 | EPO; JPO; IBM_TDB | OR | OFF | 2009/06/23 17:34 |

**6/23/2009 5:36:11 PM**

PTO/SB/08a (03-09)
Approved for use through 04/30/2009. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE



# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 11733064 |
| Filing Date | 2007-04-09 |
| First Named Inventor | Jon M. Huppenthal et al. |
| Art Unit | 2183 |
| Examiner Name | Eric Coleman |
| Attorney Docket Number | SRC015 CON |

**U.S.PATENTS**

| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| /E.C./ | 1 | 5802290 | | 1998-09-01 | Casselman, Steven M. | |
| /E.C./ | 2 | 4763294 | | 1998-08-09 | Fong, Anthony S. | |
| /E.C./ | 3 | 5966534 | | 1999-10-12 | Cooke, et al. | |
| /E.C./ | 4 | 6721884 | | 2004-04-13 | De Oliveira Kastrup Pereira, et al. | |
| /E.C./ | 5 | 6704816 | | 2004-03-09 | Burke, David | |
| /E.C./ | 6 | 5509134 | | 1996-04-16 | Fandrich, et al. | |
| /E.C./ | 7 | 5953502 | | 1999-09-14 | Helbig, Sr., Walter A. | |
| /E.C./ | 8 | 6128663 | | 2000-10-03 | Thomas | |



ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.C./

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 11733064 |
| | Filing Date | 2007-04-09 |
| | First Named Inventor | Jon M. Huppenthal et al. |
| | Art Unit | 2183 |
| | Examiner Name | Eric Coleman |
| | Attorney Docket Number | SRC015 CON |

| | | | | | | |
|---|---|---|---|---|---|---|
| /E.C./ | 9 | 5715453 | | 1998-02-03 | Stewart | |

If you wish to add additional U.S. Patent citation information please click the Add button.

**U.S.PATENT APPLICATION PUBLICATIONS**

| Examiner Initial* | Cite No | Publication Number | Kind Code[1] | Publication Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1 | | | | | |

If you wish to add additional U.S. Published Application citation information please click the Add button.

**FOREIGN PATENT DOCUMENTS**

| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] i | Kind Code[4] | Publication Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear | T[5] |
|---|---|---|---|---|---|---|---|---|
| | 1 | | | | | | | ☐ |

If you wish to add additional Foreign Patent Document citation information please click the Add button

**NON-PATENT LITERATURE DOCUMENTS**

| Examiner Initials* | Cite No | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published. | T[5] |
|---|---|---|---|
| /E.C./ | 1 | HASTIE, NEIL, et al., "The Implementation of Hardware Subroutines on Field Programmable Gate Arrays", XP010005485, Plessey Semiconductors, Tamerton Rd., Plymouth, Devon, England, IEEE, 13 MAY 1990, Custom Integrated Circuits Conference, pgs. 314. 1-4. *the whole document* | ☐ |
| /E.C./ | 2 | HARBAUM, TILL, et al., "Design of a Flexible Coprocessor Unit", Institute of Operating Systems and Computer Networks, XP000879556TU Braunschweig, Germany, Proceedings of the Euromicro Conference, September 1999, pgs. 335-342. *whole document* | ☐ |
| /E.C./ | 3 | MATHIAS P C; PATNAIK L M: "Systolic Evaluation of Polynomial Expressions," IEEE Transactions on Computers, vol. 39, no. 5, 1 May 1990, pgs. 653-665, XP000116659 | ☐ |



/Eric Coleman/ 06/23/2009

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.C./

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

# BIB DATA SHEET

**CONFIRMATION NO. 7527**

| SERIAL NUMBER | FILING or 371(c) DATE<br>RULE | CLASS | GROUP ART UNIT | ATTORNEY DOCKET NO. |
|---|---|---|---|---|
| 11/733,064 | 04/09/2007 | 712 | 2183 | SRC015 CON |

**APPLICANTS**

Jon M. Huppenthal, Colorado Springs, CO;
David E. Caliga, Colorado Springs, CO;

**** CONTINUING DATA ***************************

This application is a CON of 10/285,318 10/31/2002 PAT 7,225,324

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

04/20/2007

| Foreign Priority claimed ☐ Yes ☑ No<br>35 USC 119(a-d) conditions met ☐ Yes ☑ No<br>Verified and Acknowledged /ERIC COLEMAN/ Examiner's Signature | ☐ Met after Allowance<br>Initials | STATE OR COUNTRY | SHEETS DRAWINGS | TOTAL CLAIMS | INDEPENDENT CLAIMS |
|---|---|---|---|---|---|
| | | CO | 20 | 52 | 3 |

**ADDRESS**

HOGAN & HARTSON LLP
ONE TABOR CENTER, SUITE 1500
1200 SEVENTEENTH ST
DENVER, CO 80202
UNITED STATES

**TITLE**

MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS

| FILING FEE RECEIVED | | |
|---|---|---|
| 2730 | FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following: | ☐ All Fees<br>☐ 1.16 Fees (Filing)<br>☐ 1.17 Fees (Processing Ext. of time)<br>☐ 1.18 Fees (Issue)<br>☐ Other _____<br>☐ Credit |

| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 11733064 | HUPPENTHAL ET AL. |
| | Examiner | Art Unit |
| | Eric Coleman | 2183 |

## SEARCHED

| Class | Subclass | Date | Examiner |
|---|---|---|---|
| 712 | 226,15,19,215 (partial search via East classification search and key word search) | 1/8/09 | EC |
| updated above | | 6/23/09 | EC |

## SEARCH NOTES

| Search Notes | Date | Examiner |
|---|---|---|
| Searched East US Pat file US PG pub file | 1/8/09 | EC |
| inventor name search | 1/8/09 | EC |
| Searched Google Scholar | 1/8/09 | EC |
| Consulted WQAS Padmanabhan Mano on possible 101 (mathematical algorithm) | 1/8/09 | EC |
| Searched East US Pat file US PG Pub file EPO file JPO file IBM_TDB file | 6/23/09 | EC |
| Searched Google Scholar (search terms data driven data flow wavefront systolic rate of change derivative column) | 6/23/09 | EC |
| inventor name search | 6/23/09 | EC |

## INTERFERENCE SEARCH

| Class | Subclass | Date | Examiner |
|---|---|---|---|
| 712 | 226 (via East US PG pub file) | 6/23/09 | EC |

| Index of Claims | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 11733064 | HUPPENTHAL ET AL. |
| | Examiner | Art Unit |
| | Eric Coleman | 2183 |

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|---|---|---|---|---|---|---|---|
| ✓ | Rejected | - | Cancelled | N | Non-Elected | A | Appeal |
| = | Allowed | ÷ | Restricted | I | Interference | O | Objected |

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☒ T.D. ☐ R.1.47

| CLAIM | | DATE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Final | Original | 01/08/2009 | 06/24/2009 | | | | | | | |
| 1 | 1 | ✓ | = | | | | | | | |
| 2 | 2 | ✓ | = | | | | | | | |
| 3 | 3 | ✓ | = | | | | | | | |
| 4 | 4 | ✓ | = | | | | | | | |
| 5 | 5 | ✓ | = | | | | | | | |
| 6 | 6 | ✓ | = | | | | | | | |
| 7 | 7 | ✓ | = | | | | | | | |
| 8 | 8 | ✓ | = | | | | | | | |
| 9 | 9 | ✓ | = | | | | | | | |
| 10 | 10 | ✓ | = | | | | | | | |
| 11 | 11 | ✓ | = | | | | | | | |
| 12 | 12 | ✓ | = | | | | | | | |
| 13 | 13 | ✓ | = | | | | | | | |
| 14 | 14 | ✓ | = | | | | | | | |
| 15 | 15 | ✓ | = | | | | | | | |
| 16 | 16 | ✓ | = | | | | | | | |
| 17 | 17 | ✓ | = | | | | | | | |
| 18 | 18 | ✓ | = | | | | | | | |
| 19 | 19 | ✓ | = | | | | | | | |
| 20 | 20 | ✓ | = | | | | | | | |
| 21 | 21 | ✓ | = | | | | | | | |
| 22 | 22 | ✓ | = | | | | | | | |
| 23 | 23 | ✓ | = | | | | | | | |
| 24 | 24 | ✓ | = | | | | | | | |
| 25 | 25 | ✓ | = | | | | | | | |
| 26 | 26 | ✓ | = | | | | | | | |
| 27 | 27 | ✓ | = | | | | | | | |
| 28 | 28 | ✓ | = | | | | | | | |
| 29 | 29 | ✓ | = | | | | | | | |
| 30 | 30 | ✓ | = | | | | | | | |
| 31 | 31 | ✓ | = | | | | | | | |
| 32 | 32 | ✓ | = | | | | | | | |
| 33 | 33 | ✓ | = | | | | | | | |
| 34 | 34 | ✓ | = | | | | | | | |
| 35 | 35 | ✓ | = | | | | | | | |
| 36 | 36 | ✓ | = | | | | | | | |

| Index of Claims | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 11733064 | HUPPENTHAL ET AL. |
| | Examiner | Art Unit |
| | Eric Coleman | 2183 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ✓ | Rejected | - | Cancelled | N | Non-Elected | A | Appeal |
| = | Allowed | ÷ | Restricted | I | Interference | O | Objected |

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☒ T.D. ☐ R.1.47

| CLAIM | | DATE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Final | Original | 01/08/2009 | 06/24/2009 | | | | | | | |
| 37 | 37 | ✓ | = | | | | | | | |
| 38 | 38 | ✓ | = | | | | | | | |
| 39 | 39 | ✓ | = | | | | | | | |
| 40 | 40 | ✓ | = | | | | | | | |
| 41 | 41 | ✓ | = | | | | | | | |
| 42 | 42 | ✓ | = | | | | | | | |
| 43 | 43 | ✓ | = | | | | | | | |
| 44 | 44 | ✓ | = | | | | | | | |
| 45 | 45 | ✓ | = | | | | | | | |
| 46 | 46 | ✓ | = | | | | | | | |
| 47 | 47 | ✓ | = | | | | | | | |
| 48 | 48 | ✓ | = | | | | | | | |
| 49 | 49 | ✓ | = | | | | | | | |
| 50 | 50 | ✓ | = | | | | | | | |
| 51 | 51 | ✓ | = | | | | | | | |
| 52 | 52 | ✓ | = | | | | | | | |

Client/Matter No. 80404.0018.001
EFS-Web

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | |
|---|---|
| Serial No. 11/733,064<br>Application of: Jon M. Huppenthal and David E. Caliga<br>Filed: April 9, 2007<br>Attorney Docket No. SRC015 CON<br>For: MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS | Confirmation No.: 7527<br>Art Unit: 2183<br>Examiner: Coleman, Eric<br>Customer No.: **25235** |

RE-SUBMISSION OF DRAWING FIG. 1

MAIL STOP ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The attached Fig. 1 drawing sheet should replace the previously filed Fig. 1as required by the Notice of Allowance. An annotated drawing is not included as no new matter has been added.

Attachment: Replacement Sheet

24 July 2009
Date

Michael C. Martensen, Reg. No. 46,901
HOGAN & HARTSON LLP
One Tabor Center
1200 17th Street, Suite 1500
Denver, Colorado 80202
(719) 448-5910 Tel
(303) 899-7333 Fax

\\\CS - 080404/000018 - 116236 v1

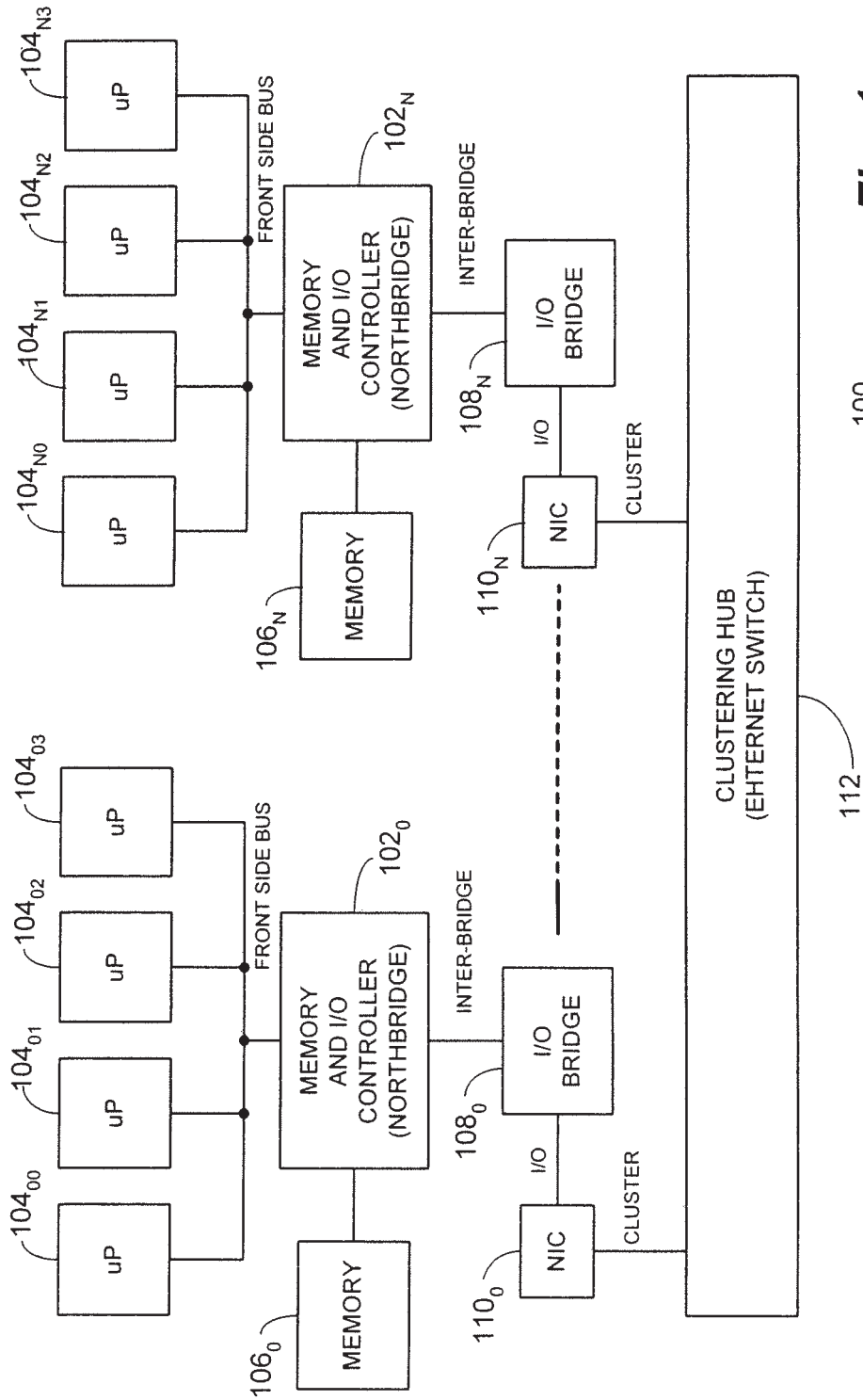


***Fig. 1***
***Prior Art***

Client Matter No. 80404.0018.001
EFS-Web

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | |
|---|---|
| Serial No. 11/733,064<br>Application of: Jon M. Huppenthal and David E. Caliga<br>Filed: April 9, 2007<br>Attorney Docket No. SRC015 CON<br>For: MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS | Confirmation No.: 7527<br>Art Unit: 2183<br>Examiner: Coleman, Eric<br>Customer No.: **25235** |

INTERVIEW SUMMARY IN ACCORDANCE WITH 37 CFR 1.133

MAIL STOP ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Interview Summary request mailed June 30, 2009, please enter the formal reply as follows:

On June 24, 2009 at approximately 10:45 AM EDT, a telephonic interview was conducted among Examiner Eric Coleman of the USPTO, and Michael C. Martensen, attorney representing the Applicant. The interview lasted about 15 minutes and concluded at approximately 11:00 AM EDT.

The Examiner's Interview Summary of June 30, 2009 is deemed to be substantially correct as to all of the pertinent facts regarding the interview.

No fee is believed due for this submittal. However, any fee deficiency associated with this submittal may be charged to Deposit Account No. 50-1123.

Respectfully submitted,

24 July, 2009

Michael C. Martensen, No. 46901
Hogan & Hartson LLP
One Tabor Center
1200 17th Street, Suite 1500
Denver, Colorado 80202
(719) 448-5910 Tel
(303) 899-7333 Fax

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 5768920 |
| **Application Number:** | 11733064 |
| **International Application Number:** | |
| **Confirmation Number:** | 7527 |
| **Title of Invention:** | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS |
| **First Named Inventor/Applicant Name:** | Jon M. Huppenthal |
| **Customer Number:** | 25235 |
| **Filer:** | Michael Christian Martensen/Julie Lange |
| **Filer Authorized By:** | Michael Christian Martensen |
| **Attorney Docket Number:** | SRC015 CON |
| **Receipt Date:** | 24-JUL-2009 |
| **Filing Date:** | 09-APR-2007 |
| **Time Stamp:** | 18:58:44 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | | DOC136.PDF | 40398<br>87f7d9546445c78f6d1d80e856543f4259b5f321 | yes | 2 |

| | Multipart Description/PDF files in .zip description | | |
|---|---|---|---|
| | **Document Description** | **Start** | **End** |
| | Miscellaneous Incoming Letter | 1 | 1 |
| | Drawings-only black and white line drawings | 2 | 2 |

| | | | | | |
|---|---|---|---|---|---|
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Applicant summary of interview with examiner | DOC137.PDF | 33456<br>a0290e2674faea7ef9f0b0dfee9c5596e36796f2 | no | 1 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 73854 | | |

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**New Applications Under 35 U.S.C. 111**
**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**
**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

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PTO/SB/08a (05-07)
Approved for use through 11/30/2007. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 11733064 |
| Filing Date | 2007-04-09 |
| First Named Inventor | Jon M. Huppenthal et al. |
| Art Unit | 2183 |
| Examiner Name | Not Yet Assigned |
| Attorney Docket Number | SRC015CON |

**U.S.PATENTS** Remove

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|---|---|---|---|---|---|---|---|---|
| /E.C./ | 1 | 63-086079 | JPX | | 1988-04-16 | Nippon Telegr & Teleph Corp. | | ☐ |
| /E.C./ | 2 | 59-206972 | JPX | | 1984-11-22 | Toshiba Corp. | | ☐ |

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PM 7/24/08

# PART B - FEE(S) TRANSMITTAL

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Alexandria, Virginia 22313-1450
**or Fax** (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

25235 7590 06/30/2009

HOGAN & HARTSON LLP
ONE TABOR CENTER, SUITE 1500
1200 SEVENTEENTH ST
DENVER, CO 80202

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**Certificate of Mailing or Transmission**

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for ~~first class mail~~ in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

| | |
|---|---|
| Julie Lange | (Depositor's name) |
| | (Signature) |
| 14 September 2009 | (Date) |

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 11/733,064 | 04/09/2007 | Jon M. Huppenthal | SRC015 CON | 7527 |

TITLE OF INVENTION: MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS

| APPLN. TYPE | SMALL ENTITY | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE |
|---|---|---|---|---|---|---|
| nonprovisional | NO | $1510 | $300 | $0 | $1810 | 09/30/2009 |

| EXAMINER | ART UNIT | CLASS-SUBCLASS |
|---|---|---|
| COLEMAN, ERIC | 2183 | 712-226000 |

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Michael C. Martensen
2 William J. Kubida
3 Hogan & Hartson LLP

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: SRC Computers, Inc.

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Colorado Springs, Colorado

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

☒ Issue Fee
☒ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

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☐ A check is enclosed.
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5. **Change in Entity Status** (from status indicated above)

☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature Michael C Martensen Date 14 Sept 2009

Typed or printed name Michael C. Martensen Registration No. 46,901

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 11733064 |
| **Filing Date:** | 09-Apr-2007 |
| **Title of Invention:** | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS |
| **First Named Inventor/Applicant Name:** | Jon M. Huppenthal |
| **Filer:** | Peter John Meza/Julie Lange |
| **Attorney Docket Number:** | SRC015 CON |

Filed as Large Entity

## Utility under 35 USC 111(a) Filing Fees

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Basic Filing:** | | | | |
| **Pages:** | | | | |
| **Claims:** | | | | |
| **Miscellaneous-Filing:** | | | | |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |
| **Post-Allowance-and-Post-Issuance:** | | | | |
| Utility Appl issue fee | 1501 | 1 | 1510 | 1510 |
| Publ. Fee- early, voluntary, or normal | 1504 | 1 | 300 | 300 |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Extension-of-Time:** | | | | |
| **Miscellaneous:** | | | | |
| | | | **Total in USD ($)** | **1810** |

# Electronic Acknowledgement Receipt

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|---|---|
| **EFS ID:** | 6070336 |
| **Application Number:** | 11733064 |
| **International Application Number:** | |
| **Confirmation Number:** | 7527 |
| **Title of Invention:** | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS |
| **First Named Inventor/Applicant Name:** | Jon M. Huppenthal |
| **Customer Number:** | 25235 |
| **Filer:** | Peter John Meza/Julie Lange |
| **Filer Authorized By:** | Peter John Meza |
| **Attorney Docket Number:** | SRC015 CON |
| **Receipt Date:** | 14-SEP-2009 |
| **Filing Date:** | 09-APR-2007 |
| **Time Stamp:** | 18:50:39 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | Deposit Account |
| Payment was successfully received in RAM | $1810 |
| RAM confirmation Number | 5089 |
| Deposit Account | 501123 |
| Authorized User | |

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

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Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Issue Fee Payment (PTO-85B) | DOC029.PDF | 90419<br>204e99d9938dfbb1b9d5416cc3f00e29c553c78a | no | 1 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Fee Worksheet (PTO-875) | fee-info.pdf | 32096<br>b667285eb43931d06d2154cd5c933f7e7542a33e | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 122515 | | |

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**New Applications Under 35 U.S.C. 111**
**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**
**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**
**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

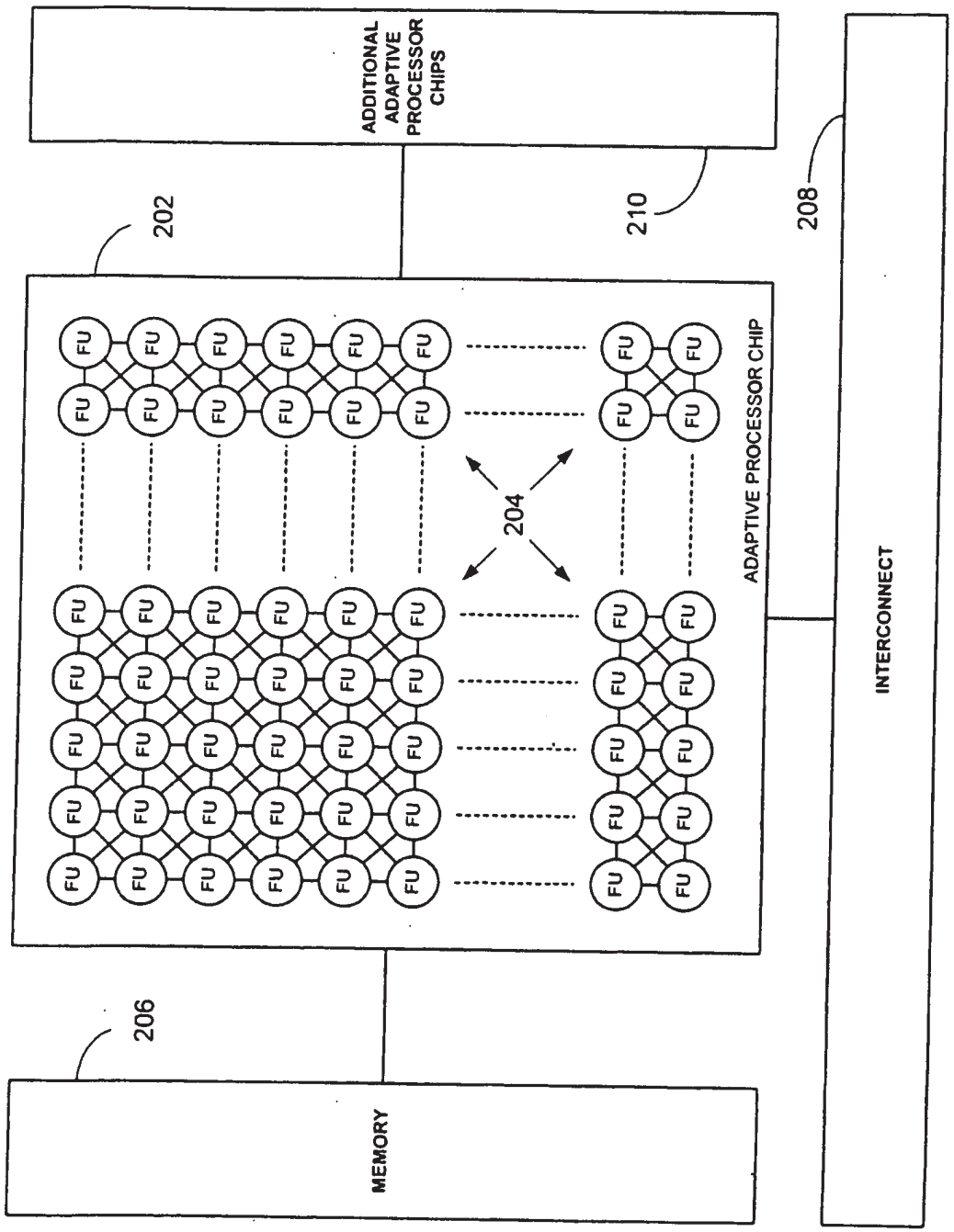

ADDITIONAL ADAPTIVE PROCESSOR CHIPS
210
208
202
200
ADAPTIVE PROCESSOR CHIP
FU
204
INTERCONNECT
206
MEMORY

Fig. 2

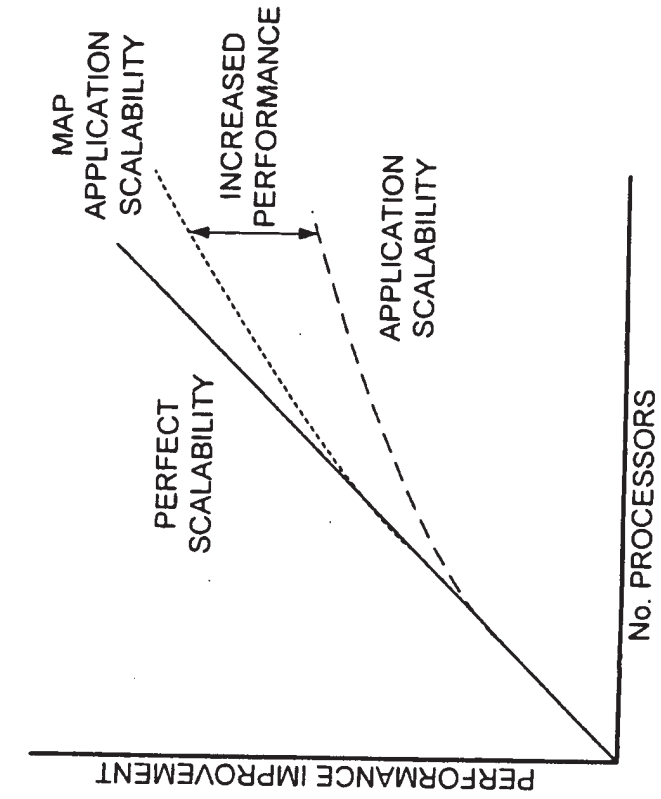



*Fig. 3B*

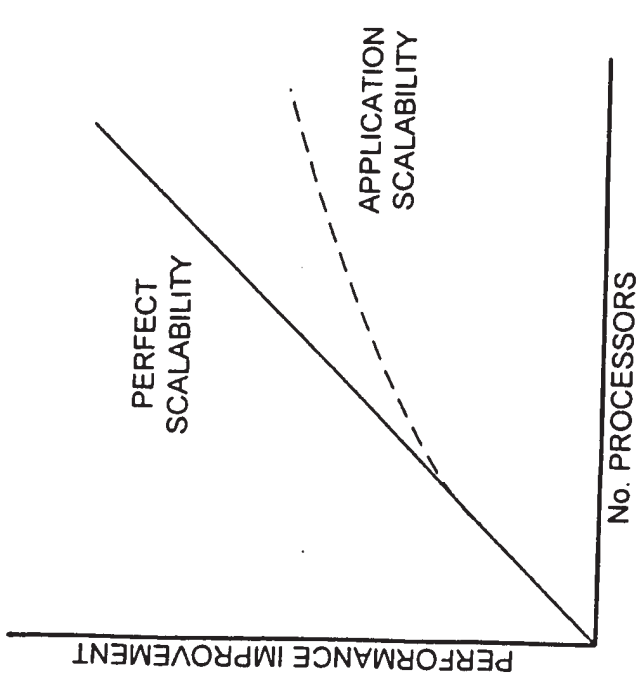



*Fig. 3A*
*PRIOR ART*

Fig. 4B




Fig. 4A
Prior Art

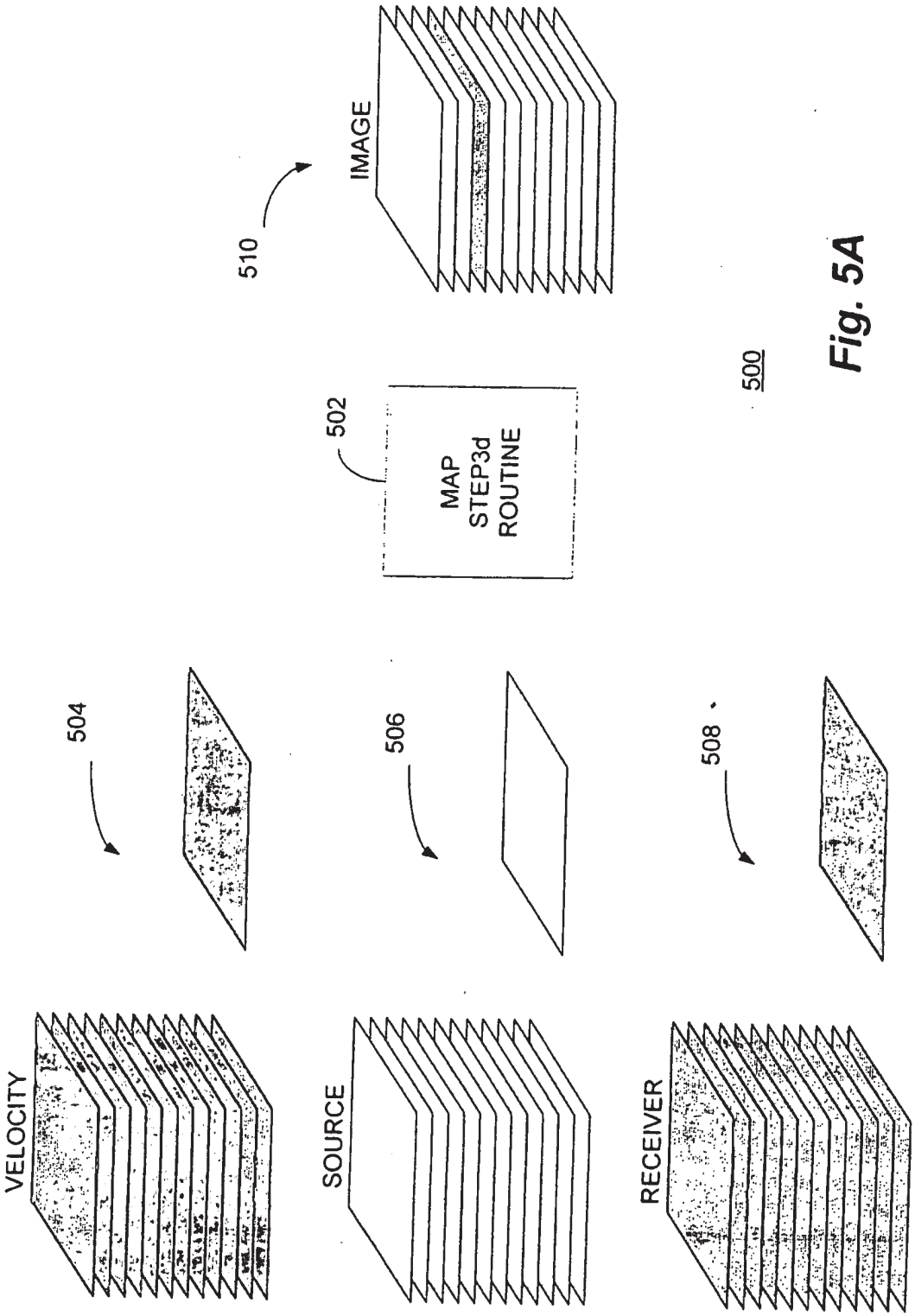

500
502
MAP
STEP3d
ROUTINE
504
506
508
510
IMAGE
VELOCITY
SOURCE
RECEIVER

Fig. 5A

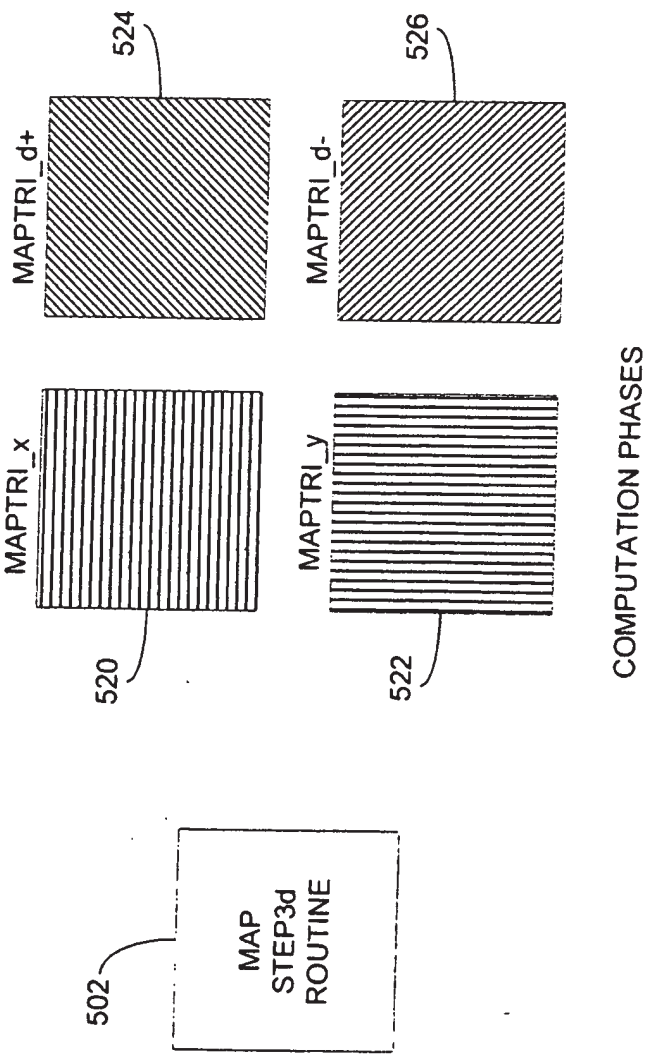

502
MAP
STEP3d
ROUTINE
520
MAPTRI_x
522
MAPTRI_y
524
MAPTRI_d+
526
MAPTRI_d-
COMPUTATION PHASES

*Fig. 5B*

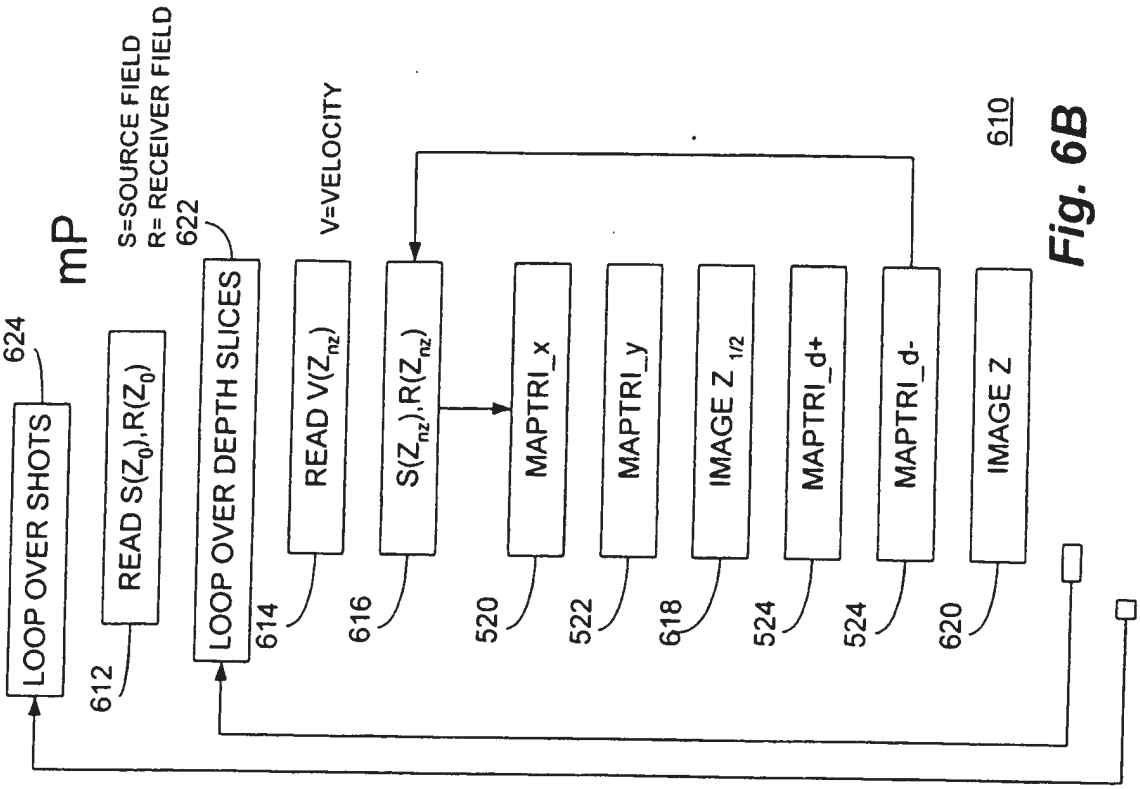
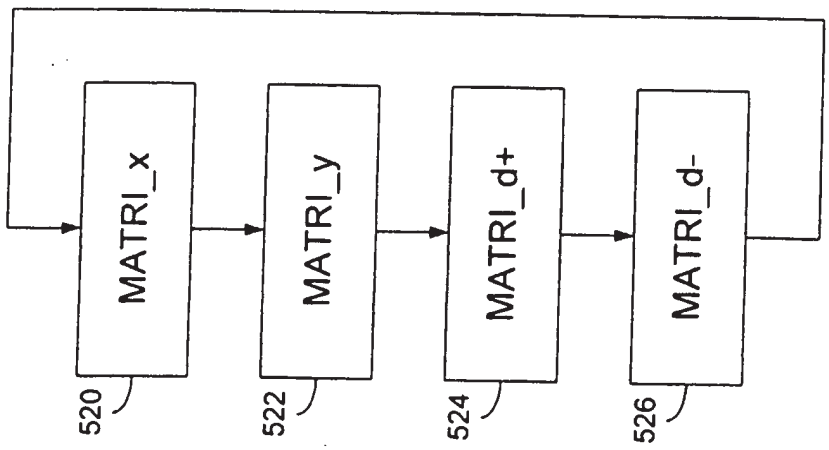

mP
S=SOURCE FIELD
R= RECEIVER FIELD
V=VELOCITY
LOOP OVER SHOTS
624
READ S(Z0),R(Z0)
612
LOOP OVER DEPTH SLICES
622
READ V(Znz)
614
S(Znz),R(Znz)
616
MAPTRI_x
520
MAPTRI_y
522
IMAGE Z 1/2
618
MAPTRI_d+
524
MAPTRI_d-
524
IMAGE Z
620
610

Fig. 6B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520
MATRI_y
522
MATRI_d+
524
MATRI_d-
526
600

Fig. 6A

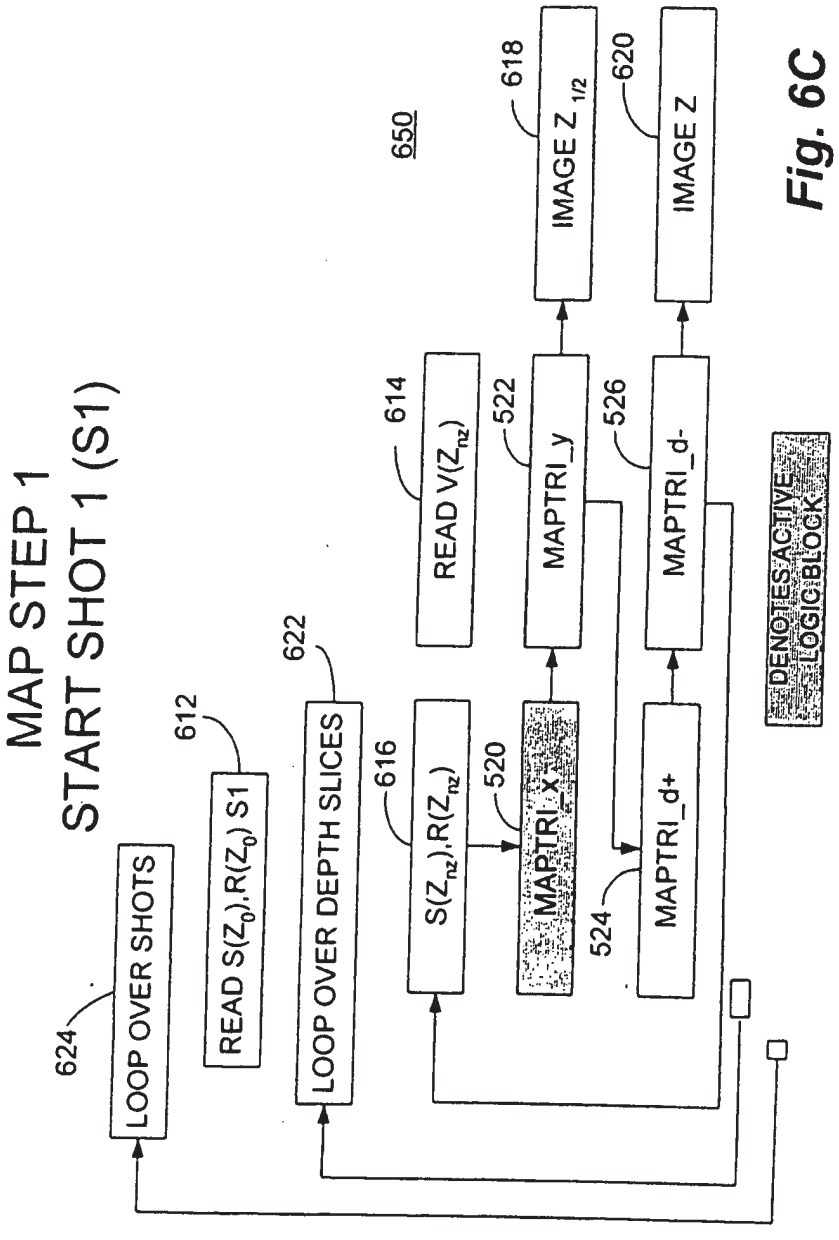

MAP STEP 1
START SHOT 1 (S1)
650
624
LOOP OVER SHOTS
612
READ $S(Z_0)$,$R(Z_0)$ S1
622
LOOP OVER DEPTH SLICES
616
$S(Z_{n2})$,$R(Z_{n2})$
520
MAPTRI_x
614
READ $V(Z_{n2})$
522
MAPTRI_y
524
MAPTRI_d+
526
MAPTRI_d-
618
IMAGE $Z_{1/2}$
620
IMAGE Z
DENOTES ACTIVE LOGIC BLOCK

Fig. 6C

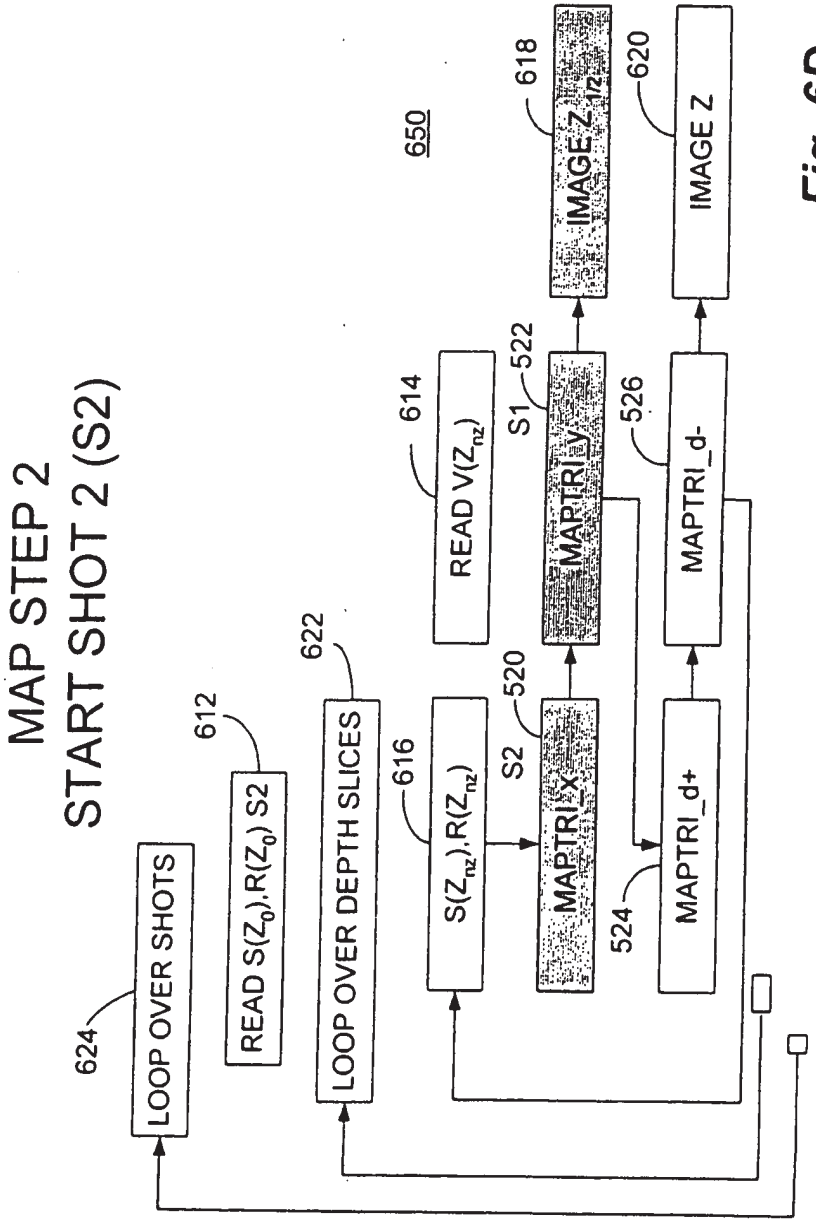

MAP STEP 2
START SHOT 2 (S2)
650
624
LOOP OVER SHOTS
612
READ $S(Z_0)$,$R(Z_0)$ S2
622
LOOP OVER DEPTH SLICES
616
$S(Z_{nz})$,$R(Z_{nz})$
S2
520
MAPTRI_x
524
MAPTRI_d+
614
READ $V(Z_{nz})$
S1
522
MAPTRI_v
526
MAPTRI_d-
618
IMAGE $Z_{1/2}$
620
IMAGE Z

*Fig. 6D*

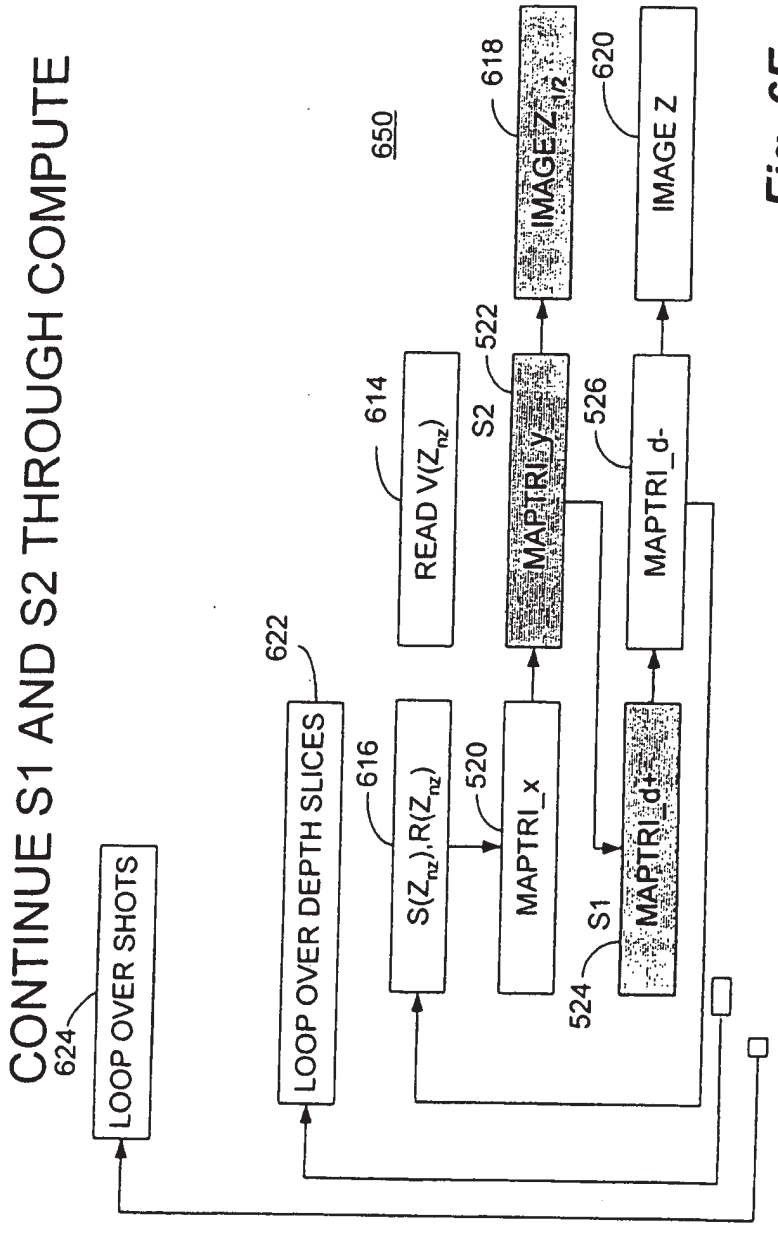

CONTINUE S1 AND S2 THROUGH COMPUTE
624
LOOP OVER SHOTS
622
LOOP OVER DEPTH SLICES
616
S(Z_nz),R(Z_nz)
520
MAPTRI_x
S1
524
MAPTRI_d+
526
MAPTRI_d-
S2
522
MAPTRI_y
614
READ V(Z_nz)
650
618
IMAGE Z_n2
620
IMAGE Z

*Fig. 6E*

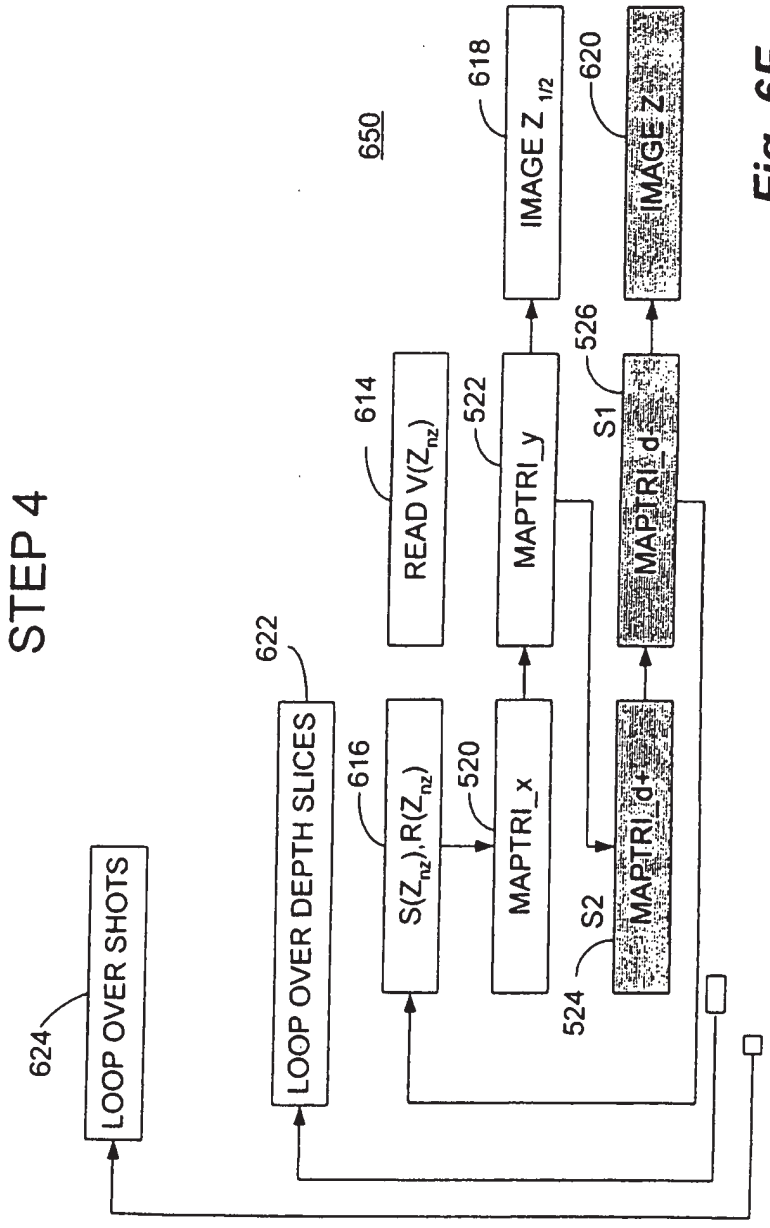

STEP 4
650
624
LOOP OVER SHOTS
622
LOOP OVER DEPTH SLICES
616
$S(Z_{nz}),R(Z_{nz})$
520
MAPTRI_x
524
S2
MAPTRI_d+
614
READ $V(Z_{nz})$
522
MAPTRI_y
526
S1
MAPTRI_d-
618
IMAGE $Z_{1/2}$
620
IMAGE Z

Fig. 6F

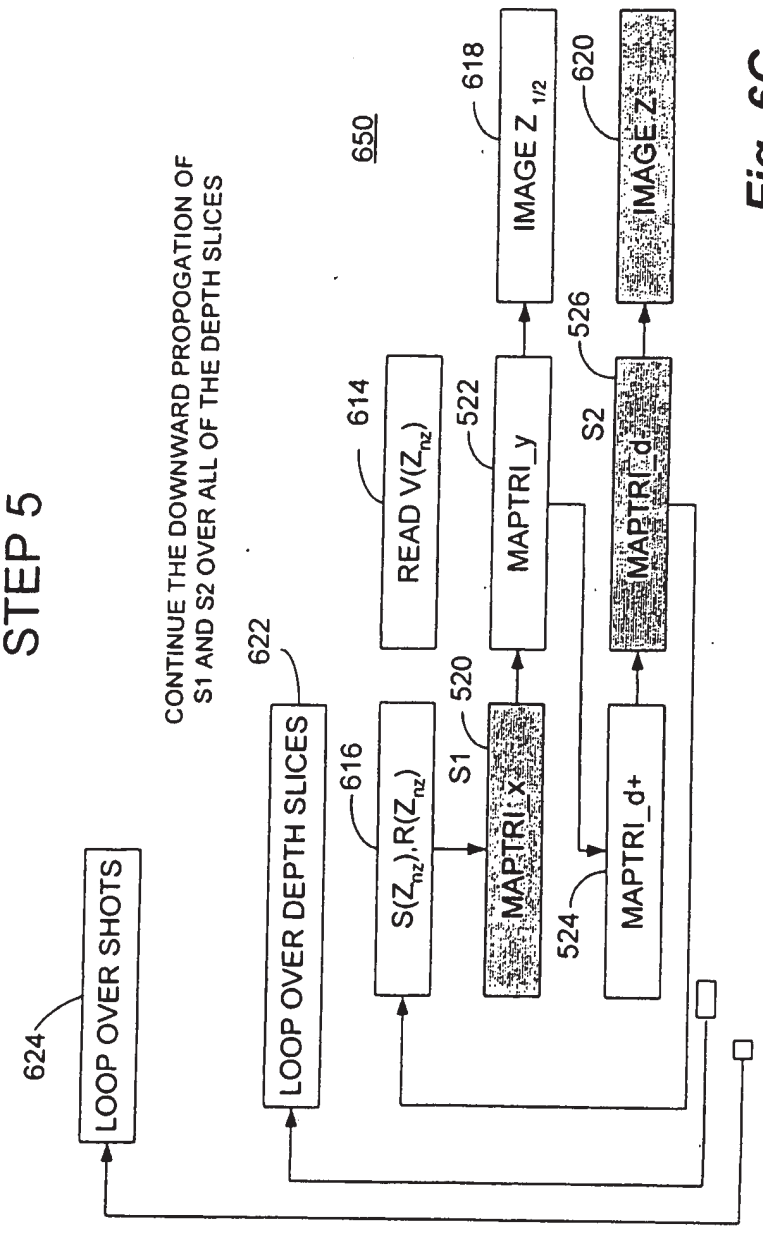

STEP 5
CONTINUE THE DOWNWARD PROPOGATION OF
S1 AND S2 OVER ALL OF THE DEPTH SLICES
650
624
LOOP OVER SHOTS
622
LOOP OVER DEPTH SLICES
616
$S(Z_{nz}),R(Z_{nz})$
614
READ $V(Z_{nz})$
520
S1
MAPTRI_x
522
MAPTRI_y
524
MAPTRI_d+
526
S2
MAPTRI_d-
618
IMAGE $Z_{1/2}$
620
IMAGE Z

*Fig. 6G*

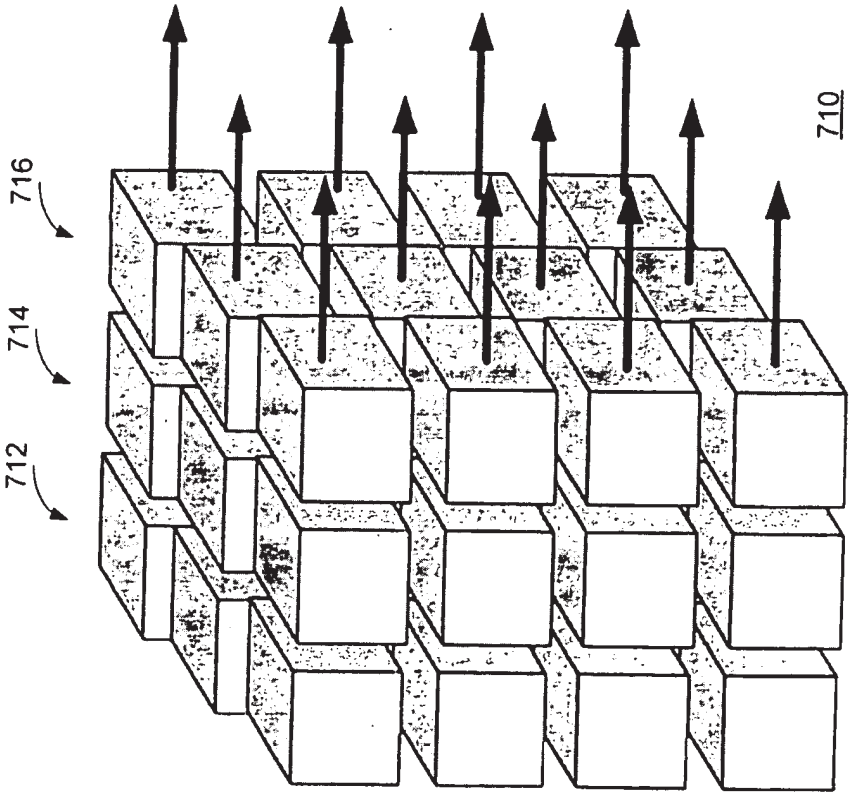

710
716
714
712
718
720
722
724
VALUES USED IN THE COMPUTE FROM NEIGHBORING CELLS IN i,j,k

Fig. 7B

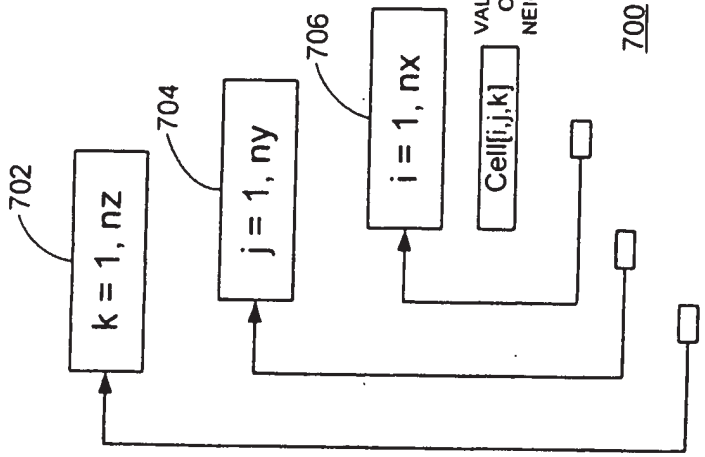

700
702
k = 1, nz
704
j = 1, ny
706
i = 1, nx
Cell[i,j,k]

Fig. 7A

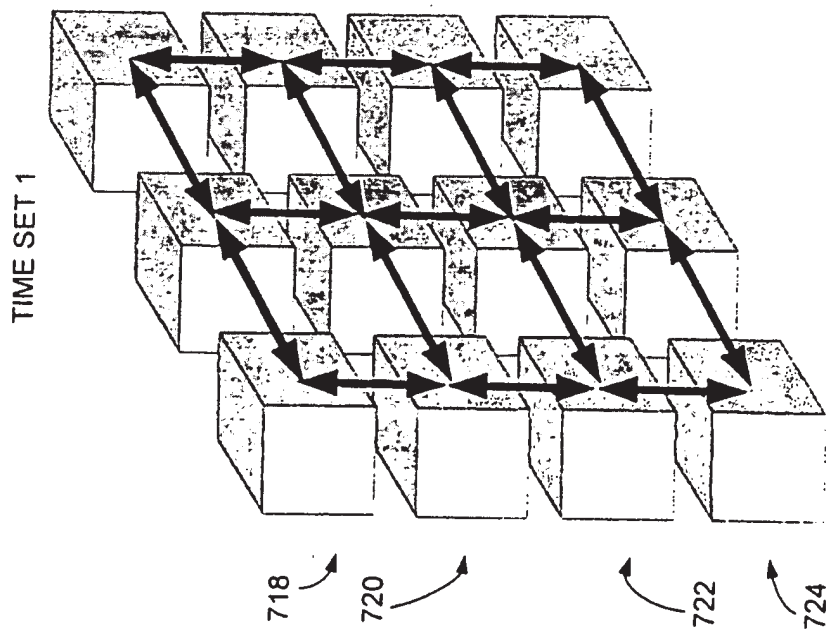



Fig.7C

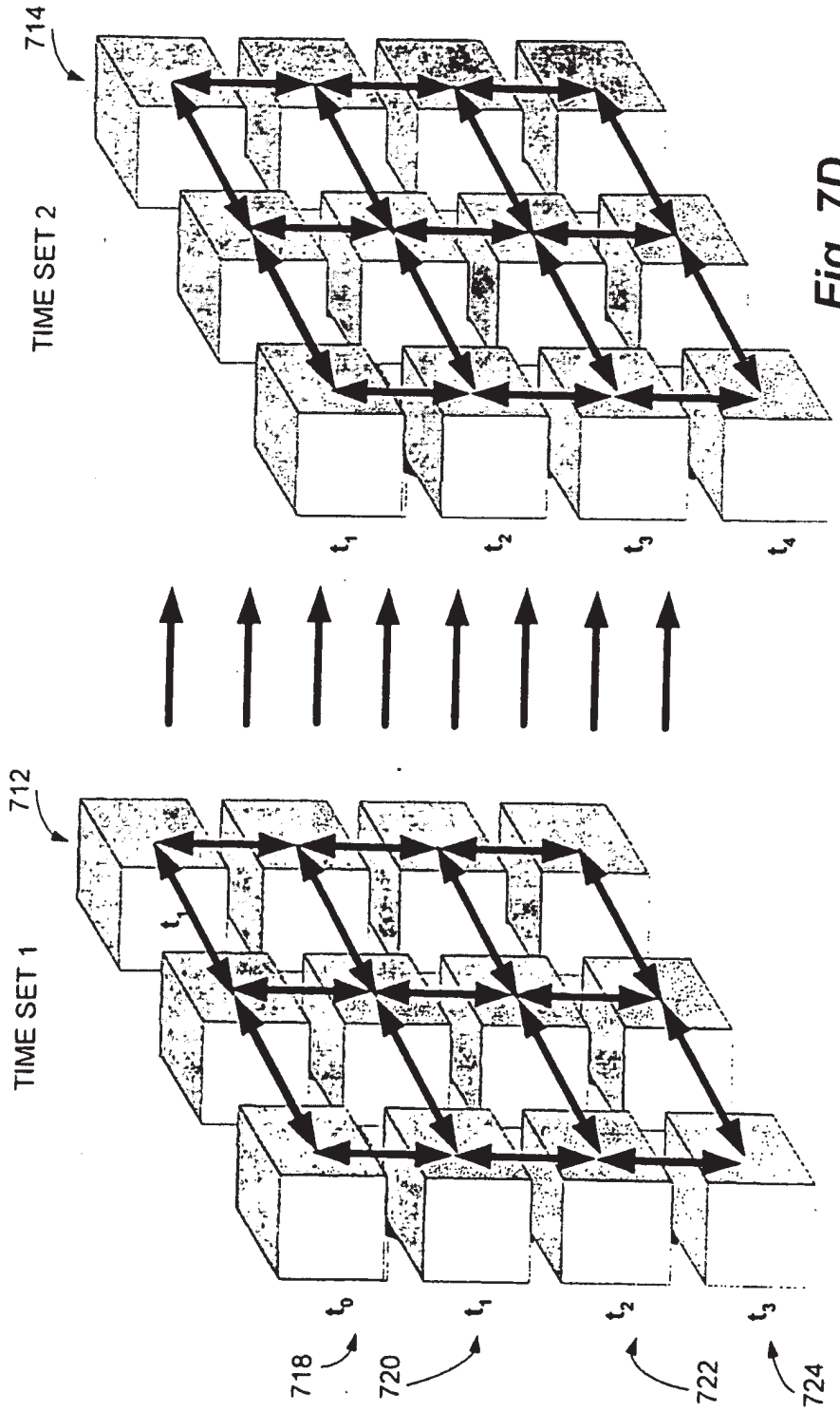

714
TIME SET 2
$t_1$
$t_2$
$t_3$
$t_4$
712
TIME SET 1
$t_0$
$t_1$
$t_2$
$t_3$
718
720
722
724

Fig. 7D

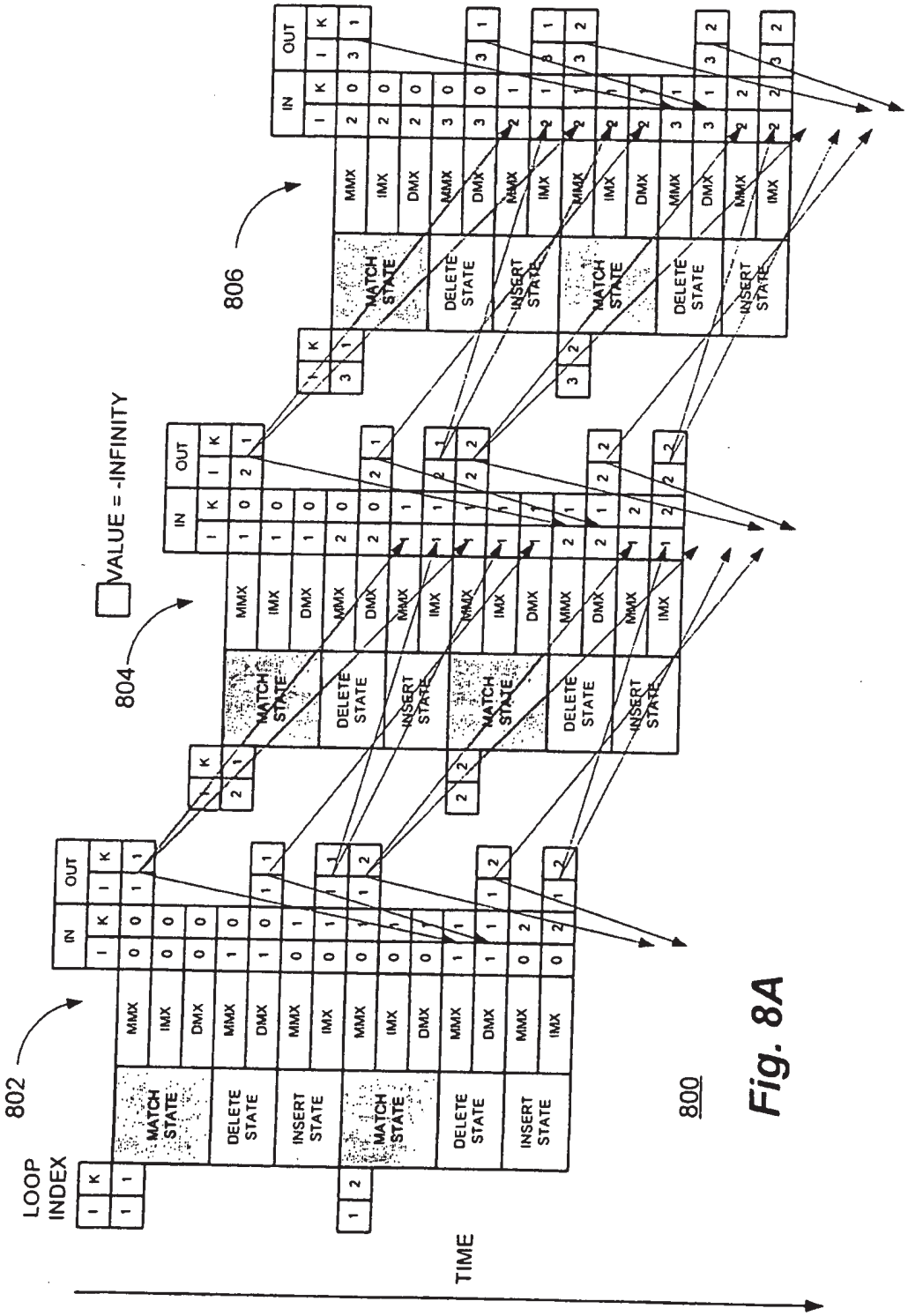

802
804
806
800
LOOP INDEX
TIME
VALUE = -INFINITY
MATCH STATE
DELETE STATE
INSERT STATE
MMX
IMX
DMX
IN
OUT
K

Fig. 8A

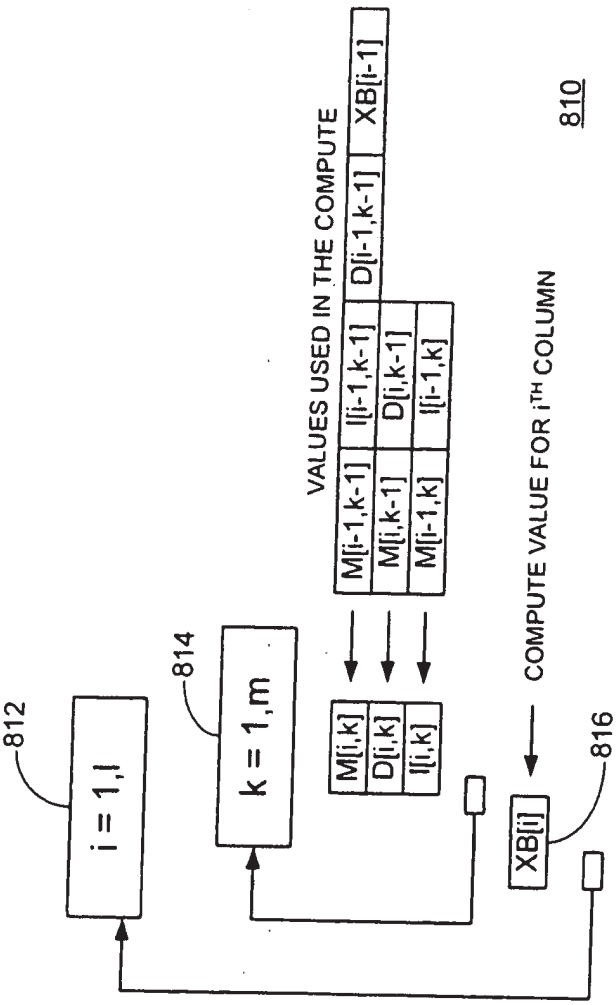
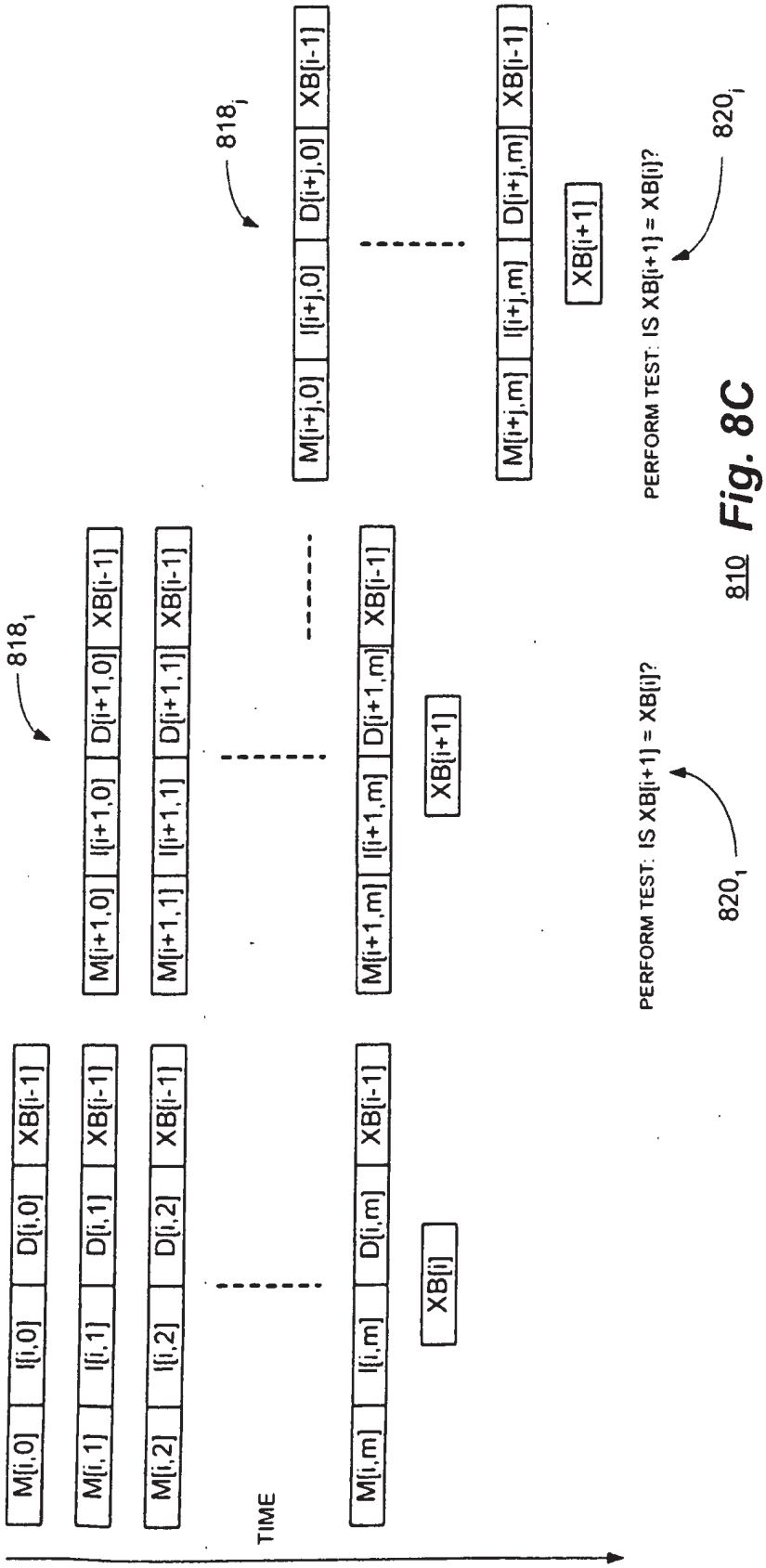

VALUES USED IN THE COMPUTE
M[i-1,k-1]
I[i-1,k-1]
D[i-1,k-1]
XB[i-1]
M[i,k-1]
D[i,k-1]
M[i-1,k]
I[i-1,k]
M[i,k]
D[i,k]
I[i,k]
XB[i]
COMPUTE VALUE FOR iTH COLUMN
810
812
814
816
i = 1,I
k = 1,m

Fig. 8B


$818_0$
$818_1$
$818_j$
M[i,0] I[i,0] D[i,0] XB[i-1]
M[i,1] I[i,1] D[i,1] XB[i-1]
M[i,2] I[i,2] D[i,2] XB[i-1]
M[i,m] I[i,m] D[i,m] XB[i-1]
XB[i]
M[i+1,0] I[i+1,0] D[i+1,0] XB[i-1]
M[i+1,1] I[i+1,1] D[i+1,1] XB[i-1]
M[i+1,m] I[i+1,m] D[i+1,m] XB[i-1]
XB[i+1]
M[i+j,0] I[i+j,0] D[i+j,0] XB[i-1]
M[i+j,m] I[i+j,m] D[i+j,m] XB[i-1]
XB[i+1]
TIME
PERFORM TEST: IS XB[i+1] = XB[i]?
$820_1$
PERFORM TEST: IS XB[i+1] = XB[i]?
$820_j$

810 *Fig. 8C*

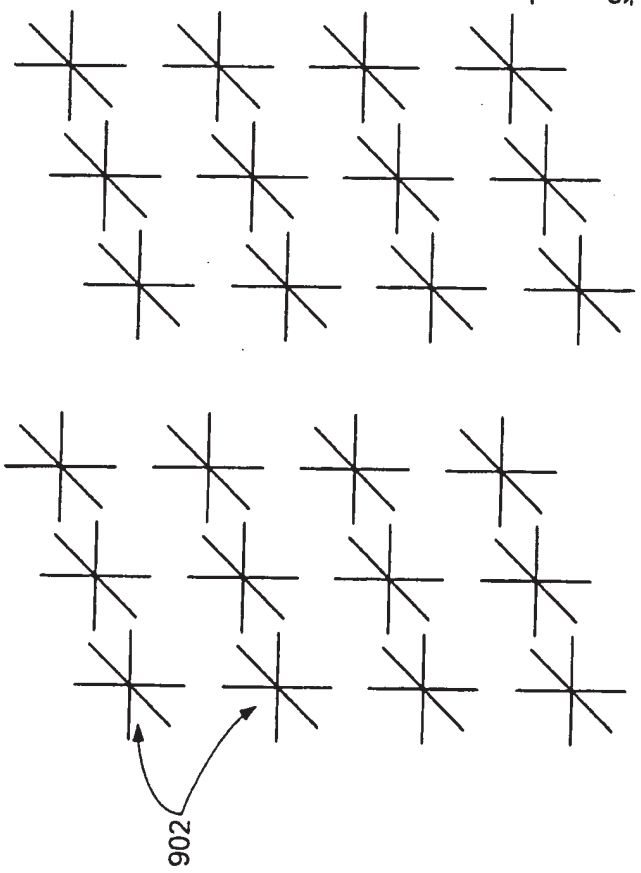



Fig. 9A

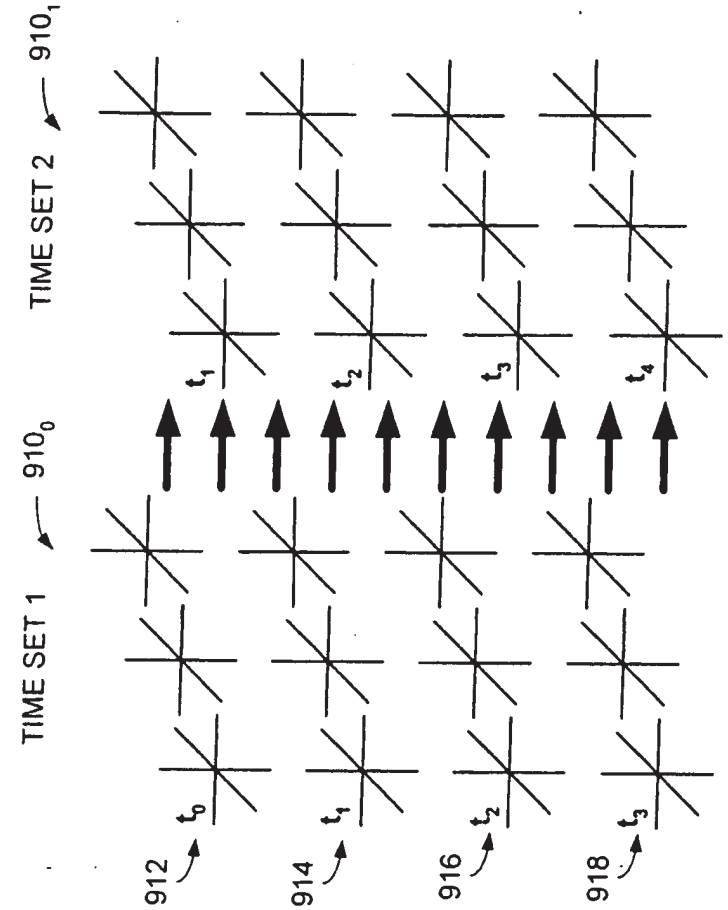

TIME SET 1
$910_0$
TIME SET 2
$910_1$
$t_0$
$t_1$
$t_2$
$t_3$
$t_1$
$t_2$
$t_3$
$t_4$
912
914
916
918

Fig. 9C

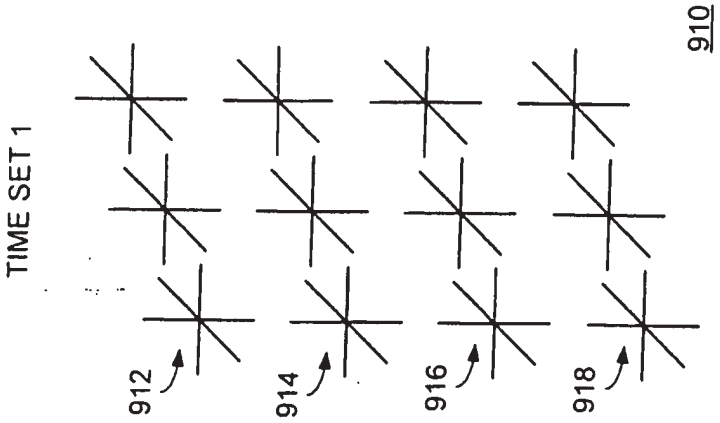

TIME SET 1
910
912
914
916
918

Fig. 9B

# SCORE Placeholder Sheet for IFW Content

Application Number: **11733064** Document Date: **10/20/2009**

The presence of this form in the IFW record indicates that the following document type was received in paper and is scanned and stored in the SCORE database.

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Form Revision Date: December 8, 2006

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| APPLICATION NO. | ISSUE DATE | PATENT NO. | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 11/733,064 | 11/17/2009 | 7620800 | SRC015 CON | 7527 |

25235 7590 10/28/2009

HOGAN & HARTSON LLP
ONE TABOR CENTER, SUITE 1500
1200 SEVENTEENTH ST
DENVER, CO 80202

# ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

**Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)**
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 95 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Jon M. Huppenthal, Colorado Springs, CO;
David E. Caliga, Colorado Springs, CO;

PATENT
EFS-Web
Attorney Docket No. SRC015 CON
Client/Matter No. 80404.0018.001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | |
|---|---|
| Serial No. 11/733,064<br>Application of: Jon M. Huppenthal and David E. Caliga<br>Filed: April 9, 2007<br>Attorney Docket No. SRC015 CON<br>For: MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS | Art Unit: 2183<br>Confirmation No.: 7527<br>Examiner: Eric Coleman<br>Customer No.: **25235** |

INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. § 1.97

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to 37 C.F.R. § 1.97(i), please place the attached Form 1449 and the enclosed copy of the listed patent references in the above-referenced file. In submitting this reference, no representation is made or implied that the references are or are not material.

This Information Disclosure Statement is filed with no request for consideration of this reference. Accordingly, no fee is believed due. However, any fee associated herewith may be charged to Deposit Account No. 50-1123.

Respectfully submitted,

15 March 2011
Date

William J. Kubida, Reg. No. 29,664
HOGAN LOVELLS US LLP
One Tabor Center
1200 17th Street, Suite 1500
Denver, Colorado 80202
(719) 448-5909 Tel
(303) 899-7333 Fax

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
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# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 11733064 |
| Filing Date | 2007-04-09 |
| First Named Inventor | Jon M. Huppenthal |
| Art Unit | 2183 |
| Examiner Name | Coleman, Eric |
| Attorney Docket Number | SRC015 CON |

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**NON-PATENT LITERATURE DOCUMENTS**

| Examiner Initials* | Cite No | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published. | T[5] |
|---|---|---|---|

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 11733064 |
| | Filing Date | 2007-04-09 |
| | First Named Inventor | Jon M. Huppenthal |
| | Art Unit | 2183 |
| | Examiner Name | Coleman, Eric |
| | Attorney Docket Number | SRC015 CON |

| | | | |
|---|---|---|---|
| | 1 | EPO EXAMINATION REPORT, App. No. 10183862.1-2211/2278495, mailing date January 11, 2011, pps. 11. | ☐ |

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**EXAMINER SIGNATURE**

| Examiner Signature | | Date Considered | |
|---|---|---|---|

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 11733064 |
| | Filing Date | 2007-04-09 |
| | First Named Inventor | Jon M. Huppenthal |
| | Art Unit | 2183 |
| | Examiner Name | Coleman, Eric |
| | Attorney Docket Number | SRC015 CON |

**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☒ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

| Signature | /william j. kubida/ | Date (YYYY-MM-DD) | 2011-03-15 |
|---|---|---|---|
| Name/Print | William J. Kubida | Registration Number | 29664 |

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 9701787 |
| **Application Number:** | 11733064 |
| **International Application Number:** | |
| **Confirmation Number:** | 7527 |
| **Title of Invention:** | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS |
| **First Named Inventor/Applicant Name:** | Jon M. Huppenthal |
| **Customer Number:** | 25235 |
| **Filer:** | William J. Kubida/Julie Lange |
| **Filer Authorized By:** | William J. Kubida |
| **Attorney Docket Number:** | SRC015 CON |
| **Receipt Date:** | 21-MAR-2011 |
| **Filing Date:** | 09-APR-2007 |
| **Time Stamp:** | 16:15:23 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

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| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | | DOC289.PDF | 558525<br>cb82905f7e94f262b9ebd148a4bb87ba5d00f4d0 | yes | 15 |

| | Multipart Description/PDF files in .zip description | | |
|---|---|---|---|
| | **Document Description** | **Start** | **End** |
| | Information Disclosure Statement (IDS) Filed (SB/08) | 1 | 4 |
| | Foreign Reference | 5 | 15 |
| **Warnings:** | | | |
| **Information:** | | | |
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**New Applications Under 35 U.S.C. 111**
**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

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**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**
**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | |
|---|---|
| Serial No. 11/733,064<br>Filed: April 9, 2007<br>Attorney Docket No. SRC015 CON<br>For: MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS | Confirmation No.: 7527<br>Art Unit: 2183<br>Examiner: Coleman, Eric<br>Customer No.: **25235** |

TRANSMITTAL OF NOTIFICATION OF ENTITLEMENT TO SMALL ENTITY STATUS PURSUANT TO 37 C.F.R. § 1.27(c)(2)

MAIL STOP - OFFICE OF PETITIONS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

By this communication, Applicant hereby notifies the Commissioner of Patents that large entity status is no longer appropriate for the above-identified application, and we assert that Applicant is entitled to small entity status.

A **Certification of Small Entity Status,** signed by Applicant, is attached.

Respectfully submitted,

December 17, 2014

Peter J. Meza, No. 32,920
Hogan Lovells US LLP
2 North Cascade Avenue, Suite 1300
Colorado Springs, Colorado 80903
(719) 448-5906 Tel
(719) 448-5922 Fax

## SMALL ENTITY STATUS

The Patent Office allows "Small Entities" to pay lower Patent Office fees. However, improperly claiming small entity status can invalidate your patent. Section A below will help you determine if you or your business qualify as a small entity. Section B includes a certification for small entity status. If after reviewing the following materials you determine that you qualify for small entity status, please complete the certification and return it to us. If we do not receive the signed certification from you, we will not claim small entity status for the application identified below, and you will not qualify for the lower Patent Office fees. If you do complete the certification, we may ask you to confirm your small entity status at various points during the prosecution of the application and the life of the issued patent.

### A. Definition of Small Entity

A small entity means any "person," "small business concern," "nonprofit organization," or a combination of these, that holds the rights in the invention and (a) has not assigned or licensed the rights to another who is not a small entity, and (b) is not obligated to assign or license the rights to another who is not a small entity.

(1) *Person.* An inventor or other individuals who hold the rights in an invention.

(2) *Nonprofit organization.* A nonprofit organization is either:

(i) A university or institution of higher education in any country;

(ii) An organization described in section 501(c)(3), and exempt from taxation under section 501(a) of the Internal Revenue Code;

(iii) Any nonprofit scientific or educational organization qualified under a state's nonprofit organization statute; or

(iv) Any nonprofit organization located in a foreign country, that would otherwise qualify as a "nonprofit organization" if it were located in the U.S.A.

(3) *Small business concern.* Any business concern whose number of employees, (part-time and full-time), including affiliates, does not exceed 500 persons.

### B. Certification

Applicant or Patentee: SRC Computers, LLC

Assignee: SRC Computers, LLC

Application No(s). SEE EXHIBIT A

# SRC Computers, LLC

STATEMENT CONCERNING SMALL ENTITY STATUS

I hereby certify that the owner of the application/patent identified above qualifies for small entity status because the owner has not assigned or licensed the rights in the invention to another who is not a small entity, and is not obligated to assign or license the rights in the invention to another who is not a small entity, and because:

The owner is a small business concern:

Business Name SRC Computers, LLC

Signor's Name Jon Huppenthal Signature

Title President and CEO Date 10/10/14

Business Address 4240 N. Nevada Avenue, Colorado Springs, C0 80907

SRC Computers, LLC
EXHIBIT A

| Docket Number | Application Date | Application Number | Grant Date | Patent Number | Title |
|---|---|---|---|---|---|
| SRC001 | 12/17/1997 | 08/992,763 | 06/13/2000 | 6,076,152 | MULTIPROCESSOR COMPUTER ARCHITECTURE |
| SRC001 CON | 01/12/2000 | 09/481,902 | 06/12/2001 | 6,247,110 | MULTIPROCESSOR COMPUTER ARCHITECTURE |
| SRC001 CON/DIV | 01/05/2001 | 09/755,744 | | | MULTIPROCESSOR COMPUTER ARCHITECTURE |
| SRC001 CON2 | 01/08/2003 | 10/339,133 | 11/01/2005 | 6,961,841 | MULTIPROCESSOR COMPUTER ARCHITECTURE |
| SRC001 CON3 | 10/20/2004 | 10/969,635 | 06/26/2007 | 7,237,091 | MULTIPROCESSOR COMPUTER ARCHITECTURE |
| SRC002 | 01/20/1998 | 09/008,871 | | | SCALABLE SINGLE SYSTEM IMAGE OPERATING |
| SRC003 | 02/03/1998 | 09/018,032 | 02/15/2000 | 6,026,459 | SYSTEM AND METHOD FOR DYNAMIC PRIORITY |
| SRC004 | 06/30/1998 | 09/108,088 | 09/25/2001 | 6,295,598 | SPLIT DIRECTORY-BASED CACHE COHERENCY |
| SRC006 | 07/25/2000 | 09/624,788 | 03/12/2002 | 6,356,983 | SYSTEM AND METHOD PROVIDING CACHE |
| SRC007 | 08/15/2000 | 09/638,365 | 07/15/2003 | 6,594,736 | SYSTEM AND METHOD FOR SEMAPHORE AND |
| SRC008 | 05/03/2000 | 09/563,561 | 01/15/2002 | 6,339,819 | MULTIPROCESSOR WITH EACH PROCESSOR |
| SRC009 | 11/05/2001 | 10/008,128 | 12/28/2004 | 6,836,823 | BANDWIDTH ENHANCEMENT FOR UNCACHED |
| SRC010 | 06/22/2001 | 09/888,276 | 08/13/2002 | 6,434,687 | SYSTEM AND METHOD FOR ACCELERATING WEB |
| SRC011 | 12/05/2001 | 10/011,835 | 12/26/2006 | 7,155,602 | INTERFACE FOR INTEGRATING |
| SRC011 CON | 05/31/2005 | 11/140,718 | 01/23/2007 | 7,167,976 | AN INTERFACE FOR INTEGRATING |
| SRC011 PRO | 04/30/2001 | 60/286,979 | | | DELIVERING ACCELERATION: THE POTENTIAL |
| SRC012 | 08/17/2001 | 09/932,330 | 05/13/2008 | 7,373,440 | SWITCH/NETWORK ADAPTER PORT FOR |
| SRC012 CIP | 01/10/2003 | 10/340,390 | 03/27/2007 | 7,197,575 | SWITCH/NETWORK ADAPTER PORT COUPLING A |
| SRC012 CIP2 | 08/15/2005 | 11/203,983 | 07/21/2009 | 7,565,461 | SWITCH/NETWORK ADAPTER PORT COUPLING A |
| SRC012 DIV | 11/23/2004 | 10/996,016 | 09/02/2008 | 7,421,524 | SWITCH/NETWORK ADAPTER PORT FOR |
| SRC013 | 10/23/2002 | 10/278,345 | 10/17/2006 | 7,124,211 | SYSTEM AND METHOD FOR EXPLICIT |
| SRC014 | 05/09/2002 | 10/142,045 | | | ADAPTIVE PROCESSOR ARCHITECTURE |
| SRC014 DIV | 05/02/2005 | 11/119,598 | | | ADAPTIVE PROCESSOR ARCHITECTURE |
| SRC014 DIV/CIP | 09/08/2005 | 11/222,417 | 07/29/2008 | 7,406,573 | RECONFIGURABLE PROCESSOR ELEMENT |
| SRC015 | 10/31/2002 | 10/285,318 | 05/29/2007 | 7,225,324 | MULTI-ADAPTIVE PROCESSING SYSTEMS AND |
| → SRC015 CON | 04/09/2007 | 11/733,064 | 11/17/2009 | 7,620,800 | MULTI-ADAPTIVE PROCESSING SYSTEMS AND |
| SRC016 | 10/29/2002 | 10/282,986 | 02/21/2006 | 7,003,593 | COMPUTER SYSTEM ARCHITECTURE AND |
| SRC017 | 10/31/2002 | 10/284,994 | 02/07/2006 | 6,996,656 | SYSTEM AND METHOD FOR PROVIDING AN |
| SRC017 CON | 07/22/2005 | 11/187,534 | | | SYSTEM AND METHOD FOR PROVIDING AN |
| SRC018 | 10/31/2002 | 10/285,401 | 09/06/2005 | 6,941,539 | EFFICIENCY OF RECONFIGURABLE HARDWARE |
| SRC019 | 10/31/2002 | 10/285,299 | 01/03/2006 | 6,983,456 | PROCESS FOR CONVERTING PROGRAMS IN |
| SRC019 CON | 10/04/2005 | 11/243,498 | 04/20/2010 | 7,703,085 | PROCESS FOR CONVERTING PROGRAMS IN |
| SRC020 PRO | 10/31/2002 | 60/422,722 | | | GENERAL PURPOSE RECONFIGURABLE |
| SRC021 | 10/31/2002 | 10/285,399 | 11/20/2007 | 7,299,458 | SYSTEM AND METHOD FOR CONVERTING |
| SRC022 | 10/31/2002 | 10/285,298 | 11/08/2005 | 6,964,029 | SYSTEM AND METHOD FOR PARTITIONING |
| SRC023 | 10/31/2002 | 10/285,389 | 12/26/2006 | 7,155,708 | DEBUGGING AND PERFORMANCE PROFILING |
| SRC024 | 01/10/2003 | 10/340,400 | | | SYSTEM AND METHOD FOR SCALABLE |
| SRC025 | 01/14/2003 | 10/345,082 | 11/07/2006 | 7,134,120 | MAP COMPILER PIPELINED LOOP STRUCTURE |
| SRC026 | | | | | HANDLING OF NON-NUMERIC VARIABLES |
| SRC027 | 07/11/2003 | 10/618,041 | 09/09/2008 | 7,424,552 | SWITCH/NETWORK ADAPTER PORT |
| SRC027 CIP | 06/16/2004 | 10/869,199 | | | SWITCH/NETWORK ADAPTER PORT |
| SRC027 CIP/DIV | 08/06/2007 | 11/834,439 | 03/16/2010 | 7,680,968 | SWITCH/NETWORK ADAPTER PORT |
| SRC028 | 06/16/2004 | 10/869,200 | 12/12/2006 | 7,149,867 | SYSTEM AND METHOD OF ENHANCING |
| SRC028 PRO | 06/18/2003 | 60/479,339 | | | BANDWIDTH EFFICIENCY AND UTILIZATION |
| SRC029 | 10/17/2005 | 11/252,341 | 02/15/2011 | 7,890,686 | DYNAMIC PRIORITY CONFLICT RESOLUTION IN A |
| SRC030 | 07/10/2006 | 11/456,466 | 11/19/2013 | 8,589,666 | ELIMINATION OF STREAM CONSUMER LOOP |

SRC Computers, LLC
EXHIBIT A

| | | | | | |
|---|---|---|---|---|---|
| SRC031 PRO | 11/05/2010 | 61/410,676 | | | SNAP INTERFACE USING MEMORY BUFFERS |
| SRC032 PRO | 11/10/2010 | 61/412,124 | | | COMPUTATIONAL UNIFICATION |
| SRC033 PRO | 12/16/2011 | 61/576,846 | | | MOBILE DEVICE UTLITIZING RECONFIGURABLE |
| SRC031 | 11/01/2011 | 13/286,996 | | | HETEROGENEOUS COMPUTING SYSTEM |
| SRC032 | 11/02/2011 | 13/287,322 | 04/29/2014 | 8,713,518 | SYSTEM AND METHOD FOR COMPUTATIONAL |
| SRC033 | 02/02/2012 | 13/365,090 | | | MOBILE ELECTRONIC DEVICES UTILIZING |
| SRC036 | 05/27/2014 | 14/288,094 | | | SYSTEM AND METHOD FOR RETAINING DRAM |
| SRC037 | 05/22/2014 | 14/284,616 | | | SYSTEM AND METHOD FOR THERMALLY |
| SRC035 | 05/28/2013 | 13/903,720 | | | MULTI-PROCESSOR COMPUTER ARCHITECTURE |
| SRC032 CON | 03/10/2014 | 14/203,035 | | | SYSTEM AND METHOD FOR COMPUTATIONAL |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 21123730 |
| **Application Number:** | 11733064 |
| **International Application Number:** | |
| **Confirmation Number:** | 7527 |
| **Title of Invention:** | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS |
| **First Named Inventor/Applicant Name:** | Jon M. Huppenthal |
| **Customer Number:** | 25235 |
| **Filer:** | Peter John Meza/Joyce Medrano-Paywa |
| **Filer Authorized By:** | Peter John Meza |
| **Attorney Docket Number:** | SRC015 CON |
| **Receipt Date:** | 05-JAN-2015 |
| **Filing Date:** | 09-APR-2007 |
| **Time Stamp:** | 18:49:56 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Assertion of entitlement to small entity status | DOC025.pdf | 216980<br>e0704d457ba398982cd176e26d8be54671fe73fd | no | 5 |

| | |
|---|---|
| **Warnings:** | |
| **Information:** | |

| Total Files Size (in bytes): | 216980 |
|---|---|

**This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.**

**New Applications Under 35 U.S.C. 111**
**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**
**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**
**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

PTO/AIA/81A (02-15)
Approved for use through 01/31/2018. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE


# PATENT - POWER OF ATTORNEY OR REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS

| | |
|---|---|
| Patent Number | 7,620,800 |
| Issue Date | 11-17-2009 |
| First Named Inventor | Jon M. Huppenthal |
| Title | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS |
| Attorney Docket No. | |

I hereby revoke all previous powers of attorney given in the above-identified patent.

☐ A Power of Attorney is submitted herewith.

OR

☒ I hereby appoint Practitioner(s) associated with the Customer Number identified in the box at right as my/our attorney(s) or agent(s) with respect to the patent identified above, and to transact all business in the United States Patent and Trademark Office connected therewith: 23452

OR

☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s) with respect to the patent identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

| Practitioner(s) Name | Registration Number |
|---|---|
| | |
| | |
| | |
| | |

Please recognize or change the correspondence address for the above-identified patent to:

☒ The address associated with the above-identified Customer Number.

OR

☐ The address associated with the Customer Number identified in the box at right:

OR

| | | | | | |
|---|---|---|---|---|---|
| ☐ Firm or Individual Name | | | | | |
| Address | | | | | |
| City | | State | | Zip | |
| Country | | | | | |
| Telephone | | Email | | | |

I am the:

☐ Applicant.

OR

☒ Patent owner.

*Statement under 37 CFR 3.73(c) (Form PTO/AIA/96) submitted herewith or filed on* _____.

**SIGNATURE of Applicant or Patent Owner**

| | | | |
|---|---|---|---|
| Signature | /Todd Rooke/ | Date | February 24, 2016 |
| Name | Todd Rooke | Telephone | |
| Title and Company | CEO, SRC Labs, LLC | | |

NOTE: Signatures of all the applicants or patent owners of the entire interest or their representative(s) are required. If more than one signature is required, submit multiple forms, check the box below, and identify the total number of forms submitted in the blank below.

☑ A total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

*If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.*

# Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE


# STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: SRC Labs, LLC

Application No./Patent No.: 7,620,800 Filed/Issue Date: 11-17-2009

Titled: MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS

SRC Labs, LLC, a Limited Liability Company

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 037820, Frame 0147, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____

   The document was recorded in the United States Patent and Trademark Office at

   Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____

   The document was recorded in the United States Patent and Trademark Office at

   Reel _____, Frame _____, or for which a copy thereof is attached.

PTO/AIA/96 (08-12)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE


## STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

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6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☐ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

| | |
|---|---|
| /Todd R. Fronek/ | March 4, 2016 |
| Signature | Date |
| Todd R. Fronek | 48516 |
| Printed or Typed Name | Title or Registration Number |

# Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 25103906 |
| **Application Number:** | 11733064 |
| **International Application Number:** | |
| **Confirmation Number:** | 7527 |
| **Title of Invention:** | MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS |
| **First Named Inventor/Applicant Name:** | Jon M. Huppenthal |
| **Customer Number:** | 25235 |
| **Filer:** | Todd Ryan Fronek/Kathryn Becker |
| **Filer Authorized By:** | Todd Ryan Fronek |
| **Attorney Docket Number:** | SRC015 CON |
| **Receipt Date:** | 04-MAR-2016 |
| **Filing Date:** | 09-APR-2007 |
| **Time Stamp:** | 13:03:44 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Power of Attorney | 800.pdf | 137729<br>e96b8e906a7858250c510ce903bbb2affb20f435 | no | 2 |

| | |
|---|---|
| **Warnings:** | |
| **Information:** | |

| | | | | | |
|---|---|---|---|---|---|
| 2 | Assignee showing of ownership per 37 CFR 3.73 | 800_373c.pdf | 110592<br>a60d7851ccda4449f8ebcec9a507051ab59f178e | no | 3 |

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| **Warnings:** | |
| **Information:** | |
| **Total Files Size (in bytes):** | 248321 |

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**New Applications Under 35 U.S.C. 111**

**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**

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**New International Application Filed with the USPTO as a Receiving Office**

**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
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www.uspto.gov

| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|---|---|---|---|
| 11/733,064 | 04/09/2007 | Jon M. Huppenthal | SRC015 CON |

**CONFIRMATION NO. 7527**

**POA ACCEPTANCE LETTER**

25235
HOGAN LOVELLS US LLP - Colorado Springs
TWO NORTH CASCADE AVENUE
SUITE 1300
COLORADO SPRINGS, CO 80903

*OC000000081498404*

Date Mailed: 03/18/2016

## NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 03/04/2016.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/fstephanos/

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|---|---|---|---|
| 11/733,064 | 04/09/2007 | Jon M. Huppenthal | SRC015 CON |

**CONFIRMATION NO. 7527**

**POA ACCEPTANCE LETTER**

23452
LARKIN HOFFMAN DALY & LINDGREN, LTD.
8300 Norman Center Drive
Suite 1000
Minneapolis, MN 55437

*OC000000082564952*

Date Mailed: 05/02/2016

## NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 03/04/2016.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/fstephanos/

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|---|---|---|---|
| 11/733,064 | 04/09/2007 | Jon M. Huppenthal | SRC015 CON |

**CONFIRMATION NO. 7527**

**POWER OF ATTORNEY NOTICE**

25235
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SUITE 1300
COLORADO SPRINGS, CO 80903

*OC000000082564929*

Date Mailed: 05/02/2016

## NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 03/04/2016.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/fstephanos/