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EXAMINER		DATE CONSIDERED 10/02/05

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.

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WCS - 80404/0018 - 62565 v1

Index of Claims

Application/Control No.	10/285,318	Applicant(s)/Patent under Reexamination	HUPPENTHAL ET AL.
Examiner	Eric Coleman	Art Unit	2183

√	Rejected	−	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	+	Restricted	I	Interference	O	Objected

Final	Original	10/2/05					Final	Original	10/2/05					Final	Original			
	1	√						51	√						101			
	2	√						52	√						102			
	3	√						53	√						103			
	4	√						54	√						104			
	5	√						55	√						105			
	6	√						56							106			
	7	√						57							107			
	8	√						58							108			
	9	√						59							109			
	10	√						60							110			
	11	√						61							111			
	12	√						62							112			
	13	√						63							113			
	14	√						64							114			
	15	√						65							115			
	16	√						66							116			
	17	√						67							117			
	18	√						68							118			
	19	√						69							119			
	20	√						70							120			
	21	√						71							121			
	22	√						72							122			
	23	√						73							123			
	24	√						74							124			
	25	√						75							125			
	26	√						76							126			
	27	√						77							127			
	28	√						78							128			
	29	√						79							129			
	30	√						80							130			
	31	√						81							131			
	32	√						82							132			
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	37	√						87							137			
	38	√						88							138			
	39	√						89							139			
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	41	√						91							141			
	42	√						92							142			
	43	√						93							143			
	44	√						94							144			
	45	√						95							145			
	46	√						96							146			
	47	√						97							147			
	48	√						98							148			
	49	√						99							149			
	50	√						100							150			

Search Notes	Application/Control No.	Applicant(s)/Patent under Reexamination
‖‖‖‖‖‖‖‖‖‖‖‖‖	10/285,318	HUPPENTHAL ET AL.
	Examiner	**Art Unit**
	Eric Coleman	2183

SEARCHED			
Class	Subclass	Date	Examiner
712	15 19 226	10/3/05	EC

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
Searched EAST USPAT File USPG Pub file EPo File	10/3/05	EC

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

U.S. Patent and Trademark Office

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Serial No. 10/285,318

Application of: Jon M. Huppenthal and David E. Caliga

Filed: October 31, 2002

Art Unit: 2183

Examiner: Coleman, Eric

Attorney Docket No. SRC015

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

6531

Confirmation No.: 1420

Customer No.: **25235**
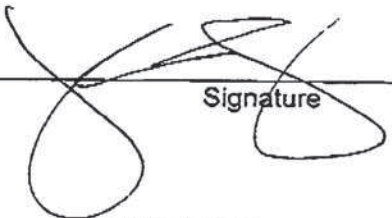
I hereby certify that this correspondence is being facsimile transmitted to the United States Patent and Trademark Office

1. Amendment in response to the Office Action dated October 7, 2005.

on   16 December 2005   16
      _____   _____
      Date   No. of Pages
                                                     (incl. Coversheet)

to centralized fax number: 571-273-8300

                                    Signature

                    Julie Lange
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Client Reference No. 80404.0018   Fax No. 719-448-5922

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Client Matter No. 80404.0018
Via Facsimile

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No. 10/285,318	Confirmation No.: 1420
Application of: Jon M. Huppenthal and David E. Caliga	Customer No.: **25235**
Filed: October 31, 2002	
Art Unit: 2183	
Examiner: Coleman, Eric	
Attorney Docket No. SRC015	
For: MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS	

<u>AMENDMENT</u>

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

Sir:

In response to the office communication mailed October 7, 2005, 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 9 of this paper.

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Amendments to the Claims:

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

Listing of Claims:

1.   (currently amended) A method for data processing in a reconfigurable computing system comprising a plurality of functional units, said method comprising:

defining a calculation for said reconfigurable computing system;

instantiating at least two of said functional units to perform said calculation wherein how many functional units and functional type of each functional unit is based on the calculation;

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

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

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.

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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.   (currently amended) The method of claim 1 wherein ~~said calculation~~
~~comprises a structures calculation for crash analysis~~ instantiating includes
establishing a stream communication connection between functional units.

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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.   (currently amended) The method of claim 1 wherein said ~~calculation comprises an decryption algorithm~~ reconfigurable computing system communicates between functional units independent of external communication protocols.

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

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

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

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

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26.   (original) A method for data processing in a reconfigurable computing
system comprising a plurality of functional units, said method comprising:

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

    computing a value at each of said cells in at least a first row of said first
systolic wall;

    communicating said values between cells in said first row of said cells to
produce updated values;

    communicating said updated values to a second row of said first systolic
wall; and

    substantially concurrently providing said updated values to a first row of a
second systolic wall of rows of cells in said subset of said plurality of functional
units.

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

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

29.   (original) The method of claim 26 wherein said values correspond to time,
steps in a computation.

30.   (original) The method of claim 26 wherein said values correspond to grid
points in a computation.

31.   (original) The method of claim 26 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.

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32.   (original) The method of claim 26 wherein said values correspond to a seismic imaging calculation.

33.   (original) The method of claim 26 wherein said values correspond to a synthetic aperture radar imaging calculation.

34.   (original) The method of claim 26 wherein said values correspond to a JPEG image compression calculation.

35.   (original) The method of claim 26 wherein said values correspond to an MPEG image compression calculation.

36.   (original) The method of claim 26 wherein said values correspond to a fluid flow calculation for a reservoir simulation.

37.   (original) The method of claim 26 wherein said values correspond to a fluid flow calculation for weather prediction.

38.   (original) The method of claim 26 wherein said values correspond to a fluid flow calculation for automotive applications.

39.   (original) The method of claim 26 wherein said values correspond to a fluid flow calculation for aerospace applications.

40.   (original) The method of claim 26 wherein said values correspond to a fluid flow calculation for an injection molding application.

41.   (currently amended) The method of claim 26 wherein said values correspond to a structures calculation for crash analysis defining includes establishing a stream communication connection between functional units and

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wherein how many functional units and functional type of each functional unit is based on a computing algorithm within the reconfigurable computing system.

42.   (original) The method of claim 26 wherein said values correspond to a structures calculation for structural analysis.

43.   (original) The method of claim 26 wherein said values correspond to a search algorithm for an image search.

44.   (original) The method of claim 26 wherein said values correspond to a search algorithm for data mining.

45.   (original) The method of claim 26 wherein said values correspond to a financial modeling application.

46.   (original) The method of claim 26 wherein said values correspond to an encryption algorithm.

47.   (currently amended) The method of claim 26 wherein ~~said values correspond to an decryption algorithm~~ reconfigurable computing system communicates between functional units independent of external communication protocols.

48.   (original) The method of claim 26 wherein said values correspond to a genetic pattern matching function.

49.   (original) The method of claim 26 wherein said values correspond to a protein folding function.

50.   (original) The method of claim 26 wherein said values correspond to an organic structure interaction function.

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51.   (original) The method of claim 26 wherein said values correspond to a signal filtering application.

52.   (original) The method of claim 26 wherein said reconfigurable computing system comprises at least one adaptive processor.

53.   (original) The method of claim 52 wherein said reconfigurable computing system further comprises at least one microprocessor.

54.   (currently amended) A method for data processing in a reconfigurable computing system comprising a plurality of functional units, said method comprising:

    performing a calculation by a subset of said plurality of functional units to produce computed data;

    passing said computed data from a first column of said calculation to a next column in said calculation;

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

    continuing said calculation [[if]] 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.

55.   (Canceled)

56.   (New) The method of claim 54 wherein how many functional units comprise the subset and functional type of each functional unit in said subset is based on the calculation and wherein the passing step is external communication protocol independent.

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REMARKS/ARGUMENTS

Claims 1-55 were presented for examination and are pending in this application. In an Official Office Action dated October 7, 2005, claims 1-55 were rejected. The Applicants thank the Examiner for his consideration and address the Examiner's comments concerning the claims pending in this application below.

Applicants herein amend claims 1, 15, 21, 41, 47 and 54 and respectfully traverse the Examiners rejections. Claim 55 is presently canceled without prejudice and new claim 56 is presently added. Claims 1-54 and 56 are now pending in this application. These changes are believed not to introduce new matter, and their entry is respectfully requested. Support of the amendments can be generally found on page 11 and page 16 of the specification. The claims have been amended to expedite the prosecution and issuance of the application. In making this amendment, Applicants have not and are not narrowing the scope of the protection to which the Applicants consider the claimed invention to be entitled and do 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, Applicants reserve the right to pursue such protection at a later point in time and merely seek to pursue protection for the subject matter presented in this submission.

35 U.S.C. §103(a) Obviousness Rejection of Claims

Claims 1-5, 26-31, 52 and 53 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,385,757 ("Gupta") in view of U.S. Patent No. 5,274,832 ("Khan"). Applicants respectfully traverse these rejections in light of the aforementioned remarks and respectfully requests reconsideration.

MPEP §2143 provides:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation,

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either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teaching. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

The cited references fail to teach or suggest all of the limitations recited in the claims as currently amended. For example, independent claim 1 recites, "...wherein how many functional units and functional type of each functional unit is based on the calculation ..." and "...substantially concurrently utilizing a second of said functional units to operate upon a previous data dimension of said calculation." Neither Gupta nor Khan teach or suggest a substantially concurrent use of functional units of a reconfigurable computing system to concurrently operate upon data dimensions of a calculation. In contrast both Gupta and Khan follow the traditional parallel processing format of sequential processing data since the result of one processor, functional unit, or cell may be required by an adjacent processor, functional unit, or cell.

Typically, 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. Consequently, intermediate results must be passed around the system in order to complete the computation of the total problem. This, by 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.

In the use of an adaptive or reconfigurable processor-based system as is claimed in the Applicants' invention, ten to one thousand times more computations

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can be performed within a single chip and any boundary data that is shared
between these functional units need never leave a single integrated circuit chip
eliminating the need for external communication protocols and simplifying internal
communications. For example a complier associated with the reconfigurable
computing system can establish stream connections between functional units that
rely on general communication protocols. 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. Such an adaptive processor-based system is distinct from that
taught by Khan.

In addition, the Applicants' invention build functional units of the
reconfigurable processor-based system based on the algorithms being used in the
calculations. The type of each functional unit and the total number of functional
units created is unique for each assigned task. This is distinct from Gupta. Gupta
teaches a system using a Very Long Instruction Word ("VLIW") processor. VLIW
processors do have the ability to use multiple arithmetic functional units one at a
time but the set of functional units are limited and fixed within the VLIW processor.
The flexible nature of the Applicants' invention allows for computational flow in one
or more dimensions of the problem. The system disclosed by Gupta and Kahn
does not offer such an approach.

Gupta also appears to teach a system to generate an instruction format that
is used to control a processor control path in what is called parallel instruction
computing. This instruction-level parallelism issues several operations per
instruction to multiple functional units to control a processors data path. As the
Examiner admits, Gupta fails to teach a substantially concurrent use of data
dimensions during a calculation. The Applicants disagree with the Examiner's

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conclusion that Khan teaches this noted insufficiency of Gupta. Khan appears to
teach a serialized or sequential approach to multi-processor parallelism using
systolic arrays. As stated in Khan, "...the corresponding matrix and vector signals
are inputted into their respective processing elements sequentially, multiplied and
accumulated therein." See Khan Col. 12, lines 35-37. Thus, Khan teaches a
systolic sequential parallel approach to processing that moves in one direction in a
one by one fashion.

    Systolic sequential parallelism utilizes an array of processing elements
(typically multiplier-accumulator chips) in a pipeline structure. The "systolic," coined
by H. T. Kung of Carnegie-Mellon, refers to the rhythmic transfer of data through
the pipeline, like blood flowing through the vascular system. Such an approach
inherently accomplishes calculations by using a serialized approach. As recited in
Gupta, "...the algorithm selects a set of FUs [Functional Units] to be instantiated in
the data path, one by one, by looking at the requirement of the operation group
cliques provided." Gupta, Col. 21, lines 23-24. (emphasis added)

    In contrast to the sequential processing operation of Khan and Gupta, the
Applicants' invention utilizes available resources to have an application evaluate a
problem in a concurrent data flow sense. That is, it will "pass" a subsequent
dimension of a given problem through a first loop of logic concurrently with the
previous dimension of data being processed through a second loop. This type of
concurrent operation is not taught or suggested by Gupta or Kahn. 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.

    In addition, and as recited in claim 26, the Applicants' method "substantially
concurrently provides updated values to a first row of a second systolic wall of rows
of cells...." (emphasis added) The combination of defining a calculation for a
reconfigurable computing system and concurrently operating on data and
communicating values between cells is distinct from Gupta in view of Khan. This

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and other features of claim 26 were recognized as having novelty, an inventive step, and industrial applicability by the International Preliminary Examining Authority of the Patent Cooperation Treaty. A recently received International Preliminary Examination Report received November 16, 2005 found that the combination of limitations found in claim 26 and 54 (designated as claims 1 and 7 of the PCT application) in full consideration of Gupta and Khan, possessed novelty, inventive step, and industrial applicability.

The Applicants also assert that Gupta in view of Khan are improperly combined. To establish a prima facie case of obviousness there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teaching. Assuming for arguments sake that the elements of the Applicants' invention are found in a combination of Gupta and Khan, (an assumption to which the Applicants do not agree) there is nothing in either Gupta or Khan to suggest or motivate such a combination or modification. The long felt need of the Applicants' invention given problems associated with parallel processing as well as the commercial success of products derived from the Applicants' invention are evidence that one of ordinary skill in the art would not and have not been motivated to combine these references. The Applicants thus traverse the Examiner's rejections of independent claims 1 and 26 for the aforementioned reasons.

Claims 2-5, 27-31, 52 and 53 depend from claims 1 and 26 respectively and are, for at least the same aforementioned reasons, patentable over Gupta in view of Khan. The Applicants respectfully request the rejections be withdrawn and the claims reconsidered.

Claims 19 and 45 were rejected under 35 U.S.C § 103(a) as being unpatentable over Gupta in view of Khan and in further view of U.S. Patent No. 4,872,133 ("Leeland"). Leeland fails to rectify the aforementioned deficiencies of

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Gupta and Khan with respect to independent claims 1 and 26 and therefore, as claims 19 and 45 depend from claims 1 and 26 respectively, the Applicants submit claims 19 and 45 are patentable over Gupta in view of Khan in further view of Leeland.

The Examiner also rejects dependent claims 10-16, 36-42 and independent claim 54 under 35 U.S.C. § 103(a) as being unpatentable over Gupta in view of Khan in further view of U.S. Patent No. 5,072,371 ("Benner"). The Applicants traverse these rejections. For at least the aforementioned reasons, the Applicants submit that Brenner fails to resolve the deficiencies noted in Gupta and Kahn. Claims 10-16 and 16-42, which depend from claims 1 and 21 respectively, are therefore patentable over Gupta in view of Khan in further view of Benner.

With regard to independent claim 54, the Examiner asserts that Benner discloses continuing calculations of variables that do not change in a column and restarting calculations of variables once a change occurs. The Applicants disagree. The text cited by the Examiner (Benner Col. 22, lines 35-52) does not teach or suggest systolic calculations as recited in claim 54 and the Examiner's conclusion that the words "wave mechanics, fluid dynamics, and beam strain analysis" imply the data processing in a reconfigurable computing system claimed by the Applicants is unjustified. The Applicants respectfully request either the rejection be withdrawn or specific reference to portions of Gupta, Kahn, and Benner that teach and suggest each and every limitation of claim 54 be identified.

Claims 6-9, 17-18, 20-25, 32-35, 43-44 and 46-51 are rejected by the Examiner under 35 U.S.C. § 103(a) as being unpatentable over Gupta and Kahn as applied to claims 1-2 and 26 and in further view of U.S. Patent No. 4,962,381 ("Helbig"), U.S. Patent No. 5,784,108 ("Skaletsky") and U.S. Patent No. 6, 061,706 ("Gai"), respectively. As all of these claims depend from either independent claim 1 or 26, the Applicants submit, for at least the aforementioned reasons, each is patentable over Gupta and Kahn. Reconsideration is respectfully requested.

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

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 Applicants' attorney at the telephone number listed below.

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,

16 December, 2005

Michael C. Martensen, Reg. No. 46,901
Hogan & Hartson LLP
One Tabor Center
1200 17th Street, Suite 1500
Denver, Colorado 80202
(719) 448-5906 Tel
(303) 899-7333 Fax

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PATENT APPLICATION FEE DETERMINATION RECORD
Effective October 1, 2001

Application or Docket Number

b285 J 8

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	55	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	55 minus 20 = *	35
INDEPENDENT CLAIMS	4 minus 3 = *	1
MULTIPLE DEPENDENT CLAIM PRESENT		☐

SMALL ENTITY TYPE ☐		OR	OTHER THAN SMALL ENTITY	
RATE	FEE		RATE	FEE
BASIC FEE	370.00	OR	BASIC FEE	740.00
X$ 9=		OR	X$18=	630
X42=		OR	X84=	84
+140=		OR	+280=	
TOTAL		OR	TOTAL	1454

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

CLAIMS AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	* 55	Minus	** 55	= —
Independent	* 3	Minus	*** 4	= —
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. 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.

FORM PTO-875 (Rev. 8/01)

☆U.S. GPO 2001 482 174 / 98197

Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	207	712/15.ccls.	US-PGPUB; USPAT; EPO	OR	OFF	2006/03/01 13:11
L2	48	712/19.ccls.	US-PGPUB; USPAT; EPO	OR	OFF	2006/03/01 13:11
L3	389	712/226.ccls.	US-PGPUB; USPAT; EPO	OR	OFF	2006/03/01 13:12
L4	559	systolic adj array	US-PGPUB; USPAT; EPO	OR	OFF	2006/03/01 13:12
L5	3411206	(process$3 or execut$3)(concurrent$2 or simultaneous$2) near3 dimension$1	US-PGPUB; USPAT; EPO	OR	OFF	2006/03/01 13:13
L6	86	(process$3 or execut$3) near3(concurrent$2 or simultaneous$2) near3 dimension$1	US-PGPUB; USPAT; EPO	OR	OFF	2006/03/01 13:14
L7	638	1 or 2 or 3	US-PGPUB; USPAT; EPO	OR	OFF	2006/03/01 13:14
L8	0	6 and 7	US-PGPUB; USPAT; EPO	OR	OFF	2006/03/01 13:14

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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/285,318	10/31/2002	Jon M. Huppenthal	SRC015	1420

25235	7590	03/06/2006

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

EXAMINER
COLEMAN, ERIC

ART UNIT	PAPER NUMBER
2183	

DATE MAILED: 03/06/2006

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

PTO-90C (Rev. 10/03)

	Application No.	**Applicant(s)**
Office Action Summary	10/285,318	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 <u>3</u> 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) *1-54,56* 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) *1-54,56* 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-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

U.S. Patent and Trademark Office

PTOL-326 (Rev. 7-05)   **Office Action Summary**   Part of Paper No./Mail Date 03012006

DETAILED ACTION

Claim Rejections - 35 USC § 103

1.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2.   Claims 1-5,15,21,26-31,41,47,52,53,56 are rejected under 35 U.S.C. 103(a) as

being unpatentable over Gupta (US patent No. 6,385,757) in view of Khan US Patent

No. 5,274,832).

3.   Gupta taught the invention substantially as claimed including a data processing

("DP") system comprising: defining a calculation for a reconfigurable computing system

instantiating the performance of at least two array functional units (FU00-FU10)(e.g.,

see col. 17, lines 28-52 and col. 21, lines 22-29) to perform the calculation.

4.   Gupta did not expressly detail utilizing the array functional units to operate on a

subsequent data dimension of the calculation and substantially concurrently using the

second of the array units to operate on a previous data dimension of the calculation.

Khan however taught operating on three dimensions using plural two dimensional

arrays that operate concurrently on respective dimensions and are coupled to together

to produce the three dimensional array (e.g., see col. 4, lines 35-62 and col. 12, lines

15-55).

5.   It would have been obvious to one of ordinary skill in the DP art to combine the

teachings of Gupta and Khan. One of ordinary skill would have been motivated to incorporate the three dimensional array operation of the Khan reference into the Gupta system to allow the combined system to be able to perform calculations on more complicated (three dimensional) problems.

6.   Claims 1,41,56 have the limitation of wherein how many functional units and functional type of each functional unit is based on the calculation (which comprises the algorithm). As to this limitation Khan taught specific selection of the number of processing elements (which correspond to claimed functional units) are different depending on whether the calculation was a two dimensional or three dimensional calculation (e.g., see col. 5, lines 17-30). As to the type of functional unit being based on the calculation the system is a special purpose system that uses a specific type of functional unit namely processing elements that perform systolic array calculations readily and where connections and transfer of data for performing the calculation is readily done. Therefore in the implementation of the Khan teachings the type of functional unit is based on the type of calculations and the algorithm that were to be performed by the system (e.g., two dimensional algorithm or three dimensional algorithm) (e.g., see col. 5, lines 32-49).

7.   As to instantiating including establishing a stream communication connection between functional units (claims 15,41) Khan taught minimizes interconnections of processing elements and the matrix and vector signal subsets are specifically formed so that they need to be inputted to only one row and one columns and yet still be properly processing systolically along all dimensions within the array (e.g., see col. 5, lines 2-48).

Consequently the stream of communication between functional units is established as the interconnections are made and data is transferred systolically in at least one stream between processors.

8.   As to the further limitations of claim 26, Khan taught (e.g., see fig. 8) a three dimensional systolic array with connections between processors in three dimensions and the selection is done to minimize global interconnections.

9.   As to claim 2-5,27-30 Khan taught the calculation comprising plurality of planes, and grid points and plural time-steps and vectors (e.g., see fig. 8 and col. 12, lines 15-55). As per claim 31, the system taught by Khan shows direct connection between the processing elements in the array and therefore the storing of data to an extrinsic memory (i.e., outside the array) would have been unnecessary when the transfer of data between columns was performed (e.g., see fig. 8).

10.   As to the limitations of claims 52 and 53 the reconfigurable systolic processor would have been able to adapt to the application a therefore would have been an adaptive processor. As to the processor comprising a microprocessor one of ordinary skill would have been motivated to implement the systolic processor as described above as an microprocessor at least to take advantage of the reduced cost and reduced system size as was well known in the art at the time of the claimed invention.

Claim 21,47,56 comprises the limitation of reconfigurable computing system communicates between functional units independent of external communication protocols. Since the Khan and Gupta system taught systems that did not use external

protocols to communicate between the processors it is anticipated that in the implementation of a system using the Khan and Gupta teachings that the communication between processors would have been protocol independent.

11. Claims 19, 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta and Khan as applied to claims 1-2,26 above, and further in view of Leeland (US patent No. 4,872,133).

12. Leeland taught calculation comprised a financial application modeling using a spreadsheet application (e.g., see col. 5, lines 3-32).

13. It would have been obvious to one of ordinary skill in the DP art to combine the teachings of Leeland and Gupta. One of ordinary skill would have been motivated to incorporate the Leeland teaching of financial spreadsheet application for an array processor in order to provide an additional use for the combined system.

14. Claim 10-14,16 and 36-40,42,54 rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta and Khan as applied to claims 1-2,15,26 above, and further in view of Benner (US Patent No. 5,072,371).

15. Benner taught the calculation comprising fluid flow calculation and structural analysis (e.g., see col. 22, lines 35-52).

16. It would have been obvious to one of ordinary skill in the DP art to combine the teachings of Benner and Gupta. One of ordinary skill would have been motivated to incorporate the Benner teaching of fluid flow and structural analysis applications for an array processor in order to provide an additional uses for the combined system.

17.   As to the limitation in claim 54 of performing a calculation unit a variable changed
is value in a system processing a restarting at that value The Benner system taught
systolically performing calculations on fluid flow. Since in such a problem one of
ordinary skill would at times be interested when a change in the data occurred and
adjust the calculation to pin point the calculation around that certain point then one of
ordinary skill would have been motivated to operate the Benner and Gupta and Khan
system to process systolically until a change in data occurred and then restart the
calculation at the point of the change to better determine the magnitude of the change in
data.

18.   Claim 6-9,25,32-35,51 are rejected under 35 U.S.C. 103(a) as being
unpatentable over Gupta and Khan as applied to claims 1-2,26 above, and further in
view of Helbig (US patent No. 4,962,381).

19.   Helbig taught the application of a systolic processor for radar, medical
ultrasound and other imaging applications (e.g., see col. 1, lines 1-5) Clearly this would
have also comprised images processed by standard MPEG and JPEG standards.

20.   It would have been obvious to one of ordinary skill in the DP art to combine the
teachings of Helbig and Gupta. One of ordinary skill would have been motivated to
incorporate the Helbig teaching of radar, medical ultrasound and other imaging
applications for an systolic processor in order to provide an additional uses for the
combined system.

21.   As to the limitation of claims 25 and 51, since signal filtering would have been
associated with the applications taught by Helbig such as radar then one of ordinary

skill would have been motivated to use the Helbig systolic processor in signal filtering applications.

22.   Claim 17,18,22-24,43,44,48-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta and Khan as applied to claims 1-2,26 above, and further in view of Skaletsky (US patent No. 5,784,108).

23.   Skaletsky taught using an systolic processor for processing search algorithm for image search such as when a best match was to be found and clearly this would have been applicable to data mining as these are similar applications (e.g., see col. 3, line 13-col. 4, line 57).

24.   It would have been obvious to one of ordinary skill in the DP art to combine the teachings of Skaletsky and Gupta. One of ordinary skill would have been motivated to incorporate the Skaletsky teaching of search algorithm applications for an systolic processor in order to provide an additional uses for the combined system.

25.   As to the limitations of claims 22-24,48-50 in light of the search algorithm teaching especially for finding a best match for data then the use of systolic processors for similar applications such as the genetic pattern matching, protein folding and organic structure interaction would have been an obvious uses for systolic processors (such as taught by Skaletsky) to one of ordinary skill in the DP art.

26.   Claim 20,46, are rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta and Khan as applied to claims 1-2,26 above, and further in view of Gai (US patent No. 6,061,706).

27.   Gai taught use of systolic processors in encryption/decryption applications to
speed the encryption/decryption of public keys (e.g. see col. 1, lines 25-41.

28.   It would have been obvious to one of ordinary skill in the DP art to combine the
teachings of Gai and Gupta. One of ordinary skill would have been motivated to
incorporate the Gai teaching of encryption and decryption applications for an systolic
processor in order to provide an additional uses for the combined system.

The change in scope of the amended claims has necessitated a new search.

Response to Arguments

Applicant's arguments with respect to claims 1-25,41,47,54,56 have been
considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments filed 12/16/05 have been fully considered but they are not
persuasive.

The applicant argues in substance the following:

Gupta and Khan did not teach concurrently operating on plural dimensions of a
calculation The examiner contends that this is taught by Khan as detailed in the
outstanding rejection above (e.g., see col. 4, lines 35-62 and col. 12, lines 15-55 of
Khan). Note that during a pipelined operation plural functional units in an array operate
concurrently and when the pipelines are in plural directions or dimensions then the
concurrency extends to plural dimensions.

Applicant alleges that the combination is improper, The Examiner contends that the reasoning for the combination provided in the outstanding rejection above is proper.

Applicant alleges that Benner does not teach continuing calculations of variables that do not change in a column and restarting calculations of variables one a change occurs. The Examiner contends as expressed in outstanding rejection above that the applications utilized for the system of Benner such as fluid flow would have motivated one of ordinary skill to use the data processing in a reconfigurable computing system.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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).

EC

ERIC COLEMAN
PRIMARY EXAMINER

Substitute for form 1449A/PTO					Application Number	10/285,318
					Filing Date	October 31, 2002
INFORMATION DISCLOSURE STATEMENT BY APPLICANT					First Named Inventor	Jon M. Huppenthal et al.
					Art Unit	2121
(Use as many sheets as necessay)					Examiner Name	Not yet assigned
Sheet	1	of	1		Attorney Docket No.	SRC015

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
ϵC		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.
ϵS		US-5,020,059	05/28/1991	Gorin et al.	Figs. 5, 9 and col. 7, line 28-col. 9, line 53.
ϵC		US-5,471,627	11/28/1995	Means et al.	Fig. 3 and col. 4, line 40- col. 12, line 42.
ϵS		US-4,727,503	02/23/1988	McWhirter	Column 3, line 49-col. 4, line 64.
ϵC		US-5,477,221	12/19/1995	Chang et al.	Fig. 5 and col. 4, line
		US-			
		US-			
		US-			
		US-			
		US-			
		US-			

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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]

EXAMINER SIGNATURE	*Eric Le*	DATE CONSIDERED	2/28/06

EXAMINER: Initial if reference 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. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached.

WCS - 80404/0018 - 67156 v1

Index of Claims	Application/Control No.	Applicant(s)/Patent under Reexamination
(barcode)	10/285,318	HUPPENTHAL ET AL.
	Examiner	Art Unit
	Eric Coleman	2183

√	Rejected	−	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

Claim Final	Claim Original	Date 3/1/06	Claim Final	Claim Original	Date 3/1/06	Claim Final	Claim Original	Date
	1	√		51	√		101	
	2	√		52	√		102	
	3	√		53	√		103	
	4	√		54	√		104	
	5	√		-55-			105	
	6	√		56	√		106	
	7	√		57			107	
	8	√		58			108	
	9	√		59			109	
	10	√		60			110	
	11	√		61			111	
	12	√		62			112	
	13	√		63			113	
	14	√		64			114	
	15	√		65			115	
	16	√		66			116	
	17	√		67			117	
	18	√		68			118	
	19	√		69			119	
	20	√		70			120	
	21	√		71			121	
	22	√		72			122	
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	24	√		74			124	
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	27	√		77			127	
	28	√		78			128	
	29	√		79			129	
	30	√		80			130	
	31	√		81			131	
	32	√		82			132	
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	34	√		84			134	
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	38	√		88			138	
	39	√		89			139	
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	43	√		93			143	
	44	√		94			144	
	45	√		95			145	
	46	√		96			146	
	47	√		97			147	
	48	√		98			148	
	49	√		99			149	
	50	√		100			150	

Search Notes	Application/Control No.	Applicant(s)/Patent under Reexamination
	10/285,318	HUPPENTHAL ET AL.
	Examiner	Art Unit
	Eric Coleman	2183

SEARCHED

Class	Subclass	Date	Examiner
712	{ 15 19 226	3/1/2006	ξ(.

SEARCH NOTES (INCLUDING SEARCH STRATEGY)

	DATE	EXMR
Searched East US Pat file US PG Pub file EPO file	3/1/2006	ξ(.

INTERFERENCE SEARCHED

Class	Subclass	Date	Examiner

U.S. Patent and Trademark Office

Part of Paper No. 03012006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No. 10/285,318	Confirmation No.: 1420
Application of: Jon M. Huppenthal and David E. Caliga	Customer No.: **25235**
Filed: October 31, 2002	
Art Unit: 2183	
Examiner: Coleman, Eric	
Attorney Docket No. SRC015	
For: MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS	

<u>AMENDMENT AFTER FINAL</u>

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

Sir:

In response to the office communication mailed March 6, 2006, 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 9 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.   (currently amended) 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:

defining a calculation at the at least one reconfigurable processor for said reconfigurable computing system;

instantiating at least two of said functional units at the at least one reconfigurable processor to perform said calculation wherein how many functional units and functional type of each functional unit is based on the calculation and wherein communications between said functional units is external communication protocol independent and internal communication protocol independent;

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

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

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. (previously presented) 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.   (Canceled)

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

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

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

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

26.   (currently amended) 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:

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;

communicating said values between cells in said first row of said cells to produce updated values, wherein communicating said values is both internal and external communication protocol independent;

communicating said updated values to a second row of said first systolic wall, wherein communicating said updated values is both internal and external communication protocol independent; and

substantially concurrently providing said updated values to a first row of a second systolic wall of rows of cells in said subset of said plurality of functional units.

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

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

29.   (original) The method of claim 26 wherein said values correspond to time steps in a computation.

30.   (original) The method of claim 26 wherein said values correspond to grid points in a computation.

31.   (original) The method of claim 26 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.

32.   (original) The method of claim 26 wherein said values correspond to a seismic imaging calculation.

33.   (original) The method of claim 26 wherein said values correspond to a synthetic aperture radar imaging calculation.

34.   (original) The method of claim 26 wherein said values correspond to a JPEG image compression calculation.

35.   (original) The method of claim 26 wherein said values correspond to an MPEG image compression calculation.

36.   (original) The method of claim 26 wherein said values correspond to a fluid flow calculation for a reservoir simulation.

37.   (original) The method of claim 26 wherein said values correspond to a fluid flow calculation for weather prediction.

38.   (original) The method of claim 26 wherein said values correspond to a fluid flow calculation for automotive applications.

39.   (original) The method of claim 26 wherein said values correspond to a fluid flow calculation for aerospace applications.

40.   (original) The method of claim 26 wherein said values correspond to a fluid flow calculation for an injection molding application.

41.   (previously presented) The method of claim 26 wherein defining includes establishing a stream communication connection between functional units and wherein how many functional units and functional type of each functional unit is based on a computing algorithm within the reconfigurable computing system.

42.   (original) The method of claim 26 wherein said values correspond to a structures calculation for structural analysis.

43.   (original) The method of claim 26 wherein said values correspond to a search algorithm for an image search.

44.   (original) The method of claim 26 wherein said values correspond to a search algorithm for data mining.

45.   (original) The method of claim 26 wherein said values correspond to a financial modeling application.

46.   (original) The method of claim 26 wherein said values correspond to an encryption algorithm.

47.   (canceled)

48.   (original) The method of claim 26 wherein said values correspond to a genetic pattern matching function.

49.   (original) The method of claim 26 wherein said values correspond to a protein folding function.

50.   (original) The method of claim 26 wherein said values correspond to an organic structure interaction function.

51.   (original) The method of claim 26 wherein said values correspond to a signal filtering application.

52.   (canceled)

53.   (currently amended) The method of claim [[52]]26 wherein said reconfigurable computing system ~~further~~ comprises at least one microprocessor.

54.   (currently amended) 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:

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

        passing said computed data from a first column of said calculation to a next column in said calculation, wherein said passing is both internal and external communication protocol independent;

        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.

55.   (Canceled)

56.   (Previously Presented) The method of claim 54 wherein how many functional units comprise the subset and functional type of each functional unit in said subset is based on the calculation and wherein the passing step is external communication protocol independent.

REMARKS/ARGUMENTS

Claims 1-54 and 56 were presented for examination and are pending in this application. In an Official Final Office Action dated March 6, 2006, claims 1-54, and 56 were rejected. The Applicants thank the Examiner for his consideration and address the Examiner's comments concerning the claims pending in this application below.

Applicants herein amend claims 1, 26, 53 and 54 and respectfully traverse the Examiner's rejections. Claims 21, 47, and 52 are presently canceled without prejudice. Claims 1-20, 22-46, 48-51 and 53, 54 and 56 are now pending in this application. The additional limitations brought into the independent claims place the claims in better condition for consideration on appeal and because they appear in dependent claims as filed, these amendments do not raise any new issues that would require further research by the Examiner. 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 these amendments, Applicants have not and are not narrowing the scope of the protection to which the Applicants consider the claimed invention to be entitled and do 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, Applicants reserve the right to pursue such protection at a later point in time and merely seek to pursue protection for the subject matter presented in this submission.

35 U.S.C. §103(a) Obviousness Rejection of Claims

Claims 1-5, 15, 21, 26-31, 41, 47, 52, 53 and 56 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,385,757 ("Gupta") in view of U.S. Patent No. 5,274,832 ("Khan"). Applicants respectfully traverse these rejections in light of the aforementioned remarks and respectfully request reconsideration.

Gupta in view of Khan fails to teach or suggest computing data flows between functional units of a single reconfigurable processor. Gupta and Khan teach traditional parallel processing with sequential processing of data between one processor, functional unit, or cell and an adjacent processor, functional unit, or cell.

The Applicants' invention calculates the number of required functional units and the type of units entirely within a single reconfigurable processor to accomplish the processing task. Computations performed by these functional units are shared within the processor and thus never need leave the single reconfigurable processor environment. This consolidation of computations eliminates the need for external and internal communication protocols. Such an adaptive (reconfigurable) processor-based system is distinct from that taught by Khan or Gupta. Khan and Gupta do not teach performing these calculations in a single processor. Rather multiple processors are disclosed which would require consideration for both internal and external communication protocols.

The Applicants reject the sweeping and unsupported conclusion by the Examiner with respect to claims 21, 47, and 56 (now incorporated into independent claims 1, 26 and 54). The Examiner states that it is "anticipated that in the implementation of a system using Khan and Gupta teachings that the communication between processors would have been protocol independent." There is no basis for this conclusion. The invention as claimed states that communication between functional units, and not the processors, is communication protocol independent. Furthermore, the Examiner's rejection of the claims fail to meet the criteria established by the MPEP for rejection under 35 U.S.C. §103(a). The Applicants submit that this limitation is not taught or suggested in Khan or Gupta and as incorporated into claims 1, 26 and 54, place these claims in condition for allowance.

The Applicants reiterate that the Applicants' invention builds functional units of a reconfigurable processor-based system based on the algorithms being used in the calculations in a single reconfigurable processor. The type of each functional unit and the total number of functional units created is unique for each assigned task. This is distinct from the teachings of Gupta of a system using a Very Long Instruction Word ("VLIW") processor. VLIW processors do have the ability to use multiple arithmetic functional units one at a time but the set of functional units are limited and fixed within the VLIW processor.

Gupta teaches a system to generate an instruction format that is used to control a processor control path in what is called parallel instruction computing. This instruction-level parallelism issues several operations per instruction to multiple functional units to control a processors data path. As the Examiner admits in a previous Office Action, Gupta fails to teach a substantially concurrent use of data dimensions during a calculation. The Applicants reassert their disagreement with the Examiner's conclusion that Khan teaches this noted insufficiency of Gupta. The Examiner states that during a "pipelined" operation, plural functional units in an array operate concurrently and when the pipelines are in plural directions, then the concurrency extends to plural dimensions. [See Final Office Action dated March 6, 2006]. Khan teaches a systolic sequential parallel approach to processing that moves in one direction in a one by one fashion. The Applicants concur that plural pipelines moving in different directions extend the processing described in Khan in plural dimensions, but disagree that such an extension is the equivalent to concurrent operations as claimed by the Applicants. Each pipeline is by definition a serialized operation. While multiple pipelines may be operating concurrently each pipeline individually still operates and communicates in a serial fashion.

The Applicants' invention utilizes available resources to have an application evaluate a problem in a concurrent data flow sense and not in a pipeline sense. That is, it will "pass" a subsequent dimension of a given problem through a first loop

of logic <u>concurrently</u> with the previous dimension of data being processed through a second loop. This type of concurrent operation cannot occur in the pipeline operation described in Khan. Accordingly the Applicants submit that independent claims 1, 26 and 54 are patentable over Gupta in view of Khan.

Claims 2-5, 15, 21, 27-31, 41, 47, 53 and 56 depend from claims 1, 26 or 54 and are, for at least the same aforementioned reasons, patentable over Gupta in view of Khan. The Applicants respectfully request the rejections be withdrawn and the claims reconsidered.

Claims 19 and 45 were rejected under 35 U.S.C § 103(a) as being unpatentable over Gupta in view of Khan and in further view of U.S. Patent No. 4,872,133 ("Leeland"). Leeland fails to rectify the aforementioned deficiencies of Gupta and Khan with respect to independent claims 1 and 26 and therefore, as claims 19 and 45 depend from claims 1 and 26 respectively, the Applicants submit claims 19 and 45 are patentable over Gupta in view of Khan in further view of Leeland.

The Examiner also rejects dependent claims 10-14, 16, 36-40, 42 and independent claim 54 under 35 U.S.C. § 103(a) as being unpatentable over Gupta in view of Khan in further view of U.S. Patent No. 5,072,371 ("Benner"). The Applicants traverse these rejections. For at least the aforementioned reasons, the Applicants submit that Brenner fails to resolve the deficiencies noted in Gupta and Kahn. Claims 10-14, 16 and 36-40, 42, which depend from claims 1 and 26 respectively, are therefore patentable over Gupta in view of Khan in further view of Benner.

The Examiner's rejection of claim 54 as being unpatentable over Gupta in view of Khan and in further view of Benner is traversed in light of the present amendments and the aforementioned remarks.

Claims 6-9, 17-18, 20-25, 32-35, 43-44 and 46-51 are rejected by the Examiner under 35 U.S.C. § 103(a) as being unpatentable over Gupta and Kahn as

applied to claims 1-2 and 26 and in further view of U.S. Patent No. 4,962,381 ("Helbig"), or in further view of U.S. Patent No. 5,784,108 ("Skaletsky"), or in further view of U.S. Patent No. 6, 061,706 ("Gai"), respectively. As all of these claims depend from either independent claim 1 or 26, the Applicants submit, for at least the aforementioned reasons, each is patentable over Gupta and Kahn. Reconsideration is respectfully requested.

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

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 Applicants' attorney at the telephone number listed below.

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,

_____4 May_____, 2006

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

Electronic Acknowledgement Receipt

EFS ID:	1039013
Application Number:	10285318
Confirmation Number:	1420
Title of Invention:	Multi-adaptive processing systems and techniques for enhancing parallelism and performance of computational functions
First Named Inventor:	Jon M. Huppenthal
Customer Number:	25235
Filer:	Michael Christian Martensen
Filer Authorized By:	
Attorney Docket Number:	SRC015
Receipt Date:	04-MAY-2006
Filing Date:	31-OCT-2002
Time Stamp:	17:29:20
Application Type:	Utility
International Application Number:	

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)	Multi Part	Pages
1		DOC013.PDF	87902	yes	13

Multipart Description			
Doc Desc		Start	End
Amendment After Final		1	1
Amendment Copy Claims/Response to Suggested Claims		2	8
Applicant Arguments/Remarks Made in an Amendment		9	13

Warnings:

Information:

Total Files Size (in bytes):	87902

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.

PATENT APPLICATION FEE DETERMINATION RECORD
Effective October 1, 2001

Application or Docket Number

p285318

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	55	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	55 minus 20= *	35
INDEPENDENT CLAIMS	4 minus 3 =	1
MULTIPLE DEPENDENT CLAIM PRESENT		☐

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

SMALL ENTITY TYPE ☐		OR	OTHER THAN SMALL ENTITY	
RATE	FEE		RATE	FEE
BASIC FEE	370.00	OR	BASIC FEE	740.00
X$ 9=		OR	X$18=	630
X42=		OR	X84=	84
+140=		OR	+280=	
TOTAL		OR	TOTAL	1454

CLAIMS AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	• 55	Minus	•• 55	= —
Independent	• 3	Minus	••• 4	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐				

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	• 54	Minus	•• 55	•
Independent	• 3	Minus	••• 3	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐				

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	•	Minus	••	•
Independent	•	Minus	•••	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐				

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. 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.

FORM PTO-875 (Rev. 8/01)

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/285,318	10/31/2002	Jon M. Huppenthal	SRC015	1420

25235   7590   05/23/2006

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

EXAMINER
COLEMAN, ERIC

ART UNIT	PAPER NUMBER
2183	

DATE MAILED: 05/23/2006

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

PTO-90C (Rev. 10/03)

	Application No.	Applicant(s)
Advisory Action ***Before the Filing of an Appeal Brief***	10/285,318	HUPPENTHAL ET AL.
	Examiner	Art Unit
	Eric Coleman	2183

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

THE REPLY FILED <u>04 May 2006</u> FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

1. ☒ The reply was filed after a final rejection, but prior to or on the same day as filing a Notice of Appeal. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. The reply must be filed within one of the following time periods:

    a) ☐ The period for reply expires _____ months from the mailing date of the final rejection.

    b) ☒ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

        Examiner Note: If box 1 is checked, check either box (a) or (b). ONLY CHECK BOX (b) WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

<u>NOTICE OF APPEAL</u>

2. ☐ The Notice of Appeal was filed on _____ . A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

<u>AMENDMENTS</u>

3. ☒ The proposed amendment(s) filed after a final rejection, but prior to the date of filing a brief, will <u>not</u> be entered because

    (a)☒ They raise new issues that would require further consideration and/or search (see NOTE below);

    (b)☐ They raise the issue of new matter (see NOTE below);

    (c)☒ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or

    (d)☐ They present additional claims without canceling a corresponding number of finally rejected claims.

        NOTE: *See Continuation Sheet*. (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).

5. ☐ Applicant's reply has overcome the following rejection(s): _____ .

6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).

7. ☒ For purposes of appeal, the proposed amendment(s): a) ☒ will not be entered, or b) ☐ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.

    The status of the claim(s) is (or will be) as follows:

    Claim(s) allowed: _____ .

    Claim(s) objected to: _____ .

    Claim(s) rejected: *1-54 and 56*.

    Claim(s) withdrawn from consideration: _____ .

<u>AFFIDAVIT OR OTHER EVIDENCE</u>

8. ☐ The affidavit or other evidence filed after a final action, but before or on the date of filing a Notice of Appeal will <u>not</u> be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).

9. ☐ The affidavit or other evidence filed after the date of filing a Notice of Appeal, but prior to the date of filing a brief, will <u>not</u> be entered because the affidavit or other evidence failed to overcome <u>all</u> rejections under appeal and/or appellant fails to provide a showing a good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).

10. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

<u>REQUEST FOR RECONSIDERATION/OTHER</u>

11. ☒ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: See Continuation Sheet.

12. ☐ Note the attached Information Disclosure Statement(s). (PTO/SB/08 or PTO-1449) Paper No(s). _____

13. ☐ Other: _____ .

Eric Coleman
Primary Examiner

Continuation of 3. NOTE: The proposed change in scope of the claims (e.g., addition of defining a calculation "at the at least one reconfigurable processor" and "wherein communications between said functional units is external communication protocol independent and internal communication independent") would necessitate a new search.

Continuation of 11. does NOT place the application in condition for allowance because: of the reasons stated in the final rejection. Also, the proposed added wherein clauses are not required by, or are not a consequence of, any element or step in the claims consequently it is merely intended use. The implementation by Khan using an array of processing elements does not require any change in protocol for communcation to perform any process with the array also There is no requirement that there would be the only one particular protocol that would allow implementation of the invention in Gupta. Also processing in Gupta and Khan was performed at at least one reconfigurable processor (e.g., see col. 17, lines 28-52 and col. 21, lines 22-29 of Gupta; and col. 7, line 7-col. 8, line 65 of Khan).   .

PTO/SB/30 (04-05)
Approved for use through 07/31/2006. OMB 0651-0031
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.

REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL	Application Number	10/285,318
	Filing Date	October 31, 2002
	First Named Inventor	Jon M. Huppenthal et al.
	Group Art Unit	2183
Address to: Mail Stop RCE Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450	Examiner Name	Coleman, Eric
	Attorney Docket Number	SRC015

This is a Request for Continued Examination (RCE) under 37 C.F.R. 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO) on page 2.

1. **Submission required under 37 C.F.R. 1.114** Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

   a. ☐ Previously submitted. If a final Office Action is outstanding, any amendments filed after the final Office Action may be considered as a submission even if this box is not checked.

      i. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

      ii. ☐ Other _____

   b. ☒ Enclosed

      i. ☒ Amendment/Reply   iii. ☐ Information Disclosure Statement (IDS)

      ii. ☐ Affidavit(s)/Declaration(s)   iv. ☐ Other _____

2. **Miscellaneous**

   a. ☐ Suspension of action on the above-identified application is requested under 37 C.F.R. 1.103(c) for a period of _____ months. (Period of suspension shall not exceed 3 months; Fee under 37 C.F.R. 1.17(i) **required**)

   b. ☐ Other _____

3. **Fees** The RCE fee under 37 C.F.R. 1.17(e) is required by 37 C.F.R. 1.114 when the RCE is filed.

   a. ☒ The Director is hereby authorized to charge the following fees, any underpayment of fees, or credit any overpayments, to Deposit Account No. 50-1123.

      i. ☒ RCE fee required under 37 C.F.R 1.17(e)

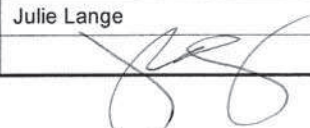   ii. ☐ Extension of time fee (37 C.F.R 1.136 and 1.17)

      iii. ☒ Other: Charge any additional fees or credit any overpayments **for this filing**

   b. ☐ Check in the amount of $ enclosed

   c. ☐ Payment by credit card (Form PTO-2038 enclosed)

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED			
Name (Print/Type)	Michael C. Martensen	Registration No. (Attorney/Agent)	46,901
Signature	*[signature]*	Date	2 June 2006

CERTIFICATE OF MAILING OR TRANSMISSION			
I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage in an envelope addressed to: Mail Stop RCE, Commissioner For Patents, P.O. Box 1450, Alexandria, VA 22313-1450 or facsimile transmitted to the U.S. Patent and Trademark Office on the date shown below.			
Name (Print/Type)	Julie Lange		
Signature	*[signature]*	Date	2 June 2006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No. 10/285,318	Confirmation No.: 1420
Application of: Jon M. Huppenthal and David E. Caliga	Customer No.: **25235**
Filed: October 31, 2002	
Art Unit: 2183	
Examiner: Coleman, Eric	
Attorney Docket No. SRC015	
For: MULTI-ADAPTIVE PROCESSING SYSTEMS AND TECHNIQUES FOR ENHANCING PARALLELISM AND PERFORMANCE OF COMPUTATIONAL FUNCTIONS	

SUPPLEMENTAL AMENDMENT AFTER FINAL

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

Sir:

In response to the office communication mailed March 6, 2006, 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.

Amendments to the Claims:

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

Listing of Claims:

1.   (currently amended) 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:

defining a calculation at the at least one reconfigurable processor for said reconfigurable computing system;

instantiating at least two of said functional units at the at least one reconfigurable processor to perform said calculation wherein how many functional units and functional type of each functional unit is based on the calculation and wherein each functional unit at the at least one reconfigurable processor communications with each other functional unit at the at least one reconfigurable processor independent of external and internal communication protocols;

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

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

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

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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.   (previously presented) 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.   (Canceled)

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

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

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

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

26.   (currently amended) 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:

      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;

      communicating said values between cells in said first row of said cells to produce updated values, wherein communicating said values is both internal and external communication protocol independent;

      communicating said updated values to a second row of said first systolic wall, wherein communicating said updated values is both internal and external communication protocol independent; and

      substantially concurrently providing said updated values to a first row of a second systolic wall of rows of cells in said subset of said plurality of functional units.

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

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

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29.   (original) The method of claim 26 wherein said values correspond to time steps in a computation.

30.   (original) The method of claim 26 wherein said values correspond to grid points in a computation.

31.   (original) The method of claim 26 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.

32.   (original) The method of claim 26 wherein said values correspond to a seismic imaging calculation.

33.   (original) The method of claim 26 wherein said values correspond to a synthetic aperture radar imaging calculation.

34.   (original) The method of claim 26 wherein said values correspond to a JPEG image compression calculation.

35.   (original) The method of claim 26 wherein said values correspond to an MPEG image compression calculation.

36.   (original) The method of claim 26 wherein said values correspond to a fluid flow calculation for a reservoir simulation.

37.   (original) The method of claim 26 wherein said values correspond to a fluid flow calculation for weather prediction.

38.   (original) The method of claim 26 wherein said values correspond to a fluid flow calculation for automotive applications.

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39.   (original) The method of claim 26 wherein said values correspond to a fluid flow calculation for aerospace applications.

40.   (original) The method of claim 26 wherein said values correspond to a fluid flow calculation for an injection molding application.

41.   (previously presented) The method of claim 26 wherein defining includes establishing a stream communication connection between functional units and wherein how many functional units and functional type of each functional unit is based on a computing algorithm within the reconfigurable computing system.

42.   (original) The method of claim 26 wherein said values correspond to a structures calculation for structural analysis.

43.   (original) The method of claim 26 wherein said values correspond to a search algorithm for an image search.

44.   (original) The method of claim 26 wherein said values correspond to a search algorithm for data mining.

45.   (original) The method of claim 26 wherein said values correspond to a financial modeling application.

46.   (original) The method of claim 26 wherein said values correspond to an encryption algorithm.

47.   (canceled)

48.   (original) The method of claim 26 wherein said values correspond to a genetic pattern matching function.

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49.   (original) The method of claim 26 wherein said values correspond to a protein folding function.

50.   (original) The method of claim 26 wherein said values correspond to an organic structure interaction function.

51.   (original) The method of claim 26 wherein said values correspond to a signal filtering application.

52.   (canceled)

53.   (currently amended) The method of claim [[52]]26 wherein said reconfigurable computing system ~~further~~ comprises at least one microprocessor.

54.   (currently amended) 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:

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

    passing said computed data from a first column of said calculation to a next column in said calculation, wherein said passing is both internal and external communication protocol independent;

    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.

55.   (Canceled)

56.   (Previously Presented) The method of claim 54 wherein how many functional units comprise the subset and functional type of each functional unit in said subset is based on the calculation and wherein the passing step is external communication protocol independent.

REMARKS/ARGUMENTS

Claims 1-54 and 56 were presented for examination and are pending in this application. In an Official Final Office Action dated March 6, 2006, claims 1-54, and 56 were rejected. The Applicants thank the Examiner for his consideration and address the Examiner's comments concerning the claims pending in this application below.

Applicants herein amend claims 1, 26, 53 and 54 and respectfully traverse the Examiner's rejections. Claims 21, 47, and 52 are presently canceled without prejudice. Claims 1-20, 22-46, 48-51 and 53, 54 and 56 are now pending in this application. The additional limitations brought into the independent claims place the claims in better condition for consideration on appeal and because they appear in dependent claims as filed, these amendments do not raise any new issues that would require further research by the Examiner. 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 these amendments, Applicants have not and are not narrowing the scope of the protection to which the Applicants consider the claimed invention to be entitled and do 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, Applicants reserve the right to pursue such protection at a later point in time and merely seek to pursue protection for the subject matter presented in this submission.

35 U.S.C. §103(a) Obviousness Rejection of Claims

Claims 1-5, 15, 21, 26-31, 41, 47, 52, 53 and 56 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,385,757 ("Gupta") in view of U.S. Patent No. 5,274,832 ("Khan"). Applicants respectfully traverse these rejections in light of the aforementioned remarks and respectfully request reconsideration.

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Section 103(a) of title 35 of the United States Code states that a patent may not be obtained if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. See 35 U.S.C. §103(a). To form a *prima facie* case of obviousness under 35 U.S.C. §103 and in accord with section 2143 of the MPEP, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify a reference or to combine reference teachings. Second, there must be a reasonable expectation that the art suggested in the references cited by the Examiner will succeed in creating the claimed invention. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. These three criteria have not been met by the Examiner.

A.   The Examiner provides neither explicit nor implicit reasons why one skilled in the art at the time of the Applicants' invention would modify Gupta with the teachings of Khan.

The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. In re Mills, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir., 1990). According to the Federal Circuit, this motivation may be found implicitly or explicitly: 1) in the prior art references themselves; 2) in the knowledge of those of ordinary skill in the art that certain references, or disclosures in those references, are of special interest or importance in the field; 3) or from the nature of the problem to be solved leading inventors to look to reference relating to possible solutions to that problem. See Ruiz v. A.B. Chance Co., 234 F.3d 654, 57 U.S.P.Q.2d 1161 (Fed. Cir. (Mo.), 2000). To prevent the use of hindsight based on the Applicants' invention to defeat the

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patentability of the Applicants' invention, the Examiner must show a motivation to combine the references that creates the case of obviousness. "In other words, the examiner must show reasons that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed." In re Rouffet, 149 F.3d 1350, 47 U.S.P.Q.2d 1453 (Fed. Cir., 1998). Thus absent some teaching, suggestion or incentive supporting the proposed combination of art, obviousness cannot be established.

The Examiner asserts that it would be obvious for one of ordinary skill in the art at the time of the Applicants' invention to combine the teachings of Gupta and Khan. The Examiner attempts to support his assertion by stating that one skilled in the DP art would have been motivated to incorporate the three dimensional array operations of Khan reference into the Gupta system to allow the combined system to be able to perform calculations on more complicated (three dimensional) problems. A careful word search of Gupta and Khan reveals no such motivating statement thus the Applicants assume the Examiner finds this motivation inherent. The Court in Rouffet stated that to "prevent the use of hindsight based on the invention to defeat patentability of the invention, this court requires the examiner to show a motivation to combine the references that create the case of obviousness." Id. As in the present invention, the examiner in Roufett relied on the high level of skill in the art to provide the necessary motivation. Finding such motivation absent, the Rouffet Court stated that "if such rote invocation could suffice to supply a motivation to combine, the more sophisticated scientific fields would rarely, if ever, experience a patentable technical advance." Id.

The Federal Circuit has repeatedly warned against the use of the Applicants' invention as a blueprint by which to build a case of obviousness.

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The Examiner offers no explanation of the specific understanding or principle within the knowledge of one skilled in the DP art that would motivate one with no knowledge of the Applicants' invention to combine the teachings of Gupta and Khan to create the Applicants' invention. A system to be able to perform calculations on more complicated problems applies to any system. There is no foundation to motivate one skilled in the relevant art at the time of the Applicants' invention to combine the teachings of Gupta with reference to Very Long Instruction Word processors with that of a systolic array for multidimensional matrix computations as taught by Khan other than the Applicants' invention. The Examiner's use of hindsight is improper and can not be used to support a rejection under 35 U.S.C. §103.

B.   Modifying Gupta by the teachings of Khan fails to provide a reasonable expectation of success to produce the Applicants' claimed invention as a whole because neither Gupta nor Khan address boundary interactions and communications between functional units conducting parallel computations in a reconfigurable processor based system.

A proper analysis under 35 U.S.C. §103 includes the determination of "whether the prior art would also have revealed that in so making or carrying out, those of ordinary would have a reasonable expectation of success." Noelle v. Lederman, 355 F.3d 1343, 69 U.S.P.Q.2d 1508 (Fed. Cir., 2004). While an absolute expectation of success is not necessary, the combined art must provide a reasonable expectation that one skilled in the art will succeed in making the claimed subject matter as a whole. "To have a reasonable expectation of success, one must be motivated to do more than merely to vary all parameters or try each of numerous possible choices until one possibly arrived at a successful result, where the prior art gave either no indication of which parameters were critical or no direction as to which of many possible

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choices is likely to be successful. Medichem, S.A. v. Rolabo, S.L. 437 F.3d 1157, *1165 (C.A.Fed. (N.Y.),2006). Foster in view of O'Sullivan provides no indication, no direction and no such expectation of success.

The Examiner fails to offer any suggestion that one skilled in the art would reasonably expect a modification of Gupta based on the teachings of Khan would succeed in creating the Applicants' claimed invention. The prior art and surrounding circumstances must provide a reasonable reason to do, not a reasonable reason to try to do. Based on what has been accomplished in the art up to the time of the invention, and specifically what is suggested and taught in Gupta and Khan, there is no suggestion of a direction on how to proceed to produce the Applicants' invention. Countless objective pieces of evidence exist supporting the computing industries goal to increase computing speed, efficiency, and bandwidth. Parallel processor computing in one such advance. However, a reasonable combination of Gupta and Khan would teach a multiple processor system wherein each processor would be allocated a small portion of the problem in one or more cells. The results of each cell must interact to pass along intermediary results leading to the final computation via internal and external communication protocols. As taught by Kahn and Gupta, this would necessitate numerous chips, busses, and other I/O operations that would operate of much lower computational speeds than that offered by the Applicants' invention. Advancements in computing hardware have progressed to a point where the bandwidth and speed of computing is soon to be limited by the speed of light. In such an environment, even a 10% increase in computing capability is heralded as a major achievement. Significantly, the Applicants' invention utilizes (and claims) reconfigurable processors that are independent of such limiting communication protocols. The Applicants' invention, which the Examiner asserts is obvious by the teachings of Gupta and Khan, advances processing speed, through the use of reconfigurable processors as currently

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claimed, by more than three fold of that taught by Gupta or Khan. One skilled in the art at the time of the Applicants' invention would not reasonably expect that combining the teachings of Gupta with the teachings of Khan would produce such a result.

      C.   The Examiner fails to consider the claimed subject matter as a whole in making his obviousness rejection.

One of the hallmarks of 35 U.S.C. §103(a) is that for an invention to be unpatentable, the differences between the prior art and the claimed subject matter taken as a whole must be obvious to one skilled in the art. The Examiner fails to consider the invention as a whole and rather dissects and attacks each element individually. As has been repeatedly voiced by the Federal Circuit, "In determining obviousness, the invention must be considered as a whole without the benefit of hindsight, and the claims, must be considered in their entirety." Rockwell Intern. Corp. v. U.S., 147 F.3d 1358, 47 U.S.P.Q.2d 1027 (Fed. Cir., 1998). "In making the assessment of differences, section 103 specifically requires consideration of the claimed invention 'as a whole'". Ruiz v. A.B. Chance Co., 357 F.3d 1270, 69 U.S.P.Q.2d 1686 (Fed. Cir. (Mo), 2004).

The Examiner argues Khan suggests utilizing an array of functional units to operate on a subsequent data dimension of the calculation and substantially concurrently using a second of said array of functional units to operate on a previous data dimension of the same calculation. To support his argument, the Examiner turns to Khan Col.4, lines 35-62 and Col 12 lines 15-55. In this section, according to the Examiner, Khan teaches operating on three dimensions using plural two dimensional arrays that operate concurrently on respective dimensions and are coupled together to produce the three dimensional array. The Examiner suggests that during a pipelined operation, plural functional units in an array operate concurrently and when the pipelines are in plural directions or dimensions then the concurrency extends to plural

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dimensions. The Examiner, however, fails to step back and take the Applicants' invention as a whole. In the Applicants' invention, concurrent to the first functional units operating on a subsequent set of data, a second set of function units is operating on a previous set of data. The concurrent pipelined operations described by the Examiner and as taught by Khan is a serialized concurrent approach which does not permit a second set of functional units operate on a previous set of data.

Section 103 requires that the differences in the prior art as compared to the claimed subject matter as a whole must be so slight as to make the claimed subject matter obvious. Taking the claimed subject matter as a whole, the differences between what is suggested by Gupta in view of Khan are enormous.

D.   Each and every element of the claimed invention is not disclosed in the combined references, namely Gupta and Khan.

Gupta in view of Khan also fails to teach or suggest computing data flows between functional units of a single reconfigurable processor. Gupta and Khan teach traditional parallel processing with sequential processing of data between one processor, functional unit, or cell and an adjacent processor, functional unit, or cell.

The Applicants' invention calculates the number of required functional units and the type of units entirely within a single reconfigurable processor to accomplish the processing task. Computations performed by these functional units are shared within the processor and thus never need leave the single reconfigurable processor environment. This consolidation of computations eliminates the need for external and internal communication protocols. Such an adaptive (reconfigurable) processor-based system is distinct from that taught by Khan or Gupta. Khan and Gupta do not teach performing these calculations in a single processor. Rather, multiple processors are taught that would require consideration for both internal and external communication protocols. The Examiner states in the Advisory Action that

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there is no requirement in Gupta or Khan that would require only one particular protocol that would allow implementation. Khan teaches combining multiple processors to achieve pipelining processing. See Khan Col. 5, lines 3-16. While Khan teaches a minimization of global interactions, the interactions nonetheless exist. As one skilled in the art at the time of the Applicants' invention would recognize, these interactions necessitate a common communication protocol. The Applicants' invention operates independent of these protocols.

The Applicants, therefore, reject the sweeping and unsupported conclusion by the Examiner with respect to claims 21, 47 and 56 (now incorporated into independent claims 1, 26 and 54). The Examiner states in his final rejection that it is "anticipated that in the implementation of a system using Khan and Gupta teachings that the communication between processors would have been protocol independent." (emphasis added) There is no basis for this conclusion. Again the Examiner uses hindsight provided by the Applicants to reach his conclusion of obviousness. The invention as claimed states that communication between functional units is communication protocol independent. This is a function of the inherent nature of a reconfigurable processor. Similarly, the inherent nature of coupling multiple processors as taught by Khan is communications protocol dependent. The Applicants submit that this limitation is not taught or suggested in Khan or Gupta and as incorporated into claims 1, 26 and 54, place these claims in condition for allowance.

The Applicants reiterate that the Applicants' invention builds functional units of a reconfigurable processor-based system based on the algorithms being used in the calculations in a single reconfigurable processor. The type of each functional unit and the total number of functional units created is unique for each assigned task. This is distinct from the teachings of Gupta of a system using a Very Long Instruction Word ("VLIW") processor. VLIW processors do have the ability to use

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multiple arithmetic functional units one at a time but the set of functional units are limited and fixed within the VLIW processor.

Gupta teaches a system to generate an instruction format that is used to control a processor control path in what is called parallel instruction computing. This instruction-level parallelism issues several operations per instruction to multiple functional units to control a processors data path. As the Examiner admits in a previous Office Action, Gupta fails to teach a substantially concurrent use of data dimensions during a calculation. The Applicants reassert their disagreement with the Examiner's conclusion that Khan teaches this noted insufficiency of Gupta. Khan teaches a systolic sequential parallel approach to processing using multiple processors. The Applicants concur that plural pipelines moving in different directions extend the processing described in Khan in plural dimensions, but disagree that such an extension is the equivalent to concurrent operations as claimed by the Applicants. Each pipeline is, by definition, a serialized operation. While multiple pipelines may be operating concurrently, each pipeline individually still operates and communicates in a serial fashion.

The Applicants' invention utilizes available resources to have an application evaluate a problem in a concurrent data flow sense and not in a pipeline sense. That is, it will "pass" a subsequent dimension of a given problem through a first loop of logic concurrently with the previous dimension of data of the given problem being processed through a second loop. This type of concurrent operation cannot occur in the serialized pipeline operation described in Khan nor is it suggested or taught in Gupta. Accordingly, the Applicants submit that independent claims 1, 26 and 54 are patentable over Gupta in view of Khan.

The Examiner also suggests that Khan and Gupta teach the use of at least one reconfigurable processor. As discussed earlier, functional units in a VLIW processor are limited and fixed thus the claimed limitation that the number and type of functional units instantiated in the reconfigurable processor based on the

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calculation is not possible in a VLIW as taught by Gupta. The section of text of Khan cited by the Examiner, Col. 7 line 7 – Col. 8 line 65 mentions the reconfiguration of a single dimensional vector signal set to a two dimensional vector signal set. There is no apparent suggestion or teaching of the use of a reconfigurable processor or the instantiation of functional units in said reconfigurable processor.

E.   Conclusion

For at least the aforementioned reasons, the Applicants submit that claims 1, 26 and 54, are patentable over Gupta in view of Khan. Reconsideration and withdrawal of the rejection of the claims under 35 U.S.C. § 103(a) is respectfully requested.

Claims 2-5, 15, 21, 27-31, 41, 47, 53 and 56 depend from claims 1, 26 or 54 and are, for at least the same aforementioned reasons, patentable over Gupta in view of Khan. The Applicants respectfully request the rejections be withdrawn and the claims reconsidered.

Claims 19 and 45 were rejected under 35 U.S.C § 103(a) as being unpatentable over Gupta in view of Khan and in further view of U.S. Patent No. 4,872,133 ("Leeland"). Leeland fails to rectify the aforementioned deficiencies of Gupta and Khan with respect to independent claims 1 and 26 and therefore, as claims 19 and 45 depend from claims 1 and 26 respectively, the Applicants submit claims 19 and 45 are patentable over Gupta in view of Khan in further view of Leeland.

The Examiner also rejects dependent claims 10-14, 16, 36-40, 42 and independent claim 54 under 35 U.S.C. § 103(a) as being unpatentable over Gupta in view of Khan in further view of U.S. Patent No. 5,072,371 ("Benner"). The Applicants traverse these rejections. For at least the aforementioned reasons, the Applicants submit that Brenner fails to resolve the deficiencies noted in Gupta and Kahn. Claims 10-14, 16 and 36-40, 42, which depend from claims 1 and 26

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respectively, are therefore patentable over Gupta in view of Khan in further view of Benner.

The Examiner's rejection of claim 54 as being unpatentable over Gupta in view of Khan and in further view of Benner is traversed in light of the present amendments and the aforementioned remarks.

Claims 6-9, 17-18, 20-25, 32-35, 43-44 and 46-51 are rejected by the Examiner under 35 U.S.C. § 103(a) as being unpatentable over Gupta and Kahn as applied to claims 1-2 and 26 and in further view of U.S. Patent No. 4,962,381 ("Helbig"), or in further view of U.S. Patent No. 5,784,108 ("Skaletsky"), or in further view of U.S. Patent No. 6,061,706 ("Gai"), respectively. As all of these claims depend from either independent claim 1 or 26, the Applicants submit, for at least the aforementioned reasons, each is patentable over Gupta and Kahn. Reconsideration is respectfully requested.

Based on the above amendment and the following remarks, Applicants respectfully request that the Examiner reconsider all outstanding rejections and withdraw them.
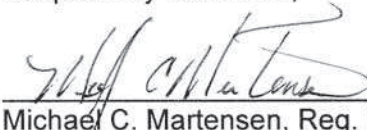
In view of all of the above, the claims are now believed to be allowable and the case in condition for allowance which action is respectfully requested. Should the Examiner be of the opinion that a telephone conference would expedite the prosecution of this case, the Examiner is requested to contact Applicants' attorney at the telephone number listed below.

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No fee beyond that associated with the RCE 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,

_2 June_____, 20_06_

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

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Electronic Patent Application Fee Transmittal

Application Number:	10285318
Filing Date:	31-Oct-2002
Title of Invention:	Multi-adaptive processing systems and techniques for enhancing parallelism and performance of computational functions
First Named Inventor:	Jon M. Huppenthal
Filer:	Michael Christian Martensen/Julie Lange
Attorney Docket Number:	SRC015

Filed as Large Entity

Utility   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($)
Miscellaneous:				
Request for continued examination	1801	1	790	790
Total in USD ($)				790

Electronic Acknowledgement Receipt

EFS ID:	1066012
Application Number:	10285318
Confirmation Number:	1420
Title of Invention:	Multi-adaptive processing systems and techniques for enhancing parallelism and performance of computational functions
First Named Inventor:	Jon M. Huppenthal
Customer Number:	25235
Filer:	Michael Christian Martensen/Julie Lange
Filer Authorized By:	Michael Christian Martensen
Attorney Docket Number:	SRC015
Receipt Date:	02-JUN-2006
Filing Date:	31-OCT-2002
Time Stamp:	18:18:10
Application Type:	Utility
International Application Number:	

Payment information:

Submitted with Payment	yes
Payment was successfully received in RAM	$790
RAM confirmation Number	366
Deposit Account	501123

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 1.16 and 1.17

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)	Multi Part	Pages
1		DOC140.PDF	1258450	yes	22

Multipart Description			
Doc Desc	Start		End
Request for Continued Examination (RCE)	1		1
Amendment After Final	2		2
Amendment Copy Claims/Response to Suggested Claims	3		10
Applicant Arguments/Remarks Made in an Amendment	11		22

Warnings:

Information:

| 2 | Fee Worksheet (PTO-875) | fee-info.pdf | 8224 | no | 2 |

Warnings:

Information:

Total Files Size (in bytes):	1266674

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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.

PATENT APPLICATION FEE DETERMINATION RECORD
Effective October 1, 2001

Application or Docket Number
b285 J 8

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	55	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	55 minus 20 =	35
INDEPENDENT CLAIMS	4 minus 3 =	1
MULTIPLE DEPENDENT CLAIM PRESENT		☐

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

SMALL ENTITY TYPE ☐		OR	OTHER THAN SMALL ENTITY	
RATE	FEE		RATE	FEE
BASIC FEE	370.00	OR	BASIC FEE	740.00
X$ 9 =		OR	X$18 =	630
X42 =		OR	X84 =	84
+140 =		OR	+280 =	
TOTAL		OR	TOTAL	1984

CLAIMS AS AMENDED - PART II

	AMENDMENT A			
	(Column 1) CLAIMS REMAINING AFTER AMENDMENT	(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	55	Minus	55	—
Independent	3	Minus	4	—
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM	☐			

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9 =		OR	X$18 =	
X42 =		OR	X84 =	
+140 =		OR	+280 =	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

	AMENDMENT B			
	(Column 1) CLAIMS REMAINING AFTER AMENDMENT	(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	54	Minus	55	
Independent	3	Minus	3	
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM	☐			

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9 =		OR	X$18 =	
X42 =		OR	X84 =	
+140 =		OR	+280 =	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

6-2-06

	AMENDMENT C			
	(Column 1) CLAIMS REMAINING AFTER AMENDMENT	(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	51	Minus	54	
Independent	3	Minus	3	
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM	☐			

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9 =		OR	X$18 =	
X42 =		OR	X84 =	
+140 =		OR	+280 =	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. 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.

FORM PTO-875 (Rev. 8/01)

Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	215	712/15.ccls.	US-PGPUB; USPAT; EPO	OR	OFF	2006/08/10 19:53
L2	49	712/19.ccls.	US-PGPUB; USPAT; EPO	OR	OFF	2006/08/10 19:53
L3	410	712/226.ccls.	US-PGPUB; USPAT; EPO	OR	OFF	2006/08/10 19:53
L4	591	systolic adj array	US-PGPUB; USPAT; EPO	OR	OFF	2006/08/10 19:53
L5	91	(process$3 or execut$3)near3 (concurrent$2 or simultaneous$2) near3 dimension$1	US-PGPUB; USPAT; EPO	OR	OFF	2006/08/10 19:54
L6	50281	reconfigur$3	US-PGPUB; USPAT; EPO	OR	OFF	2006/08/10 19:55
L7	667	1 or 2 or 3	US-PGPUB; USPAT; EPO	OR	OFF	2006/08/10 19:55
L8	10818	functional adj unit	US-PGPUB; USPAT; EPO	OR	OFF	2006/08/10 19:55
L9	24	6 with 8	US-PGPUB; USPAT; EPO	OR	OFF	2006/08/10 19:55
L10	2	7 and 9	US-PGPUB; USPAT; EPO	OR	OFF	2006/08/10 19:55

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/285,318	10/31/2002	Jon M. Huppenthal	SRC015	1420

			EXAMINER
25235	7590	08/17/2006	COLEMAN, ERIC

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

ART UNIT	PAPER NUMBER
2183	

DATE MAILED: 08/17/2006

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

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)
	10/285,318	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 <u>3</u> 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 <u>02 June 2006</u>.

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) *1-20,22-46,48-51,53,54 and 56* 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) *1-20,22-46,48-51,53,54 and 56* 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-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

U.S. Patent and Trademark Office
PTOL-326 (Rev. 7-05)   **Office Action Summary**   Part of Paper No./Mail Date 20060810

DETAILED ACTION

Claim Rejections - 35 USC § 112

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

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-20,22-46,48-51,53,54,56 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 1 (in lines 10-12) contains the language "wherein the functional unit at the at least one reconfigurable processor communications with each other functional unit at the at least one reconfigurable processor independent of external and internal communication protocols" Claim 26 (in lines 10-11) contains the language " wherein communicating said values is both internal and external communication protocol independent" and (in lines 13-14) wherein communicating said updated values is both internal and external communication protocol independent" and claim 54 (in lines 8-9) contains the language "wherein said passing is both internal and external communication protocol independent". The dependent claims 2-20,22-25,27-46,48-51,53 and 56 respectively contain the language in the corresponding independent claim above.

The language detailed above provides for a functioning of the reconfigurable computing system that is independent of the internal and external communication

protocols. The Dictionary, of Computers Information Processing & Telecommunications 2nd Edition, on page 496, defines protocol as (1) a specification for the format and relative timing of information exchanged between communicating parties; (2) the set of rules governing the operation of functional units of a communication system that must be followed if communication is to be achieved". The originally filed application does not provide for the operation of the system that would operate in a properly timed way where the data would have properly been communicated between functional units in a format providing proper operation of the system without use of internal and external protocols that the system would require for operation. This is especially true since the system is reconfigurable. The communications requirements would not always be the same so without some type of use of an internal or external protocol there would have had to have been some other means to provided for proper communications. This was not disclosed in the originally filed application. Therefore the written description requirement has not been met.

Also claim 1 contains the language (in line 9) wherein how many functional type of each functional unit is based on the calculation; claim 41 (lines 3-4) contains "functional type of each functional unit is based on a computing algorithm"; claim 56 (lines 2-3) contains "functional type of each functional unit in said subset is based on the calculation". These features were not described in the originally filed application. Therefore additionally for these reasons the written description has not been met.

Claims 1-20,22-46,48-51,53,54,56 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claims 1-20,22-46,48-51,53,54,56 rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for a reconfigurable processor that communicates using internal and external protocols, The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to , make and use the invention commensurate in scope with these claims.

Claim 1 (in lines 10-12) contains the language "wherein the functional unit at the at least one reconfigurable processor communications with each other functional unit at the at least one reconfigurable processor independent of external and internal communication protocols" Claim 26 (in lines 10-11) contains the language " wherein communicating said values is both internal and external communication protocol independent" and (in lines 13-14) wherein communicating said updated values is both internal and external communication protocol independent" and claim 54 (in lines 8-9) contains the language "wherein said passing is both internal and external communication protocol independent". The dependent claims 2-20,22-25,27-46,48-51,53 and 56 respectively contain the language in the corresponding independent claim above.

The language detailed above provides for a functioning of the reconfigurable computing system that is independent of the internal and external communication protocols. The Dictionary, of Computers Information Processing & Telecommunications 2nd Edition, on page 496, defines protocol as (1) a specification for the format and relative timing of information exchanged between communicating parties; (2) the set of rules governing the operation of functional units of a communication system that must be followed if communication is to be achieved". The originally filed application does not provide for the operation of the system that would operate in a properly timed way where the data would have properly been communicated between functional units in a format providing proper operation of the system without use of internal and external protocols that the system would require for operation. This is especially true since the system is reconfigurable. The communications requirements would not always be the same so without some type of use of an internal or external protocol there would have had to have been some other means to provided for proper communications. This was not disclosed in the originally filed application. The providing of some means to implement the originally disclosed invention with communications independent of the internal and external protocols would have required undue experimentation. Therefore as claimed the invention is not enabling.

Also, claim 1 contains the language (in line 9) wherein how many functional type of each functional unit is based on the calculation; claim 41 (lines 3-4) contains "functional type of each functional unit is based on a computing algorithm"; claim 56 (lines 2-3) contains "functional type of each functional unit in said subset is based on the

calculation". The originally disclosed invention contains a single type of functional unit (e.g., see fig. 2) arranged in a reconfigurable array. This would required the system to comprises plural types of functional units. Consequently it would have required undue experimentation for one of ordinary skill to incorporate the feature functional type of each functional unit is based on a computing algorithm. Therefore additionally for these reasons the invention as claimed is not enabling.

Claim Rejections - 35 USC § 103

1.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2.   Claims 1-5,15,21,26-31,41,47,52,53,56 are rejected under 35 U.S.C. 103(a) as being unpatentable over DeHon (Patent No. 5,956,518) in view of Khan (US Patent No. 5,274,832).

3.   DeHon taught the invention substantially as claimed including a data processing ("DP") system comprising: defining a calculation for a reconfigurable computing system instantiating the performance of at least two array functional units (101,102)(e.g., see fig. 5 and (e.g., see col. 5,lines 3-56) to perform the calculation.

4.   DeHon taught systolic pipelined operation of the system (e.g., see col. 16, lines 1-64) but did not expressly detail utilizing the array functional units to operate on a subsequent data dimension of the calculation and substantially concurrently using the

second of the array units to operate on a previous data dimension of the calculation.
Khan however taught operating on three dimensions using plural two dimensional
arrays that operate concurrently on respective dimensions and are coupled to together
to produce the three dimensional array (e.g., see col. 4, lines 35-62 and col. 12, lines
15-55).

5.   It would have been obvious to one of ordinary skill in the DP art to combine the
teachings of DeHon and Khan. One of ordinary skill would have been motivated to
incorporate the three dimensional array operation of the Khan reference into the DeHon
system to allow the combined system to be able to perform calculations on more
complicated (three dimensional) problems (e.g., see col. 5, lines 3-11 of DeHon, and
col. 4, lines 54-63 of Khan).

6.   Claim 1,26,54,56 comprises the limitation of reconfigurable computing system
communicates between functional units independent of internal and external
communication protocols. Since the Khan and DeHon system taught systems that did
not use external protocols to communicate between the processors on chip it is would
have been obvious to one of ordinary skill that in the implementation of a system using
the DeHon and Khan teachings that the communication between processors would
have been protocol independent. The limitation of independent of the internal
communication protocols as understood with respect to the originally filed application
provides for the direct communication between functional units. DeHon taught the direct
communication between functional units (e.g., see figs. 1,2,4,5,7) and therefore the
DeHon and Khan system meet the claimed limitation.

7.   Claims 1,41,56 have the limitation of wherein how many functional units and

functional type of each functional unit is based on the calculation (which comprises the

algorithm). As to this limitation Khan taught specific selection of the number of

processing elements (which correspond to claimed functional units) are different

depending on whether the calculation was a two dimensional or three dimensional

calculation (e.g., see col. 5, lines 17-30). As to the type of functional unit being based on

the calculation the system is a special purpose system that uses a specific type of

functional unit namely processing elements that perform systolic array calculations

readily and where connections and transfer of data for performing the calculation is

readily done. Therefore in the implementation of the Khan teachings the type of

functional unit is based on the type of calculations and the algorithm that were to be

performed by the system (e.g., two dimensional algorithm or three dimensional

algorithm) (e.g., see col. 5, lines 32-49).

8.   As to instantiating including establishing a stream communication connection

between functional units (claims 15,41) Khan taught minimizes interconnections of

processing elements and the matrix and vector signal subsets are specifically formed so

that they need to be inputted to only one row and one columns and yet still be properly

processing systolically along all dimensions within the array (e.g., see col. 5, lines 2-48).

Consequently the stream of communication between functional units is established as

the interconnections are made and data is transferred systolically in at least one stream

between processors.

9.   As to the further limitations of claim 26, Khan taught (e.g., see fig. 8) a three

dimensional systolic array with connections between processors in three dimensions

and the selection is done to minimize global interconnections.

10.   As to claim 2-5,27-30 Khan taught the calculation comprising plurality of planes,

and grid points and plural time-steps and vectors (e.g., see fig. 8 and col. 12, lines 15-

55). As per claim 31, the system taught by Khan shows direct connection between the

processing elements in the array and therefore the storing of data to an extrinsic

memory (i.e., outside the array) would have been unnecessary when the transfer of

data between columns was performed (e.g., see fig. 8).

11.   As to the limitations of claims 52 and 53 the reconfigurable systolic processor

would have been able to adapt to the application a therefore would have been an

adaptive processor. As to the processor comprising a microprocessor one of ordinary

skill would have been motivated to implement the systolic processor as described above

as an microprocessor at least to take advantage of the reduced cost and reduced

system size as was well known in the art at the time of the claimed invention.

12.   Claims 19, 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over

DeHon and Khan as applied to claims 1-2,26 above, and further in view of Leeland (US

patent No. 4,872,133).

13.   Leeland taught calculation comprised a financial application modeling using a

spreadsheet application (e.g., see col. 5, lines 3-32).

14.   It would have been obvious to one of ordinary skill in the DP art to combine the

teachings of Leeland and DeHon. Speadsheet applications were well known

applications to be conventionally used for financial processing financial data. One of

ordinary skill would have been motivated to incorporate the Leeland teaching of

financial spreadsheet application for an array processor in order to provide an additional

use for the combined system.

15.   Claim 10-14,16 and 36-40,42,54 rejected under 35 U.S.C. 103(a) as being

unpatentable over DeHon and Khan as applied to claims 1-2,15,26 above, and further in

view of Benner (US Patent No. 5,072,371).

16.   Benner taught the calculation comprising fluid flow calculation and structural

analysis (e.g., see col. 22, lines 35-52).

17.   It would have been obvious to one of ordinary skill in the DP art to combine the

teachings of Benner and DeHon. DeHon taught the configuring the system as a systolic

pipeline (e.g., see col. 16, lines 10-46). One of ordinary skill would have been

motivated to incorporate the Benner teaching of fluid flow and structural analysis

applications for an array processor in order to provide an additional uses for the

combined system.

18.   As to the limitation in claim 54 of performing a calculation unit a variable changed

is value in a system processing a restarting at that value The Benner system taught

systolically performing calculations on fluid flow. Since in such a problem one of

ordinary skill would at times be interested when a change in the data occurred and

adjust the calculation to pin point the calculation around that certain point then one of

ordinary skill would have been motivated to operate the Benner and DeHon and Khan system to process systolically until a change in data occurred and then restart the calculation at the point of the change to better determine the magnitude of the change in data.

19.   Claim 6-9,25,32-35,51 are rejected under 35 U.S.C. 103(a) as being unpatentable over DeHon and Khan as applied to claims 1-2,26 above, and further in view of Helbig (US patent No. 4,962,381).

20.   Helbig taught the application of a systolic processor for radar, medical ultrasound and other imaging applications (e.g., see col. 1, lines 1-5) Clearly this would have also comprised images processed by standard MPEG and JPEG standards.

21.   It would have been obvious to one of ordinary skill in the DP art to combine the teachings of Helbig and DeHon. DeHon taught the configuring the system as a systolic pipeline (e.g., see col. 16, lines 10-46). Therefore one of ordinary skill would have been motivated to incorporate the Helbig teaching of radar, medical ultrasound and other imaging applications for an systolic processor in order to provide an additional uses for the combined system.

22.   As to the limitation of claims 25 and 51, since signal filtering would have been associated with the applications taught by Helbig such as radar then one of ordinary skill would have been motivated to use the Helbig systolic processor in signal filtering applications.

23.   Claim 17,18,22-24,43,44,48-50 are rejected under 35 U.S.C. 103(a) as being

unpatentable over DeHon and Khan as applied to claims 1-2,26 above, and further in

view of Skaletsky (US patent No. 5,784,108).

24.   Skaletsky taught using an systolic processor for processing search algorithm for

image search such as when a best match was to be found and clearly this would have

been applicable to data mining as these are similar applications (e.g., see col. 3, line

13-col. 4, line 57).

25.   It would have been obvious to one of ordinary skill in the DP art to combine the

teachings of Skaletsky and DeHon. . DeHon taught the configuring the system as a

systolic pipeline (e.g., see col. 16, lines 10-46). Therefore one of ordinary skill would

have been motivated to incorporate the Skaletsky teaching of search algorithm

applications for a systolic processor in order to provide an additional uses for the

combined system.

26.   As to the limitations of claims 22-24,48-50 in light of the search algorithm

teaching especially for finding a best match for data then the use of systolic processors

for similar applications such as the genetic pattern matching, protein folding and organic

structure interaction would have been an obvious uses for systolic processors (such as

taught by Skaletsky and DeHon) to one of ordinary skill in the DP art.

27.   Claim 20,46, are rejected under 35 U.S.C. 103(a) as being unpatentable over

DeHon and Khan as applied to claims 1-2,26 above, and further in view of Gai (US

patent No. 6,061,706).

28.   Gai taught use of systolic processors in encryption/decryption applications to

speed the encryption/decryption of public keys (e.g. see col. 1, lines 25-41.

29.   It would have been obvious to one of ordinary skill in the DP art to combine the

teachings of Gai and DeHon. One of ordinary skill would have been motivated to

incorporate the Gai teaching of encryption and decryption applications for an systolic

processor in order to provide an additional uses for the combined system.

Response to Arguments

Applicant's arguments with respect to claims 1-20,22-46,48-51,53,54,56,56 have

been considered but are moot in view of the new ground(s) of rejection.

Conclusion

The prior art made of record and not relied upon is considered pertinent to

applicant's disclosure.

Casselman (patent No. 6,289,440) disclosed a virtual computer of plural FPG's

successively reconfigured in response to a succession of inputs (e.g., see abstract).

Mirsky (patent No. 5,915,123) disclosed a system for controlling configuration

memory contexts (e.g., see abstract).

Pechanek (patent No. 5,640,586) disclosed a scalable parallel group parititioned

diagonal fold tree computing apparatus (e.g., see abstract).

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

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,956,518	09-1999	DeHon et al.	712/15
*	B	US-5,640,586	06-1997	Pechanek et al.	712/13
*	C	US-5,915,123	06-1999	Mirsky et al.	712/16
*	D	US-6,289,440	09-2001	Casselman, Steven	712/227
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Rosenberg, J. M., Dictionary of Computers , Information Processing &Telecommunications, 1984, John Wiley&Sons, 2ed, pp.496
	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.

Index of Claims

√	Rejected	−	(Through numeral) Cancelled	N	Non-Elected
=	Allowed	÷	Restricted	I	Interference

A	Appeal
O	Objected

Application/Control No. 10/285,318

Applicant(s)/Patent under Reexamination HUPPENTHAL ET AL.

Examiner Eric Coleman

Art Unit 2183

Claim Final	Claim Original	Date 8/10/06		Claim Final	Claim Original	Date 8/10/06		Claim Final	Claim Original	Date
	1	√			51	√			101	
	2	√			~~52~~				102	
	3	√			53	√			103	
	4	√			54	√			104	
	5	√			~~55~~				105	
	6	√			56	√			106	
	7	√			57				107	
	8	√			58				108	
	9	√			59				109	
	10	√			60				110	
	11	√			61				111	
	12	√			62				112	
	13	√			63				113	
	14	√			64				114	
	15	√			65				115	
	16	√			66				116	
	17	√			67				117	
	18	√			68				118	
	19	√			69				119	
	20	√			70				120	
	~~21~~				71				121	
	22	√			72				122	
	23	√			73				123	
	24	√			74				124	
	25	√			75				125	
	26	√			76				126	
	27	√			77				127	
	28	√			78				128	
	29	√			79				129	
	30	√			80				130	
	31	√			81				131	
	32	√			82				132	
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	36	√			86				136	
	37	√			87				137	
	38	√			88				138	
	39	√			89				139	
	40	√			90				140	
	41	√			91				141	
	42	√			92				142	
	43	√			93				143	
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	~~47~~				97				147	
	48	√			98				148	
	49	√			99				149	
	50	√			100				150	

U.S. Patent and Trademark Office

Part of Paper No. 20060810

Search Notes	Application/Control No.	Applicant(s)/Patent under Reexamination
	10/285,318	HUPPENTHAL ET AL.
	Examiner	Art Unit
	Eric Coleman	2183

SEARCHED			
Class	Subclass	Date	Examiner
712	15 19 226	8/10/2006	EC

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
Searched East US Pat file US PG PUb file EPO file	8/10/2006	EC

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

U.S. Patent and Trademark Office

Part of Paper No. 20060810

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Hogan & Hartson LLP
Two North Cascade Avenue
Suite 1300
Colorado Springs, CO 80903
+1.719.448.5900 Tel
+1.719.448.5922 Fax

www.hhlaw.com

TELECOPY/FACSIMILE

To:	Company:	Fax Number:	Tel Number:
Eric Coleman	USPTO	571-273-8300	
Eric Coleman	USPTO	571-273-4163	

From:	Mike Martensen	For internal purposes only:	
Date:	October 12, 2006	Client number:	80404.0018
Time:	8:49 am	Attorney billing number:	5457
Total number of pages incl. cover page:	2	Confirmation number:	719-448-5910

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MESSAGE:

Please see attached Interview Request Form for Serial No. 10/285,318.

If you have any questions prior to or after the interview, please do not hesitate to call.

Best regards

Baltimore Beijing Berlin Boulder Brussels Budapest Caracas Colorado Springs Denver Geneva Hong Kong London Los Angeles
Miami Moscow Munich New York Northern Virginia Paris Shanghai Tokyo Warsaw Washington, D.C.

Applicant Initiated Interview Request Form

Application Number: 10/285,318   First Named Applicant: Jon M. Huppenthal et al.
Examiner: Eric Coleman

Art Unit: 2183   Status of Application: Pending

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OCT 1 2 2006

Tentative Participants:
(1) Michael C. Martensen   (2) David Caliga

(3) _____   (4) _____

Proposed Date of Interview: Oct. 12, 2006   **Proposed Time:** 1:30 EST _____ (PM)

Type of Interview Requested:
(1) ☒ Telephonic   (2) ☐ Personal   (3) ☐ Video Conference

Exhibit To Be Shown or Demonstrated: ☐ YES   ☒ NO
If yes, provide brief description: _____

Issues To Be Discussed

Issues (Rej., Obj., etc)	Claims/ Fig. #s	Prior Art	Discussed	Agreed	Not Agreed
(1) Rejection §112	Claims 1, 26, 54,56	§112	☐	☐	☐
(2) Rejection §103	Claims 1, 26, 54,56	DeHon	☐	☐	☐
(3) _____	_____	_____	☐	☐	☐
(4) _____	_____	_____	☐	☐	☐

☐ Continuation Sheet Attached

Brief Description of Arguments to be Presented:
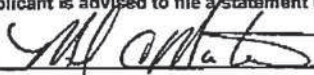
Transformation of applications written to be executed as a series of computations loops, serially, into a level of parallelism not in the original code is not taught by the prior art

An interview was conducted on the above-identified application on _____.

Note:

This form should be completed by applicant and submitted to the examiner in advance of the interview (see MPEP §713.01).

This application will not be delayed from issue because of applicant's failure to submit a written record of this interview. Therefore, applicant is advised to file a statement of the substance of this interview (37 CFR 1.133(b)) as soon as possible.

_____   _____
(Applicant/Applicant's Representative Signature)   (Examiner/SPE Signature)

Michael C. Martensen
Typed/Printed Name of Applicant or Representative

46,901
Registration Number, if applicable

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

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Two North Cascade Avenue
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To:	Company:	Fax Number:	Tel Number:
Examiner Eric Coleman	USPTO	571-273-8300	

From: Michael Martensen

Date: October 23, 2006

Time: 1:02 pm

Total number of pages incl. cover page: 4

For internal purposes only:

Client number: 80404.0018

Attorney billing number: 5457

Confirmation number: 719-448-5910

MESSAGE:

Re: Serial No. 10/285,318

Baltimore Beijing Berlin Boulder Brussels Budapest Caracas Colorado Springs Denver Geneva Hong Kong London Los Angeles
Miami Moscow Munich New York Northern Virginia Paris Shanghai Tokyo Warsaw Washington, D.C.

OCT 2 3 2006

PTOL-413A (09-04)
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Applicant Initiated Interview Request Form

Application Number: 10/285,318
Examiner: Eric Coleman

First Named Applicant: Jon M. Huppenthal et al.
Art Unit: 2183   Status of Application: <u>Pending</u>

Tentative Participants:
(1) <u>Michael C. Martensen</u>

(2) <u>David Caliga</u>

(3) _____

(4) _____

Proposed Date of Interview: __Oct. 12, 2006__

Proposed Time: __1:30 EST__ (PM)

Type of Interview Requested:
(1) ☒ Telephonic   (2) ☐ Personal

(3) ☐ Video Conference

Exhibit To Be Shown or Demonstrated: ☐ YES   ☒ NO
If yes, provide brief description: _____

Issues To Be Discussed

Issues (Rej., Obj., etc)	Claims/ Fig. #s	Prior Art	Discussed	Agreed	Not Agreed
(1) Rejection §112	Claims 1, 26, 54, 56	§112	☐	☐	☐
(2) Rejection §103	Claims 1, 26, 54, 56	DeHon/Khan	☐	☐	☐
(3) _____	_____	_____	☐	☐	☐
(4) _____	_____	_____	☐	☐	☐

☐ Continuation Sheet Attached
Brief Description of Arguments to be Presented:
See Attached

_____

An Interview was conducted on the above-identified application on _____.
Note:
This form should be completed by applicant and submitted to the examiner in advance of the Interview (see MPEP §713.01).
This application will not be delayed from issue because of applicant's failure to submit a written record of this Interview. Therefore, applicant is advised to file a statement of the substance of this Interview (37 CFR 1.133(b)) as soon as possible.

_____
(Applicant/Applicant's Representative Signature)

_____
(Examiner/SPE Signature)

__Michael C. Martensen__
Typed/Printed Name of Applicant or Representative

__46,901__
Registration Number, if applicable

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

U.S. Patent Application No: 10/285,318

Interview: 24 October 2006 @ 1330 Eastern

Proposed Agenda:

Examination of Khan and DeHon with respect the independent claims

Consideration of the proposed amendment to claim 1

1.   (currently amended) 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:

~~defining a calculation at the at least one reconfigurable processor for said reconfigurable computing system;~~

transforming an algorithm into a calculation that is systolically implemented by said reconfigurable computing system at the at least on reconfigurable processor;

instantiating at least two of said functional units at the at least one reconfigurable processor to perform said calculation wherein ~~how many~~ only functional units needed to solve ~~and functional type of each functional unit is based on the~~ calculation are instantiated and wherein each instantiated functional unit at the at least one reconfigurable processor ~~communications~~ interconnects with each other instantiated functional unit at the at least one reconfigurable processor ~~independent of external and internal communication protocols~~ based on reconfigurable routing resources within the at least one reconfigurable processor as established at instantiation, and wherein systolically linked lines of code 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; and

substantially concurrently utilizing a second of said instantiated functional units to operate upon a previous data dimension of said calculation wherein said first of said

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