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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
REQUEST FOR FILING A PROVISIONAL APPLICATION FOR PATENT  
UNDER 37 CFR §1.53 (c)

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TITLE OF THE INVENTION

MULTIPLE PARALLEL DOWNLOAD OF TARGET IMAGE PARCELS  
STREAMED OVER LIMITED AND NARROWBAND COMMUNICATIONS  
CHANNELS

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PATENT TRADEMARK OFFICE

ENCLOSED APPLICATION PARTS (check all that apply)

Specification      No. of pages: 10       Small Entity Statement

Drawings      No. of sheets: 5       Power of Attorney

Declaration       Assignment and Cover Sheet

Other: Return-Receipt Post Card.

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

Provisional Basic Filing Fee: \$ 150.00 (Small Entity: \$75.00)      Filing Fee Amount: \$ 150.00

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This invention was not made by or under contract with a US Government agency.

US Government agency and Contract:

Signature: Gerald B. Rosenberg      Date: December 26, 2000

Gerald B. Rosenberg      Application Docket No: FLVT3003  
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Address To: Box Provisional Application, Assistant Commissioner for Patents, Washington, DC 20231

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1                   MULTIPLE PARALLEL LAYERS OF TARGET IMAGE  
2                   DATA STREAMED OVER LIMITED AND  
3                   NARROWBAND COMMUNICATIONS CHANNELS  
4  
5  
6

7                   Inventors:  
8                   Isaac Levanon  
9                   Yoni Lavi  
10

11  
12                   Background of the Invention  
13

14                   The present invention is generally related to the delivery of high-resolution  
15 highly featured graphic images over limited and narrowband communications  
16 channels.  
17

18                   Summary of the Invention

19                   The objective is to display a two-dimensional pixel map, a 16-Bit RGB color  
20 image in the preferred embodiments, of very large dimensions and permitting the  
21 viewing of the image from a dynamic three-dimensional viewpoint. Multiple such  
22 images are remotely hosted for on-demand selection and transfer to a client  
23 system for viewing.

24                   Images, as stored by the server, may individually range from gigabytes to  
25 multiple terabyte in total size. A correspondingly large server storage and

1 processing system is contemplated. Conversely, client systems are contemplated  
2 to be conventional personal computer systems and, in particular, mobile, cellular,  
3 embedded, and handheld computer systems, such as personal digital assistants  
4 (PDAs) and internet-capable digital phones, with relatively limited to highly  
5 constrained network communications capabilities. For most wireless applications,  
6 conventional narrowband communications links have a bandwidth of less than  
7 approximately three kilobytes of data per second. Consequently, transmittal of  
8 entire images to a client system in reasonable time is infeasible as a practical  
9 matter.

10  
11 Description of the Invention

12 Overview:

13 For purposes of the present invention, each image (Figure 1) is at least  
14 logically defined in terms of multiple grids of image parcels with various levels of  
15 resolutions (Figure 2) that are created through composition of information from  
16 all level of resolutions, and stored by the server to provide an image for transfer  
17 to a client system (Figure 3). Composed and separate static and dynamically  
18 created layers are transferred to client system in parcels in a program selectable  
19 order to optimize for fast quality build-up of the image presented to a user of the  
20 client system, particularly when the parcels are streamed over a narrowband  
21 communication link.

22 The multiple layers of an image allow the selectivity to incorporate  
23 topographical, geographical, orientational, and other terrain and mapping  
24 related information into the image delivered. Other layers, such as geographic  
25 grids, graphical text overlays, and hyperlink selection areas, separately provided

1 or composed, aid in the useful presentation and navigation of the image as  
2 presented by the client system and viewed by the user.

3 Compositing of layers on the server enables the data transfer burden to be  
4 reduced, particularly in analysis of the requirements and capabilities of the client  
5 system and the connecting communications link. Separate transfer of layers to the  
6 client system allows the client system selectivity in managing and presentation of  
7 the data to the user.

8 The system and methods of the present invention are designed to, on  
9 demand, select, process and immediately transfer data parcels to the client  
10 system, which immediately processes and displays a low-detail representation of  
11 the image requested by the client system. The system and methods immediately  
12 continue to select, process and sequentially transfer data parcels that, in turn, are  
13 processed and displayed by the client system to augment the presented image  
14 and thereby provide a continuously improving image to the user.

15 Selection of the sequentially transferred data is, in part, dependent on the  
16 progressive translation of the three-dimensional viewpoint as dynamically  
17 modified on the client system during the transfer process. This achieves the  
18 above-stated objective while concurrently achieving a good rendering quality for  
19 continuous fly-over of the image as fast as possible, yet continuously building the  
20 image quality to the highest resolution of the image as stored by the server.

21 To optimize image quality build-up over limited and narrowband  
22 communication links, the target image, as requested by the client system, is  
23 represented by multiple grids of 64x64 image pixels (Figure 4) with each grid  
24 having some corresponding level of detail. That is, each grid is treated as a  
25 sparse data array that can be progressively revised to increase the resolution of

1 the grid and thereby the level of detail presented by the grid. The reason for  
2 choosing the 64x64 pixel dimension is that, using current image compression  
3 algorithms, a 16-bit 64x64 pixel array image can be presented as a 2KByte data  
4 parcel. In turn, this 2KByte parcel is the optimal size, subject to conventional  
5 protocol and overhead requirements, to be transmitted through a 3KByte per  
6 second narrowband transmission channel. Using a smaller image array, such as  
7 32x32, would create a 0.5KByte parcel, hence causing inefficiencies due to packet  
8 transmission overhead, given the nature of current wireless communications  
9 protocols.

10 Image array dimensions are preferably powers of two so that they can be  
11 used in texture mapping efficiently. Each parcel, as received by the client system,  
12 is preferably immediately processed and incorporated into the presented image.  
13 To do so efficiently, according to the present invention, each data parcel is  
14 independently processable by the client system, which is enabled by the selection  
15 and server-side processing used to prepare a parcel for transmission. In addition,  
16 each data parcel is sized appropriate to fit within the level-1 cache, or equivalent,  
17 of the client system processor, thereby enable the data processing intensive  
18 operations needed to process the data parcel to be performed without extended  
19 memory access delays. In the preferred embodiment of the present invention,  
20 data parcels are also processed for texture mapping and other image features,  
21 such as topographical detailing.

22 Currently, with regard to conventional client systems, a larger image array,  
23 such as 128x128, is too large to be fully placed within the level-1 cache of many  
24 of the smaller conventional current processors, such as used by personal digital

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