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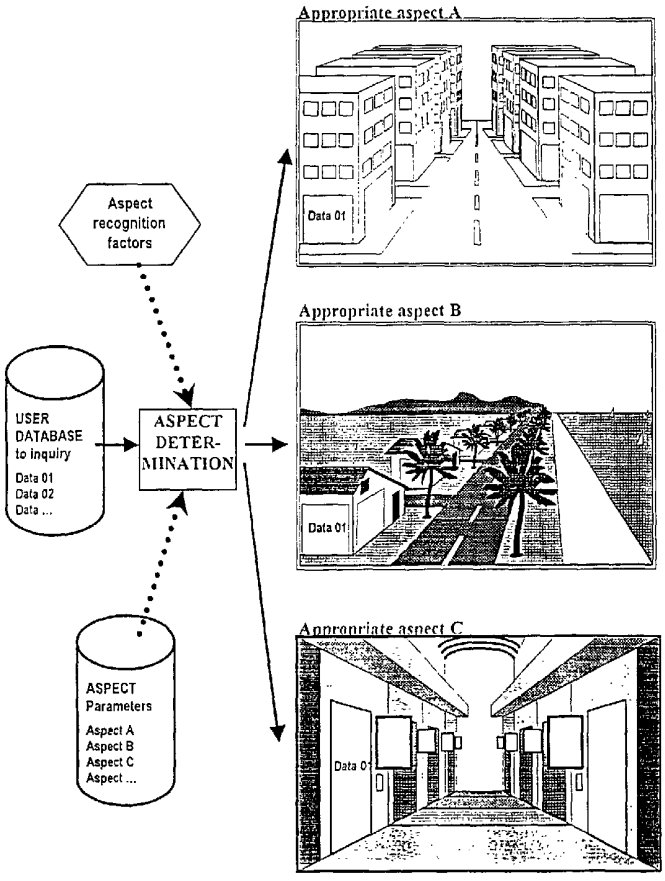
(54) Title: 3D VIRTUAL LANDSCAPE DATABASE



(57) Abstract: The result of a data retrieval request performed by a user is usually presented as rows and columns of text and numbers. The user needs to read the data in order to understand the result. The invented method allows presenting the result of a data retrieval request, by transforming the lists of data produced by the inquiry in an animated and controllable (from the user) three-dimensional image of a simulated virtual landscape. This method ensures a visual immediate understanding of the result (look instead read) and an easier and more natural data-handling manner (movement instead scroll). The aspect of this 3D virtual space is constructed in such a manner that the user feels the relation between his formulated inquiry and the resulting 3D space. The customization of the 3D landscape aspect happens by appropriately interpreting the type of the selected data, the selection criteria, the data contain and the characteristics of user itself. An equivalent virtual movement in the virtual space corresponding to the data translates any form of scroll necessary to the user to explore the selected data. The method consequently allows the user to visually recognize the contain of his data retrieval request, ensuring the understanding by feeling without reading. The method is applied in the implementation of software that allows translating the results of a data inquiry in the displaying of the mentioned 3d virtual landscape.

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3D VIRTUAL LANDSCAPE DATABASE

TECHNICAL FIELD

The present invention concerns generally the graphical display of data and the handling of the displayed data. In particular the display of data happens under the form of a three-dimensional animated landscape where the data are presented as recognizable three-dimensional objects. The handling with the displayed data happens by interacting with the 3D landscape.

BACKGROUND ART

Three-dimensional data visualization and three-dimensional animation of virtual landscapes are commonly available in charting tools for numeric data presentation, in virtual reality simulators or in three-dimensional landscapes generators for design tools or video/computer games.

The actual use of the display techniques for three-dimensional virtual landscapes could be subdivided in two categories:

A. Presentation of numeric data inquiries

B. Simulation of virtual reality in controllable 3D spaces

A. The presentation of numeric data inquiry:

An inquiry performed by a user in a data retrieval system produces usually a result consisting in rows and columns of text and numbers (like in Figure 2a). The exploration of this result consists in the scrolling of these rows of data and in the construction of aggregations of these data.

The meaning, the context, the quality and in general all the characteristics of the data resulted from the inquiry must be deducted from the user, by reading the data contain.

To increase the comprehension of numeric data, an existing approach is data visualization, like two-dimensional plots into an x-y coordinate system. Furthermore, the same principle of data visualization is applied to map data into a 3D space.

Many attempts for the increasing of the comprehension of related data were:

- Data visualization through 3D mapping in CAM Tree development by Xerox PARC, described by M. Clarkson in "An Easier Interface", Byte Magazine (Feb 1991) ...
- Visualization techniques as described in "The Ultimate User Interface" by Bob Jacobson, Byte Magazine (Apr. 1992)

In these and other similar cases, the presentation do not transform the data in virtual, leaving objects, but intended to create graphical effect to emphasize the quantitative meaning of data and the relationships between data. In these cases the user knows the data, but the resulting presentation ensures a 3D view of the data, without transformation of the data in animated components of a controllable 3D landscape ensuring a virtual reality effect and without translation of data handling functions in movement in the x,y,z space components or in the time component.

B. Simulation of virtual reality in controllable 3D spaces:

In these cases the purpose is to ensure to the user an immersion in a three-dimensional animated virtual space and to provide to the user navigation functions allowing the exploration of the 3D virtual space itself and the most real reproduction of the effects of movement and views through a 3D space.

Today's computer technology allows creating virtual animated three-dimensional worlds easily. Computer games distributed on large scale show amazing examples of this technology.

Following examples are a few cases between a huge numbers of commercial applications of 3D space simulation, sold on large scale:

- The game "Tomb Raider" of 3DO, available in any electronic game-shop for play-stations or personal computers, is one of the most famous and significant examples of navigation in a virtual 3D space.
- Different types of flight simulators ensure perfectly the virtual reality effect of the movement in the x,y,z coordinates.

In these and other similar cases, the user does not know the data behind the 3D space. The "topology data" have only a mapping purpose and are necessary to define the 3D virtual

space. The virtual topology is the data itself and do not correspond to data known by a user and directly queried and handled by the user.

Animations and movement in these virtual spaces are only means to obtain virtual reality effect and are not corresponding to data handling functions performed by a user.

Furthermore, the development of Internet allows the distribution of any kind of services, in particular the e-commerce, into consumer's houses, by using standard communication technologies.

Computer inquiries for any kind of information are consequently performed from an always larger and growing population. These users do not possess specific knowledge of data structures and computer functions.

There is consequently a need for a method allowing to present data resulting from an inquiry in the most comprehensible manner, where the user do not need to read text to completely understand the received answer, but only need to look at a three-dimensional animated landscape containing the complete answer in graphical form.

This is a need to present known data selected by an user under the form of a virtual world simulating a form appropriate to the signification of the data selected type and presenting these data like virtual objects with a simulated real form also appropriated to the data contains. Figure 2b shows how the same data selected as in Figure 2a could be presented in order to ensure a visual immediate understanding of the result (look instead read) and an easier and more natural handling manner (movement instead scroll).

This is also a need to ensure to the user, who performed a data inquiry, the feeling of the meaning of the requested data through the nearest to reality appearance of the selected objects. An example: Query on an animal database. The user performs the request for African carnivore animals: the conventional data answer is a list of rows containing animal name and some characteristics of each animal. An answer visually comprehensible to the user is a Savanna 3D landscape containing figures of the selected animals, with navigation facilities allowing the scrolling into the animal list, by exploring the landscape.

DISCLOSURE OF THE INVENTION

The invention concerns a method for displaying and handling data resulting from an inquiry performed from an user, by transforming the lists of data (produced by the inquiry) in a controllable (by the user) and animated image of a simulated virtual three-dimensional space.
The handling of the selected data happens by interacting with the 3D virtual landscape: exploring, scrolling, selecting of the data are translated to correspondent movement in the 3D virtual landscape.
Figure 2b shows how the same data selected as in Figure 2a could be presented in order to ensure a visual immediate understanding of the result of the data selected and an easier and more natural handling manner.
Each data selected corresponds to an object (in this case a building) in the virtual landscape. Record 001 becomes the first building, record 002 becomes the next building etc. Scroll of the data happens by walking forward in the road.
The data belonging to a record are presented inside the object representing the record (in this case in the windows of the building).

The method allows to synthesize the 3D image of the virtual space by using the characteristics and the selected data contain, in such a manner that the user feels the relation between his formulated inquiry and the resulting 3D space.

The method allows presenting the results of an inquiry performed by a user of any kind of data, which meaning is understandable by the user, under the form of the mentioned 3D animated virtual landscape.
Any form of scroll necessary to the user for the exploration of the selected data is translated to an equivalent virtual movement in the virtual space corresponding to the data.
Figure 4 shows the effect of a scroll command translated to the movement along a road. The starting image contains in the foreground the virtual object corresponding to the first data row selected. Forward movement allows bringing in the foreground the object corresponding to the second data row, where also the following objects become nearer.
The aspect of the virtual space and of the object presented in the space are customized depending on characteristics of user, type of data, selection criteria and data contain.

Figure 1 shows three different aspects presented for the same data selected. This different presentation happens while at least one of the parameters influencing the aspect was different.

The method allows displaying different 3D landscapes in order to help the user to visually recognize the contain of his request.

The application of this method consequently allows to a user a dialog with a database by using natural movement and exploration functions of a 3D virtual world.

Following example illustrates the method applied on the search of product in a shop/product information retrieval system:

A user performs an inquiry searching all shops selling fish and located in a given country.

The user knows the data he wants to receive: a list of shops meeting the requested criteria.

Each shop possesses conventional data like the name, the logo, the owner, the address, a photo, an offer of a day etc.

Instead to receive a written list, the user receives the three-dimensional image of a virtual seashore road where are lying small houses with doors, panels, windows etc.

The trees along the seashore road are palms (because the selected country is tropical); the panels of the shops have the form of a fish (because the product selected is fish).

Each small house represents a single shop. The main panel contains the logo of the shop, the small panel contains the name of the owner, the front window contains the photo of the shop, on the door are written the opening hours.

The scroll of the selected data (list of shops) happens through a simulation of movement along the seashore road.

Moreover, if the user requires looking the list of the product offered by the shop, also the result of this request is handled in the similar way. In this case the data inquiry of the user looks like "select all the products sold by a given shop". In the 3D animated translation of this new request, the user enters the door of the shop and the virtual simulation presents a shop inside where are lying baskets. Each basket contains the photo of the sold fish, with a panel with a name and another panel with the price.

The scroll of the selected data (list of sold fishes) happens through a simulation of movement along the aligned basket.

A further example:

The user performs a query on an Internet site searching for sailboats to rent during the month of March on Mediterranean Sea.

The conventional data answer is a list of rows containing sailboats and some other data of each boat like price, dimension or price.

The answer visually comprehensible to the user is, provided by applying the invented method is a 3D landscape of a harbor with blue water (because the selected location was Mediterranean) containing figures of the selected boats, anchored to the piers.

The houses around the harbor are white and blue (because the available boats are only in Greece) and the sky contains clouds, because the weather in Greece during the month of March is rainy. The boat's name is written on the boat, like in reality, on the pier before each boat stays a panel containing price and other data. To look this data the user needs to move near to the panel. To look the other boats selected, the user requires "walking" along the pier to the next boat.

The visit inside a selected boat helps to better understand the difference between usual 3D view and the application of the invented method.

In a usual view, the visit inside the boat could be a picture or a film activated by moving into the boat. In this case the inside view is only an attribute of the boat's database and isn't resulting from the application of the present method.

However, if boat's inside characteristics, the furniture and the equipment of the boat belong to a database accessed with the invented method, the inside's visit results from the query of the inside data of the boat. If the boat contains three bed-rooms, a dining room, a kitchen and a toilet, the inside visits happens by moving (scrolling) through the available rooms, where the aspect is constructed applying other boat's characteristics. Room's dimensions and walls furniture are presented depending on boats parameters.

The similitude degree with reality could be different, going from a complete similitude of reality, through a cartoon scenario, until the reproduction of a totally alien virtual landscape. The aspect of the 3D virtual landscape is only a detail provided by the presentation parameters and generated by the specific aspect resolution modules developed for the application of this method.

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 shows how the same data could be presented under different aspects of the three-dimensional virtual landscape, depending on external factors like user characteristics, selected data, selection criteria, data contain.

Fig. 2a shows the conventional approach to presents data: data collections are presented as columns and rows of numbers and text.

Fig. 2b shows how a data collection could be transformed in a 3D virtual landscape presenting the roads of a town.

Fig. 3 shows the effect of the aspect parameter table on two types of data ("cub" and "cyl") in the customized aspect construction of the 3D virtual world

Fig. 4 shows the translation of data handling functions translated in movement functions applied on the virtual 3d landscape corresponding to the selected data

Fig. 5 shows the flow diagram of the landscape generation process containing the three main logical steps necessaries to translate the selected data to their three-dimensional equivalent image

Fig. 5.a shows the flow diagram of the first step of the landscape generation process dedicated to receiving and resolving user inquiry of data

Fig. 5.b shows the flow diagram of the second step of the landscape generation process dedicated to the construction of the appropriate virtual aspect

Fig. 5.c shows the flow diagram of the third step of the landscape generation process dedicated to the displaying of 3D virtual landscape

Fig. 6 shows the general functional architecture of a software solution applying the invented method

Fig. 7 shows the architecture of a software solution applying the invented method with the most appropriate splitting of functions between Client and Server. This could be the case of Internet applications.

Fig. 8 shows different possible forms of aspect parameters tables, allowing different levels of aspect determination resolution or display capability

BEST MODE FOR CARRYING OUT THE INVENTION

The following description is presented solely for the purpose of disclosing how the present invention may be made and used. The scope of the invention is defined by the claims.

The best mode to carry out the Invention is to develop any form of software able to synthesize the 3D image of the virtual space by using the characteristics and the contain of the selected data, in such a manner that the user feels the relation between his formulated inquiry and the resulting 3D space.

The software form, the programming language, the operating system, the standard user interface, the development technique and tools of this computer programs aren't important because the invented method concerns only the form of dialog between a user and a database: The user formulates an inquiry and the software (developed applying the invention) translates the list of data resulted from the inquiry in an animated and controllable 3D image of a simulated virtual space. The user needs any form of scroll in the data resulted from the inquiry and the software performs an appropriate movement in the 3D space.

Software is rapidly obsolete, must continuously be maintained and must frequently be rewritten. Consequently the object of present application is the method of data display and handling and not software. Examples of program code contained hereby have only the purpose to show possible embodiments of single components in a software solution applying the invented method.

The logical process of the software functions necessaries to generate the image of a 3D landscape is described in the main flow diagram of Figure 5 The three step of figure 5 are break down in Figures 5a, 5b and 5c.

After the resolution of the data inquiry (step 1), all elements are available to determine the aspect parameters for the construction of the virtual landscape. Figure 5a shows the steps necessaries to collect all the aspect recognition factors.

The construction of the virtual aspect parameters (step 2) happens by using the following aspect determination function:

aspect = f (user characteristics, selected data, selection criteria, data contain)

The aspects parameters contain all the logical and graphical information necessary to customize a virtual landscape. Figure 3 shows an example of aspect parameters database and the relative effect on the presentation of two different types of data (type CUB and type CYL), by customizing two aspect components (object form and object color).

The aspect construction happens by generating a two-dimensional logical map by locating each selected row of data as a single object in the x,y coordinate system. The aspect parameters provide, for example, the relative dimension of the x,y projection of a single virtual object in order to fit them contiguously in the 2D virtual map.

Other parameters provides information of the manner to populate the x,y map, the relative distance between the objects, the presence of fixed position dedicated to general virtual components or the populating sequence method.

In the visual examples of figure 1, the selected data could be shops. The x,y projection of the corresponding objects in the 2D landscape could be a square for all aspect A, B and C.

The aspect parameter concerning relative distance of the objects could be zero in aspect C (total contiguity) and higher for aspect A and B (separating roads).

The population parameter of aspect B does not allow populating in the positive x coordinate (space reserved to the sea). Moreover, the parameter table contains coordinates of fixed object belonging to aspect B, which indicate the location of sails on the sea.

The display function (step 3 of figure 5 which is break down in figure 5c) transforms the 2D map in a three-dimensional view by using other parameters like z coordinate of point of view, high of the objects, backgrounds etc.

Forms, colors, appearance, textures are other aspect parameters belonging to the three scenarios. The customization of the single objects happens in the same manner.

The detail and the graphical capability of a software solution applying the invented method depends on the construction and on the aspect parameter tables contain.

The aspect customization capability and the adaptability of a software solution depend from the granularity of the aspect parameter tables. Figure 8 illustrate examples of different aspect parameter tables pragmatically constructed on the level of implementation desired for the aspect determination function which allows as maximum level:

aspect = f (user characteristics, selected data type, selection criteria, data contain)

In the same manner as the aspect determination resolution, the construction of the aspect parameter table allows more or less reality in the 3D landscape display.

The computation of the three-dimensional topology happens with conventional mathematical functions. Animation and movement happen in the same manner. Following example of software embodiment is a single small component dedicated to the topology animation. It translates the scroll effect in one of the available movements (turn left in this example):

```
public void paint(Graphics g) {
    int j;
    float ciclo;
     if ((destra == 0) && (sinistra==0) && (avanti==0)) {
        g.setColor(new Color(255, 255, 255));
        g.fillRect(1, 1, larg, iX(f1y));
        g.setColor(new Color(190, 190, 190));
        g.fillRect(1, iX(f1y), larg, 450);
        cubi1(g);
        cubi2(g);
     }
//   for (j = 1; j < 15 ; j++)  {
//     double ran = Math.random();
//     if (ran < 0.33) {
//      avanti = 1;
//      }
//      else {
//      if (ran < 0.63) {
//       destra = 1;
//      }
//       else {
//        sinistra = 1;
//       }
//      }
//  a sinistra
     if (sinistra == 1) {
     for (i = 1; i < ((dist/2) + 1) ; i++)  {
      p11x = p11x + 2;
      q11x = q11x + 2;
```

```
f1x = f1x + 4;
f2x = f2x + 4;
f3x = f3x + 4;
if (q11x >= larg) {
    g.setColor(new Color(255, 255, 255));
    g.fillRect(iX(f2x), 1, larg, iX(f1y));
    g.setColor(new Color(190, 190, 190));
    g.fillRect(iX(f2x), iX(f1y), larg, 450);
}
if (q11x > larg) {
  q11x = p11x;
  p11x = q11x - dist;
  f2x = f1x;
  f1x = f2x - dist - dist;
  f3x = f2x + dist + dist;
}
if (f2x < 0) {
}
else {
  cubi1(g);
  axpt1 = v3x;
}
if (f2x > larg) {
}
else {
  cubi2(g);
  axpt2 = v3x;
}
g.setColor(new Color(190, 190, 190));
axpt2 = axpt2 - axpt1;
g.fillRect(iX(axpt1), iX(f1y), iX(axpt2), iX(fh+fh));
}
}
```

Figure 6 shows a possible functional structure with the relationship between database and software components of a stand-alone implementation of the present display method.

Figure 7 shows a possible splitting of this functions between a client and a server how could be implemented in a typical Internet solution.

While examples of preferred embodiments have been shown, the above description intends to be exemplary of the manner to apply the invented method and is not intended to limit the scope of the claimed invention.

INDUSTRIAL APPLICABILITY

The primary commercial application of this method is software able to synthesize Virtual Shopping Centers for the e-commerce in Internet.

A data collection corresponding to a shopping center is a list of shops with the same real or virtual location.

The Virtual Shopping Center is an animated, visit able and controllable 3D image of a simulated virtual space resulted from the inquiry of all online shops belonging to the same virtual location (transformation of list of data into 3D image). The scroll of the list of selected shops is transformed into a movement trough the animated 3D image of the shopping center. Any user action is transformed in correspondent movement in the 3D virtual world.

For example, select a shop is translated in the movement to open and to enter the door of the shop. The inquiry of the list of products sold by the shop is translated in the internal visit inside the virtual shop, where the virtual image of each product is aligned and presented in virtual cases.

The customized aspect of the 3D landscape presenting the inquiry results is generated depending on characteristics of user, type of data, selection criteria and data contain.

Figure 1 illustrates how the same results of data inquiries (select shops performed by user A) could be presented differently (user B or user C) in order to ensure different views for different users.

Under the strict application of the invented method, an inquiry in a database containing shops grouped on multiple different shopping centers could be presented differently for each

shopping center (select shops where center=X). In the same manner, also the inquiry in a database containing products sold by multiple different shops allows to present differently the interior of each shop (select products where shop = Y).

In the first case (shopping center), the aspect parameter table would contain parameters bound to the type of data (shop) and the selection criteria (center=X) for the aspect customization of the 3D landscape representing the virtual shopping center X.

In the second case (shop), the aspect parameter table would contain parameters bound to the type of data (product) and the selection criteria (shop=Y) for the aspect customization of the 3D landscape representing the virtual inside of shop Y.

For further example, the search of products of a given category is translated into the presentation of a filtered view of the 3D shopping center inside, presenting only shops selling products compatible with the user criteria. The filtering process itself produces changing in the 3D landscape aspect of the center and in the single object presentation (shops).

Other sector of applicability could be software for didactic purposes. The easiest 3D presentation of data allows creating query tools for children allowing presenting data under the form of the mentioned 3D virtual space.

While examples of industrial applicability have been shown, the above description intends to be exemplary of the use of the invention and is not intended to limit the scope of the claimed invention.

CLAIMS

What is claimed is:

1. A presentation method to create the image of a virtual three-dimensional landscape as figurative translation for the result of a data inquiry performed by a user, where each data item selected is inserted in the landscape as a virtual entity, by ensuring formal and topological coherence.

2. A method to present lists of objects or data, selected by a user from any form of information retrieval system, under the form of the mentioned three-dimensional virtual landscape.
   The resulting image contains the selected objects or data locating them in a three-dimensional virtual landscape where
   - The general presentation and the orientation of the landscape is understandable by the user
   - The form, the characteristics and the orientation of the landscape are adapted to the user characteristics, to the selected data type, to the criteria and to the selected data contain.
   - The view contains at least one of the selected objects and the form chosen for the visual presentation of the selected object is conceptually or topologically coherent with the landscape form.

3. A method to present a virtual landscape as figurative translation of a data inquiry as claimed in the previous claim, where the landscape aspect determination happens by using following function
   aspect = f (user characteristics, selected data type, selection criteria, data contain)

4. A computer implemented method as described in the previous claim, to present lists of objects or data, selected by an user from a database or a from a data collection or from a catalogue or from any form of information retrieval system, under the form of a 3D virtual landscape in a display view on a graphic display or any other display device.

The resulting display view displays the selected objects or data locating them in a three-dimensional virtual landscape where

- The general presentation and the orientation of the landscape is understandable by the user
- The form, the characteristics and the orientation of the landscape are adapted to the user characteristics, to the selected data type, to the criteria and to the selected data contain.
- The view contains at least one of the selected objects and the form chosen for the visual presentation of the selected object is conceptually or topologically coherent with the landscape form.
- The landscape view allows an immediate understanding of the manner to scroll the selected object, by performing the scrolling under the form of virtual movement in the three dimensions of the presented virtual landscape.

5. A computer implemented method to present a virtual landscape as figurative translation of data inquiries as claimed in the previous claim, where the landscape aspect determination happens by performing following function

aspect = f (user characteristics, selected data type, selection criteria, data contain)

6. A computer implemented method to present a virtual 3D landscape as claimed in the previous claims, where the data-handling functions are translated to logically equivalent movement functions in the 3D landscape populated by logically equivalent object corresponding to the selected data.

7. A computer implemented method to present a virtual 3D landscape as claimed in the previous claims, where are available to the user the commands to perform movement in the three dimensions x, y and z axis and to perform an equivalent form of movement in the time component t.

8. A computer implemented method to present a virtual 3D landscape as claimed in claim 4, where the display apparatus is any device connected to the World Wide Web and the objects selected by the user are online shops ore stores and the appearance of the

landscape is a virtual shopping center or a mall or a town or any form of environment where the common sense allows to present shops.

9. A computer implemented method to present a virtual 3D landscape as claimed in claim 4, where the display apparatus is any device connected to the World Wide Web and the objects selected by the user are products, goods, services which are sold online and the appearance of the landscape is a virtual shop or store or mall or a marketplace or any form of environment where are presented goods and products to be sold.

10. A computer implemented method to present a virtual landscape as claimed in claim 5, where the display apparatus belong to any form of software application providing services for the electronic commerce by presenting the conventional data of malls, shopping centers, marts, shops, stores, products, goods, prices and any other data necessary to the online sales process under the form of a 3D virtual landscape.

11. A computer implemented method to present a virtual landscape as figurative translation of data inquiries as claimed in the previous claims, where the data inquiry happens on a server which also constructs the parameters necessaries to recognize the aspect of the virtual landscape, by performing an aspect determination like in following function

aspect = f (user characteristics, selected data, selection criteria, data contain)

and the graphical construction and the display of the three- dimensional virtual landscape happens on a client on the basis of the data and the aspect parameters received via a any form of communication line.

12. A computer implemented method to present a virtual 3D landscape as claimed in the previous claims, where the aspect determination function applies any form of sub-function or simpler reduction of the function

aspect = f (user characteristics, selected data, selection criteria, data contain)

using the same parameters or a reduced set of parameters or a fixed rule.

13. A computer implemented method to present a virtual 3D landscape as claimed in the previous claims, where the display is any form of device of graphical interface and the objects selected belong to any form of database directly accessible to a user

FIGURE 1

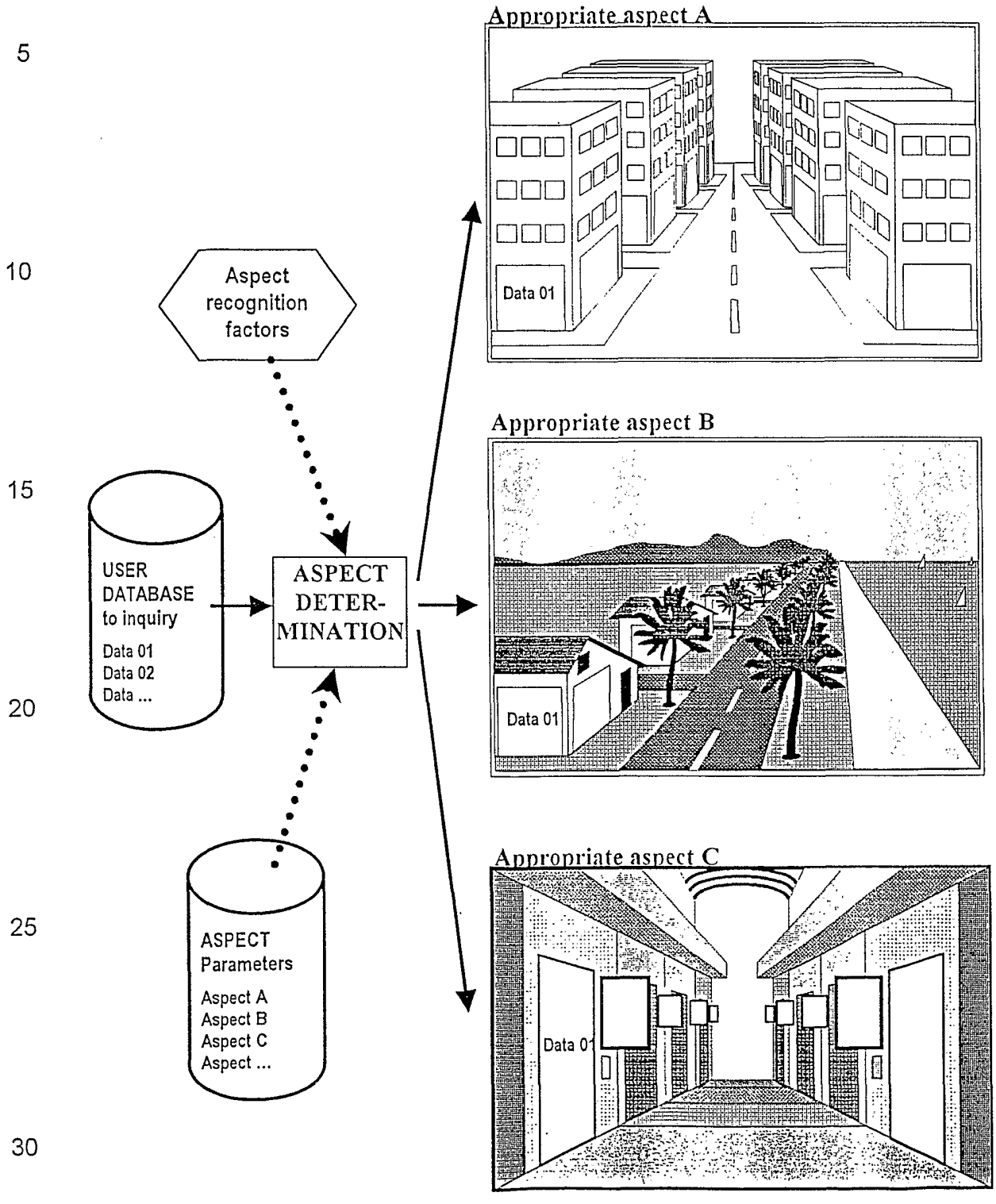
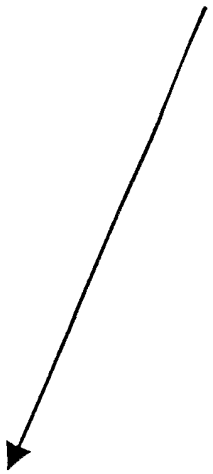

Appropriate aspect A
Data 01
Aspect recognition factors
Appropriate aspect B
Data 01
USER DATABASE to inquiry
Data 01
Data 02
Data ...
ASPECT DETER-MINATION
Appropriate aspect C
Data 01
ASPECT Parameters
Aspect A
Aspect B
Aspect C
Aspect ...

FIGURE 2a

Selected Datasets

Id.	Field 1	Field 2	...	Field N
001	A	Aa		aaa
002	B	bb		bbb
003	C	cc		ccc
004	D	dd		ddd
999	Z	zz		zzz



Usual data display device

Identification	First field	Second field	Last field
001	A	aa	aaa
002	B	bb	bbb
003	C	cc	ccc
004	D	dd	ddd

PF08 next page

FIGURE 2b

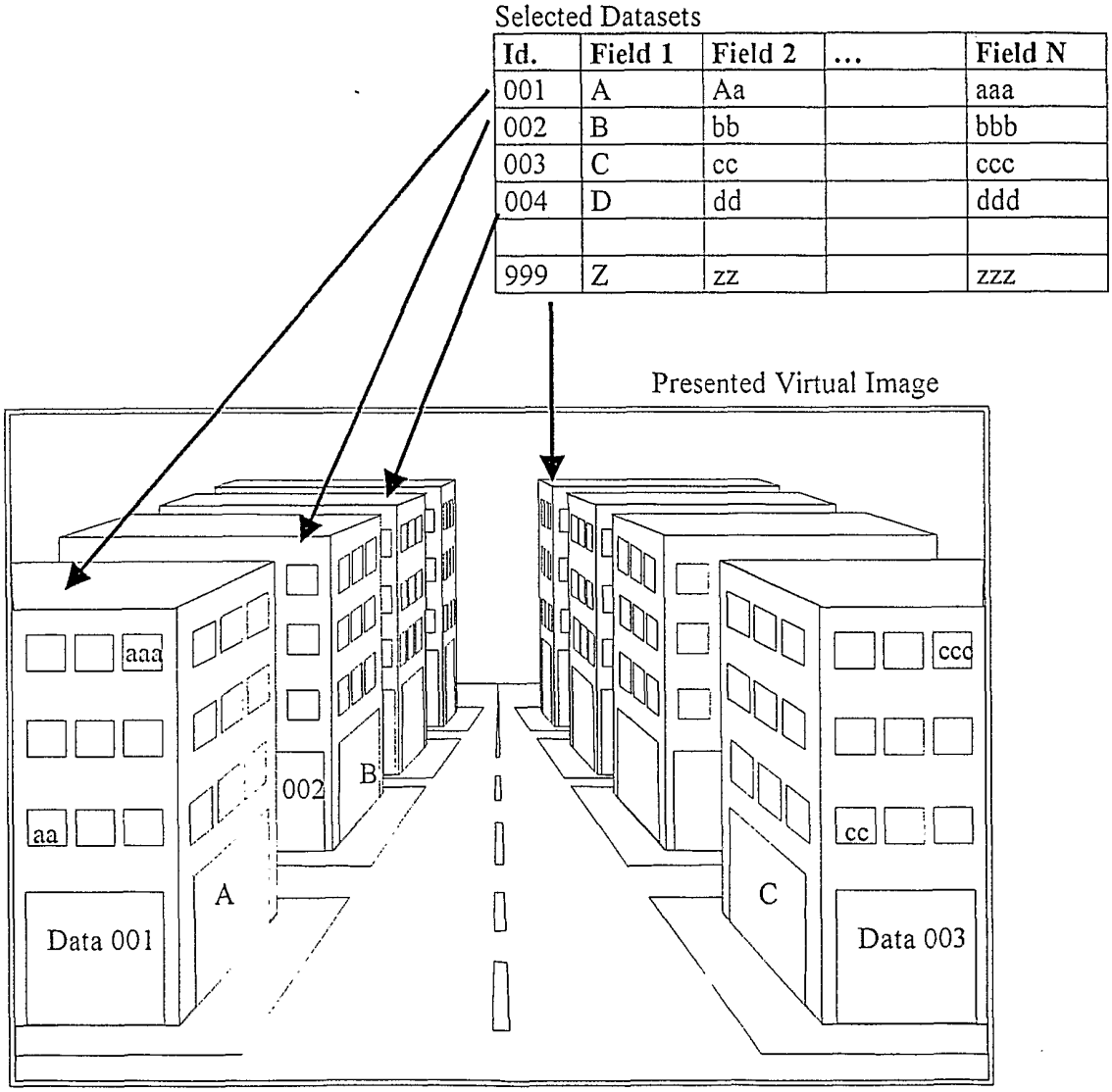

Selected Datasets
Id. | Field 1 | Field 2 | ... | Field N
001 | A | Aa | | aaa
002 | B | bb | | bbb
003 | C | cc | | ccc
004 | D | dd | | ddd
999 | Z | zz | | zzz
Presented Virtual Image
aaa
aa
002
B
A
Data 001
ccc
cc
C
Data 003

FIGURE 3

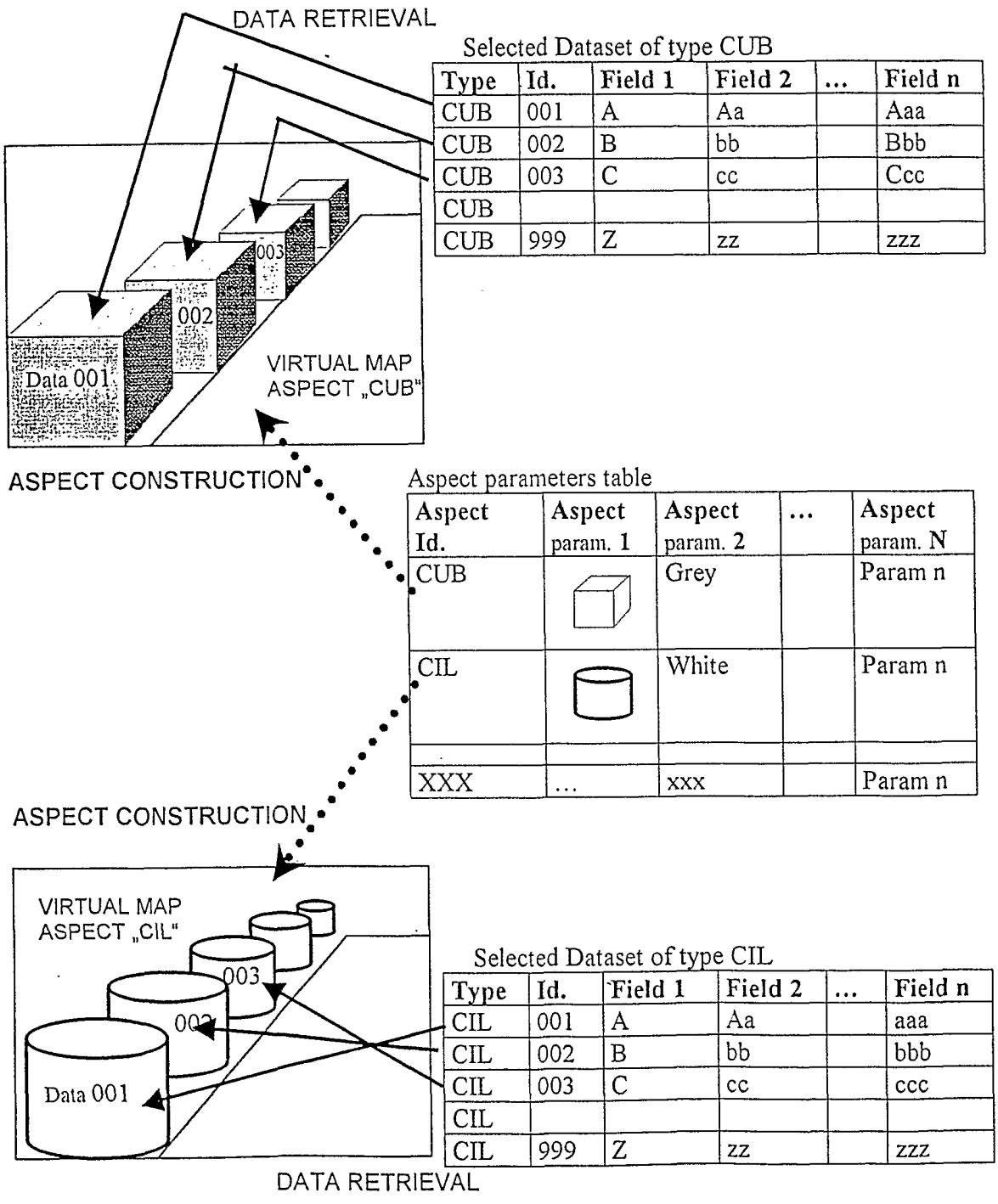
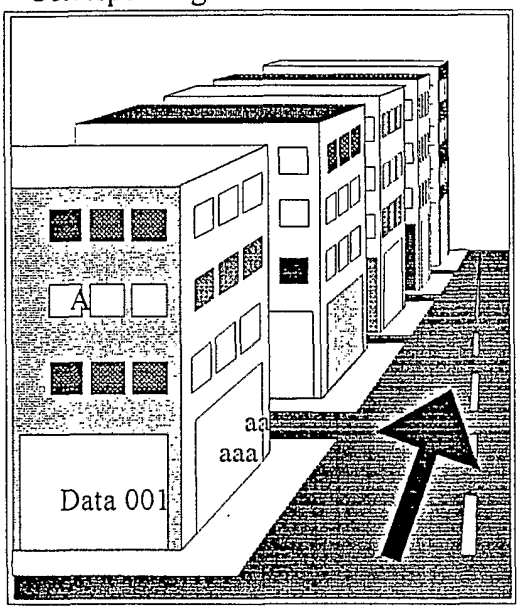

DATA RETRIEVAL
Selected Dataset of type CUB
Type | Id. | Field 1 | Field 2 | ... | Field n
CUB | 001 | A | Aa | | Aaa
CUB | 002 | B | bb | | Bbb
CUB | 003 | C | cc | | Ccc
CUB | | | | | |
CUB | 999 | Z | zz | | zzz
003
002
Data 001
VIRTUAL MAP
ASPECT „CUB"
ASPECT CONSTRUCTION
Aspect parameters table
Aspect Id. | Aspect param. 1 | Aspect param. 2 | ... | Aspect param. N
CUB | | Grey | | Param n
CIL | | White | | Param n
XXX | ... | xxx | | Param n
ASPECT CONSTRUCTION
VIRTUAL MAP
ASPECT „CIL"
003
002
Data 001
Selected Dataset of type CIL
Type | Id. | Field 1 | Field 2 | ... | Field n
CIL | 001 | A | Aa | | aaa
CIL | 002 | B | bb | | bbb
CIL | 003 | C | cc | | ccc
CIL | | | | | |
CIL | 999 | Z | zz | | zzz
DATA RETRIEVAL

FIGURE 4

Current data position

Id.	Field 1	Field 2	...	Field N
001	A	aa		aaa
002	B	bb		bbb
003	C	cc		ccc
004	D	dd		ddd
999	Z	zz		zzz

Corresponding virtual location



VIRTUAL SCROLL = MOVEMENT

Following data position

Id.	Field 1	Field 2	...	Field N
001	A	aa		aaa
002	B	bb		bbb
003	C	cc		ccc
004	D	dd		ddd
999	Z	zz		zzz

Following virtual location

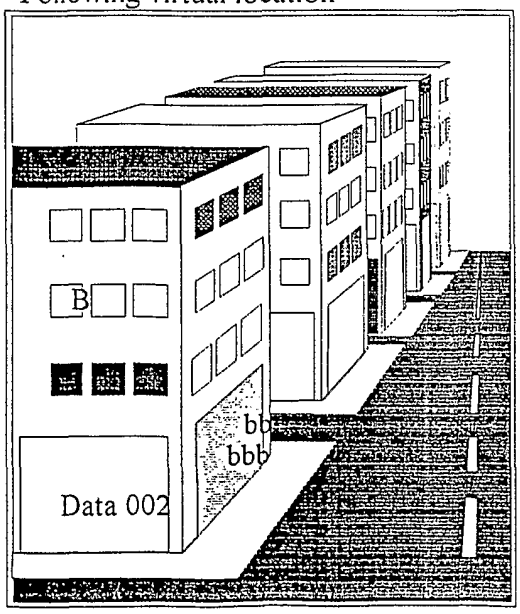


FIGURE 5

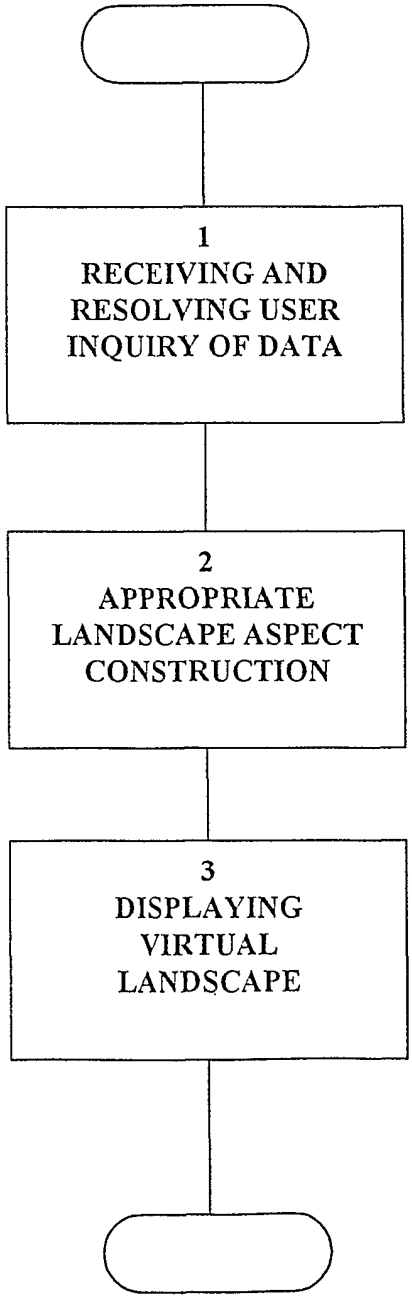

1
RECEIVING AND RESOLVING USER INQUIRY OF DATA
2
APPROPRIATE LANDSCAPE ASPECT CONSTRUCTION
3
DISPLAYING VIRTUAL LANDSCAPE

FIGURE 5a

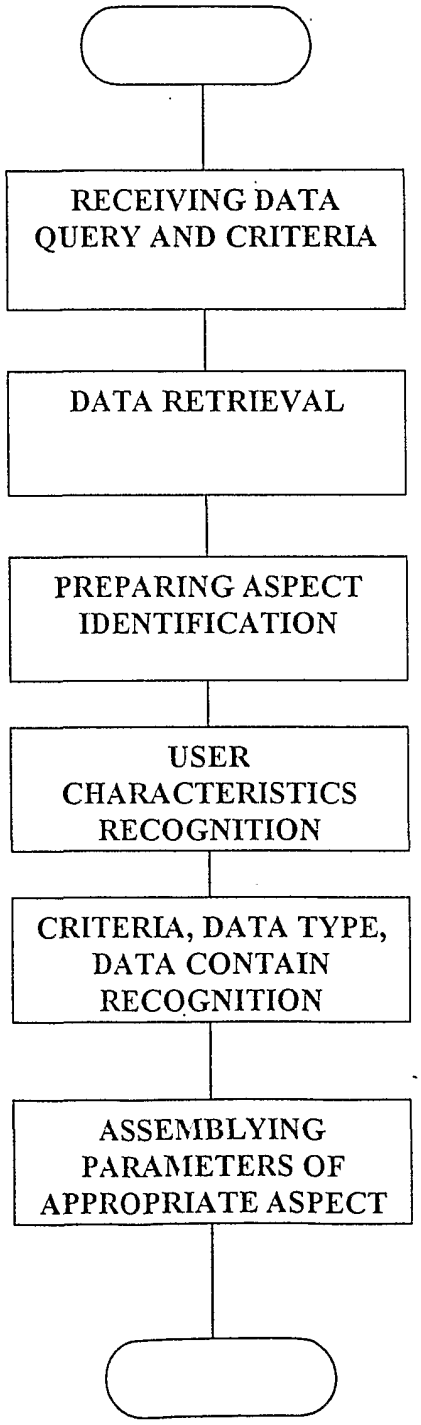

RECEIVING DATA QUERY AND CRITERIA
DATA RETRIEVAL
PREPARING ASPECT IDENTIFICATION
USER CHARACTERISTICS RECOGNITION
CRITERIA, DATA TYPE, DATA CONTAIN RECOGNITION
ASSEMBLYING PARAMETERS OF APPROPRIATE ASPECT

FIGURE 5b

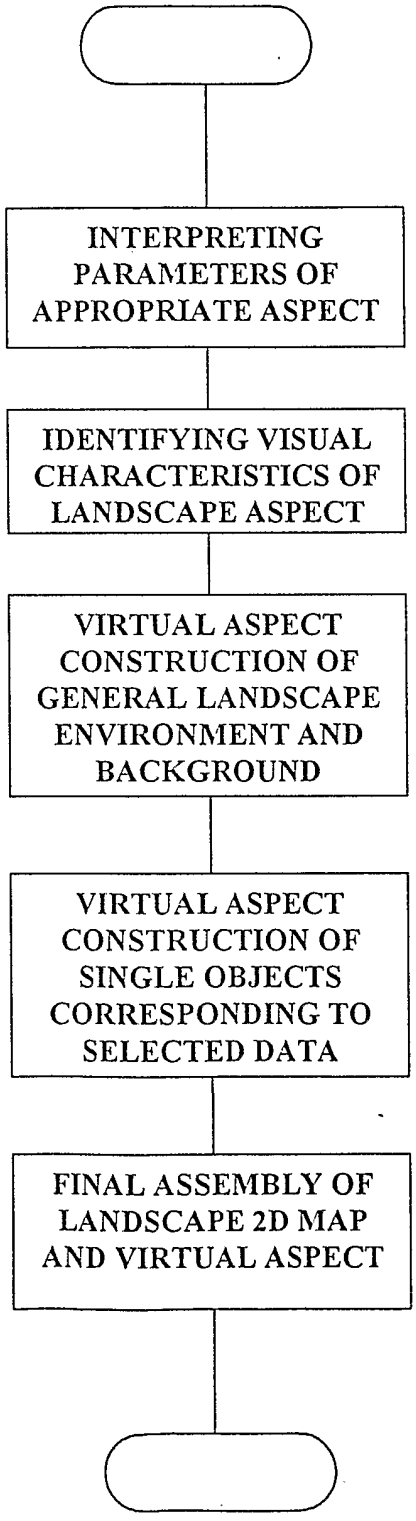

INTERPRETING PARAMETERS OF APPROPRIATE ASPECT
IDENTIFYING VISUAL CHARACTERISTICS OF LANDSCAPE ASPECT
VIRTUAL ASPECT CONSTRUCTION OF GENERAL LANDSCAPE ENVIRONMENT AND BACKGROUND
VIRTUAL ASPECT CONSTRUCTION OF SINGLE OBJECTS CORRESPONDING TO SELECTED DATA
FINAL ASSEMBLY OF LANDSCAPE 2D MAP AND VIRTUAL ASPECT

FIGURE 5c

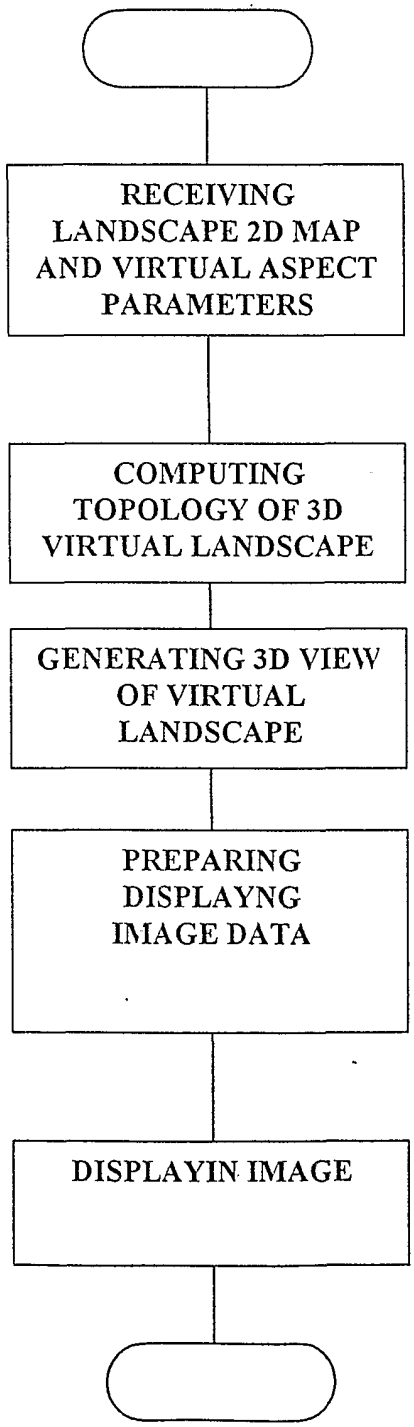

RECEIVING LANDSCAPE 2D MAP AND VIRTUAL ASPECT PARAMETERS
COMPUTING TOPOLOGY OF 3D VIRTUAL LANDSCAPE
GENERATING 3D VIEW OF VIRTUAL LANDSCAPE
PREPARING DISPLAYNG IMAGE DATA
DISPLAYIN IMAGE

FIGURE 6

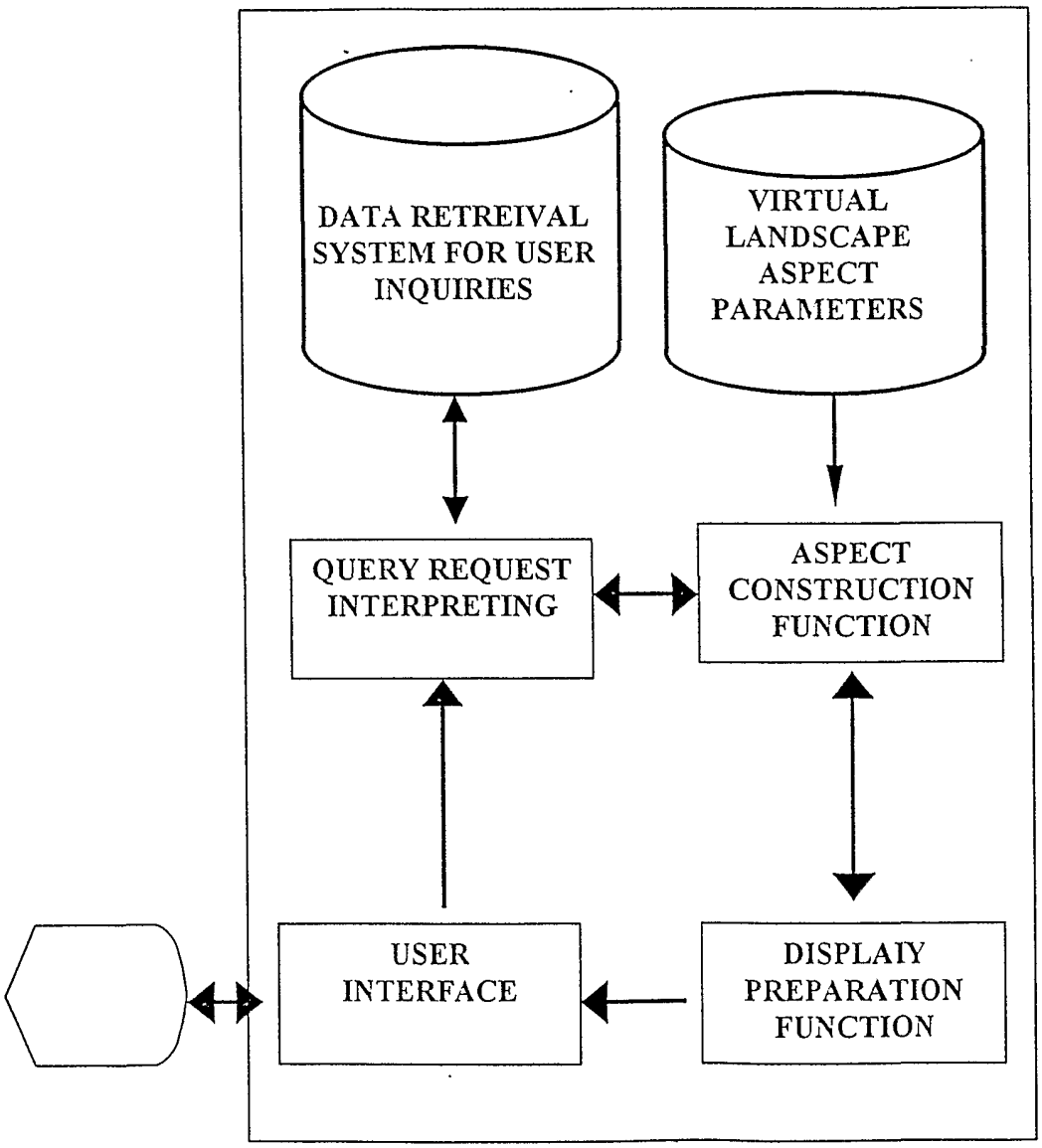

DATA RETREIVAL SYSTEM FOR USER INQUIRIES
VIRTUAL LANDSCAPE ASPECT PARAMETERS
QUERY REQUEST INTERPRETING
ASPECT CONSTRUCTION FUNCTION
USER INTERFACE
DISPLAIY PREPARATION FUNCTION

FIGURE 7

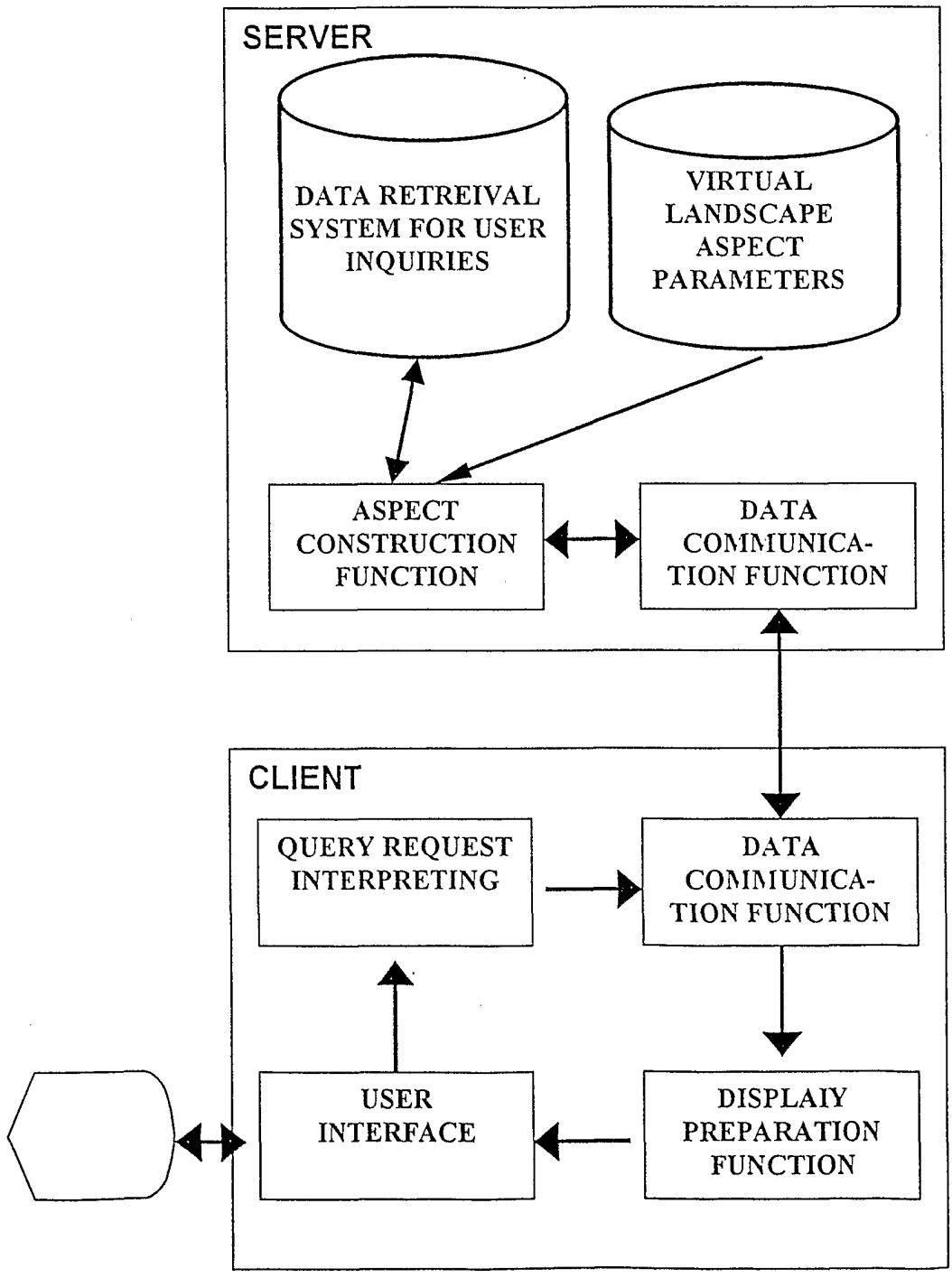
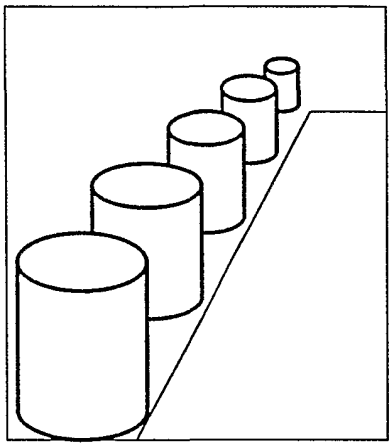

SERVER
DATA RETREIVAL SYSTEM FOR USER INQUIRIES
VIRTUAL LANDSCAPE ASPECT PARAMETERS
ASPECT CONSTRUCTION FUNCTION
DATA COMMUNICA-TION FUNCTION
CLIENT
QUERY REQUEST INTERPRETING
DATA COMMUNICA-TION FUNCTION
USER INTERFACE
DISPLAIY PREPARATION FUNCTION

FIGURE 8

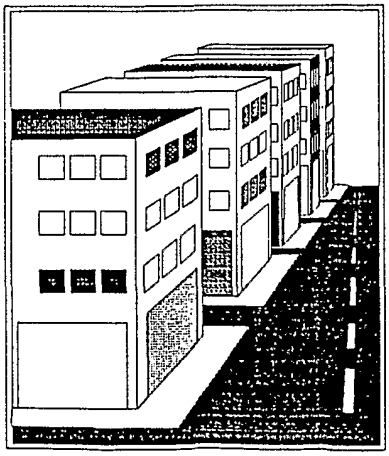
Aspect parameters table for database A

Aspect id.	Landscape parameters		
Type	Form	Color	Align.
1	Cylind	Grey	left
2	Cube	White	right
XXX	xxx	xxx	xxx



Aspect parameters table for database B

Aspect identifier					Landscape parameters						
Type	Locat.	User nat.	Shop	...	Form	High	Front Color	Roof Color	Align.	Align.	...
Shop	Center X	---	---	...	Tower	4	Grey	Grey	left	left	...
Shop	Center X	---	124	...	Tower	4	White	---	left	left	...
Shop	Center X	---	312	...	Tower	4	Blue	White	left	left	...
Shop	Center X	CH	---	...	Chalet	1	Grey	Grey	both	left	...
Shop	Center Y	---	---	...	Tower	4	Grey	Grey	left	left	...
Prod	---	---	127	...	Dec 23	1	White	White	right	right	...
XXX	XXX	xxx	xxx	...	xxx	xxx	xxx	xxx	xxx	xxx	...



INTERNATIONAL SEARCH REPORT

Inte pplication No
PCT/CH 00/00377

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G06T17/40

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G06F G06T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ, WPI Data, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 999 944 A (LIPKIN DANIEL) 7 December 1999 (1999-12-07) abstract; claims 1,2,5; figure 2A column 20, line 44 -column 21, line 31 column 24, line 12 - line 44 ---	1-13
X	US 5 737 533 A (DE HOND MAURICE) 7 April 1998 (1998-04-07) abstract; claims 1-3,8,9,13; figures 2,3,6,8,10 column 7, line 36 - line 41 column 8, line 23 - line 38 column 8, line 62 - line 65 --- -/--	1-13

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 March 2001	20/04/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Diallo, B

INTERNATIONAL SEARCH REPORT

Int ication No
PCT/CH 00/00377

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 1997, no. 05, 30 May 1997 (1997-05-30) & JP 09 016808 A (TOSHIBA CORP), 17 January 1997 (1997-01-17) abstract	1-13
A	US 6 026 376 A (KENNEY JOHN A) 15 February 2000 (2000-02-15)	

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int plication No
PCT/CH 00/00377

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5999944 A	07-12-1999	NONE	
US 5737533 A	07-04-1998	AU 698115 B	22-10-1998
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		ES 2146794 T	16-08-2000
		PT 858635 T	31-08-2000
		US 6002853 A	14-12-1999
JP 09016808 A	17-01-1997	NONE	
US 6026376 A	15-02-2000	NONE	