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Display and navigation method for large data files containing graphic elements, and method for compressing files containing textual, graphic or image information

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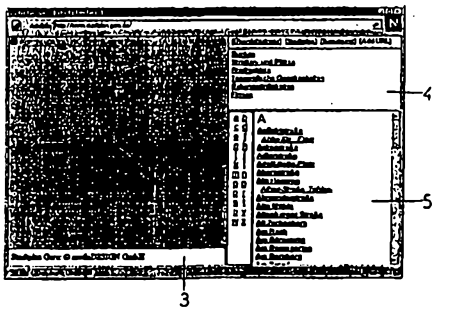
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(54) Title: DISPLAY AND NAVIGATION METHOD FOR LARGE DATA FILES CONTAINING GRAPHIC ELEMENTS, AND METHOD FOR COMPRESSING FILES CONTAINING TEXTUAL, GRAPHIC OR IMAGE INFORMATION

(54) Bezeichnung: VERFAHREN ZUM DARSTELLEN VON UND NAVIGIEREN IN GRÖSSEREN, GRAFIK-ELEMENTE ENTHALTENDEN DATEIEN SOWIE VERFAHREN ZUR KOMPRESSION VON DATEIEN, ENTHALTEND TEXT UND GRAFIK- ODER BILDINFORMATIONEN

(57) Abstract



The invention relates to a display and navigation method for large data files containing graphic elements, in which the relevant data sections are displayed or presented on a monitor. In accordance with the invention, visual and controlled division of the display surface of the monitor takes place, preferably in a Cartesian co-ordinate grid with a centre field and surrounding edge fields. The data files necessary for the first display are then charged from a data base. After this, navigation directions and recharge orders are assigned to each of the edge fields of the grid, so that, when one of the edge fields activated, the data file content representing this field becomes the centre field, while the data file content which was hitherto not displayed, and was on the edge field or adjacent to the edge fields, can be reloaded from the main data file. The remaining, non-activated edge fields, which were adjacent to the hitherto centre field, are moved away from the selected navigation direction, or optionally removed from the monitor display. During navigation, reloading of the adjacent data file content takes place by means of the edge fields and the movement of the existing data files for the centre field, and by means of the edge fields which are not activated during navigation. This enables acceleration of the whole display process.

(57) Zusammenfassung

Die Erfindung betrifft ein Verfahren zum Darstellen von und Navigieren in größeren, Grafikelemente enthaltenden Dateien, wobei die Darstellung oder Präsentation der jeweiligen Dateiausschnitte auf einem Monitor erfolgt. Erfindungsgemäß wird ein visuelles und ansteuerungsseitiges Aufteilen der Darstellungsfläche des Monitors in ein vorzugsweise kartesisches Raster mit einem Zentrums-Rasterfeld sowie dieses umgebende Randrasterfelder und Laden der für die Erstdarstellung notwendigen Dateien aus einem Datenbestand vorgenommen. Im Anschluß erfolgt ein Zuweisen von Navigationsrichtungen und Nachladebefehlen zu jedem der Randrasterfelder, so daß beim Aktivieren eines der Randrasterfelder der dieses Feld repräsentierende Dateiinhalt zum Zentrums-Rasterfeld wird sowie der bisher nicht dargestellte, am Randrasterfeld oder an den Randrasterfeldem angrenzende Dateiinhalt aus der Hauptdatei nachladbar ist. Weiterhin werden die am bisherigen Zentrums-Rasterfeld angrenzenden übrigen, nicht aktivierten Randrasterfelder entgegen der gewählten Navigationsrichtung bewegt oder ggfs. aus der Monitordarstellung herausgeführt, wobei während dem Navigierem mittels der Randrasterfelder und der Bewegung der vorhandenen Dateien für das Zentrums-Rasterfeld und der nicht navigationsseitig aktivierten Randrasterfelder das Nachladen der angrenzenden Dateiinhalte erfolgt, so daß der Darstellungsvorgang insgesamt beschleunigbar ist.

Abstract

The invention relates to a display and navigation method for large data files containing graphic elements, in which the relevant data sections are displayed or presented on a monitor. In accordance with the invention, visual and controlled division of the display surface of the monitor takes place, preferably in a Cartesian co-ordinate grid with a central field and surrounding marginal fields. The data files necessary for the first display are then loaded from a main data base. After this, navigation directions and reload commands are assigned to each marginal field of the grid, so that, when one of the marginal fields is activated, the data file content representing this field becomes the central field, while the data file content which was hitherto not displayed, and was on the marginal field or adjacent to the marginal fields, can be reloaded from the main data base. The remaining, non-activated marginal fields, which were adjacent to the hitherto central field, are moved away from the selected navigation direction, or optionally removed from the monitor display. During navigation, reloading of the adjacent data file content takes place by means of the marginal fields and the movement of the existing data files for the central field, and by means of the marginal fields which are not activated during navigation. This enable acceleration of the whole display process.

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Display and navigation method for large data files containing graphic elements, and method for compressing data files containing text and graphic or image data.

The present invention relates to a method for displaying and navigating large data files containing graphic elements, in which relevant portions of the data files are displayed or presented on a monitor. Moreover, the invention relates to a method for compressing data files containing text and graphic or image data for use in displaying and navigating large data files, wherein display of the compressed data files or portions thereof is realised on a monitor.

It is known to update large data files containing graphic elements, such as for example city maps, documents for layouts of integrated circuits or printed circuit boards or the like in great detail and to make the same available for a user online or offline. A problem encountered therewith relates to the handling of the large data files, in particular if high accuracy in every detail and expression of the graphic elements to be displayed is demanded.

With the use of external files, which can be accessed by means of communication links, for example, online by the internet, there is a problem of limited transmission bandwidth of the available networks resulting in inadequate handling thereof in view of the volume of files to be transmitted and limited usability of same.

It is known, for example, to make city maps or maps within the scope of so-called websites available on the internet. The map window which can be seen on a user's monitor shows a map section comprised of a graphic, wherein a movement along the whole of the available display is made possible by a so-called scrolling action within the maps. Since not insignificant data quantities must usually be reloaded during the scrolling operation, significant time is required resulting in unsatisfactory performance. Moreover, during display of a new map section no orientation point is given at the end of the scrolling operation with respect to the preceding map section so that navigation without difficulty is not possible.

A further problem exists in that with conventionally shaped menu layouts the necessary navigation elements are located outside of the respective map section being displayed, so that the actual space for such display is reduced by

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this area. Moreover, to display the navigation elements with the known solutions additional graphics must be loaded.

It turns out that with the usual availability of files including detailed displays of surface-like objects, possible compressions and colour reduction can lead to acceleration of the reloading steps, although the information depth will be reduced, which results, particularly in connection with city maps, in the difficulty that inscriptions of street names and other details are no longer recognisable.

As a result, online city maps or the like have reduced quality and information content in contrast to the corresponding printed media product, so that the indisputable advantages of digital versions such as its interactivity and enhanced search possibilities cannot be utilized fully and are not persuasive.

The present invention may provide a method for displaying and for navigating large data files containing graphic elements, in which relevant portions of the data files are displayed or presented on a monitor in such a way that orientation dots may be present, or may be maintained, within the file or portion being displayed on the monitor for orientation and for navigation, and in which reloading of files may be performed in such a way that its usability and search speed may not be detrimentally influenced for the user. Moreover, the present invention may provide a method for compressing data files containing text and graphic or image data for use in displaying and navigating large data files and which facilitates sufficient antialiasing irrespective of the degree of compression.

According to one aspect of the invention there is provided a method for displaying and navigating large data files containing graphic elements in which relevant portions of the data files are displayed or presented on a monitor having a display surface, said method including the steps of:

visually subdividing the display surface of the monitor into a grid including a central field and marginal fields surrounding the central field and loading the data files necessary for first display from a main data base;

assigning navigation directions and reload commands to each marginal field of said grid so that when one of the marginal fields is activated the data file content representing the activated field becomes the central field while the data file content which was hitherto not displayed and was on the marginal field or

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adjacent the marginal fields can be reloaded from the main data base and the remaining non-activated marginal fields which were adjacent the hitherto central field are moved away from the selected navigation direction or are removed from the display surface, wherein during navigation reloading of the adjacent data file content takes place by means of the marginal fields and movement of the existing data files to the central field and by means of the marginal fields which are not activated during navigation, so as to accelerate the display process.

According to a further aspect of the present invention there is provided a method for compressing data files containing text and graphic or image data for use in displaying and navigating large data files, wherein display of the compressed data files or portions thereof is realized on a monitor according to any one of the preceding claims, said method including the automatically realizable steps of:

creating in any known manner vectorized data starting material separated into levels according to textual and graphic or image data using a maximum 4-bit colour depth to indicate a number of basic colours;

separating the colour reduced data with respect to text and graphic or image data, wherein at least 5 grey levels are used for the text and the remaining colour depth is used for the graphic or image data, and

recombining the separated and colour-reduced data.

The method of the present invention may reduce the number of files to be reloaded or drawn during a display inclusive navigation and steps of the method for presenting or displaying large data files may be performed more fluently by realising raster fields corresponding to smaller files.

The method of the present invention may enhance objectively and subjectively display and presentation of files including graphic elements for the user, whereby the inventive features result in the advantage of more logical and easily performed navigation.

In view of the compression method corresponding to a further basic idea of the invention, detailed information, as is necessary in particular in connection with city maps and maps or the like in general, may be maintained with a reduction in the total quantity of data to be transferred, in particular during

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online mode, by aiming at a reduced colour palette associated with the graphic or image information.

According to a preferred embodiment of the invention the method of displaying and navigating large data files containing graphic elements may include visually subdividing the display surfaces of the monitor and therewith the files to be handled, into a Cartesian grid. The Cartesian grid may include a central raster field and marginal raster fields surrounding the central raster field.

For each marginal raster field a graphically displayed and visually recognisable navigation direction may be assigned and reload commands may also be provided. The respective display elements for a symbol-like reference of the navigation directions and also the reload commands are expediently a part of the respective individual file. Following activation of one of the marginal raster fields, the data file content representing the activated field may be displaced or moved to the central raster field, while data file content which has not yet been displayed on the monitor and was adjacent the marginal raster field may be reloaded from the main data base, which reloaded file itself becomes a new marginal raster field.

Simultaneously or successively the remaining marginal raster fields which are not activated and adjoin the previous central raster field may be moved opposite to the selected navigation direction or moved outside the monitor display, if necessary.

During the briefly described navigation operation reloading of adjacent data file content may take place by means of the marginal raster fields including the navigation symbols and movement of existing data files to the central raster field, and by means of the marginal raster fields which are not activated during navigation so as to accelerate the display process.

Because the files to be subsequently drawn are reduced to the or a few data file contents adjoining the activated marginal raster field, for example, the data quantity to be downloaded online may be reduced.

In one embodiment of the invention there exists the possibility to provide the central raster field with a zoom function. Since the central raster field itself includes a section of the display surface divided into a Cartesian grid, the corresponding file, which is subjected to a zoom function during display, is

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smaller than with known solutions so that advantages also exist for the reload cycles.

Following on from the above, a preferred application of the inventive method may be suitable for displaying land maps, city maps, sign posts and the like with a navigation facility, wherein data resources or the main data file are spatially remote, and can be accessed online without any disadvantages to the user.

A further improvement of the disclosed display method may result, if compression of files according to the method described below is used.

The compression method is suitable for data files including text and graphic or image information wherein display of the compressed files or parts thereof is realised on a monitor.

For the compression vectorized data starting material separated into corresponding levels according to text and graphic or image information is first created as is known per se. Therewith, a maximum 4-bit colour depth is used to indicated a number of basic colours.

Thereafter, the vectorized data are subjected to separation of the colour reduced data with respect to text on the one hand and graphic or image data on the other hand, wherein at least five grey levels are used for the text and the remaining colour depth is used for the graphic or image data.

The thus available data files, which have been minimised are then combined and are transformed into a corresponding pixel format.

The vectorized data expediently makes use of 16 basic colours, wherein 5 to 6 grey levels (grey stages) are available for the textual data and 10 to 11 colours are available for graphic or image data.

In a particular advantageous technique the combined colour-reduced files may already correspond to the inventive raster fields, wherein sub-files may be created in the given raster format.

A preferred embodiment of the present invention will now be described with references to the accompanying drawings wherein:

Figures 1a and 1b show in principle a monitor display comprising a 9-field raster; and

Figure 2 shows navigation symbols within the marginal raster fields.

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As can be seen from figures 1a and 1b the monitor display surface 1 is divided into a Cartesian grid of nine fields. The network-like raster 2 corresponds to the main part or content of the screen display. However, fading-in is available for further modules to be displayed for advertising purposes in the form of an advertising window 3, for status information 4 or for investigations 5 to be carried out, for example, for taking up a street register or list in alphabetical order (see figure 2).

The outer squares or marginal raster fields 6 are used for navigating within the four main and four cardinal points. A central raster field 7 is provided at the centre of the raster arrangement. By clicking on one of the marginal raster fields 6, for example, with a PC mouse, the marginal raster field becomes the new centre of the map, i.e. the central raster field 7. The marginal raster fields are reloaded and displayed by clicking on the top of the right hand side (figure 1a), for example, so that the map surface is filled out as a whole. During the inactive phases further map fields are reloaded, which in particular lay outside the marginal raster fields, and which are then available following any new activation of one of the marginal raster fields 6, thereby accelerating the display process as a whole.

As indicated in figure 2 by the "magnifying glass" symbol in the central raster field 7, the middle square can be provided with a second function, e.g. zoom-in or zoom-out.

As is shown in connection with the marginal raster field 6 and the surrounding marginal fields 6a-e, following activation of the marginal raster field 6, fields 6a-e are internally reloaded in accordance with the desired navigation direction wherein the field 6c replaces the field 6 which has become the central field 7. As only selected quasi new marginal raster fields are to be reloaded, which correspond to a partial quantity of the contents to be displayed and depending on the desired navigation direction, the data quantity to be transferred is reduced, which is desirable for quick graphic display or quick image formation.

Moreover, the symbols which are displayed and which are a part of the respective files, facilitate easy handling at the screen without the necessity for a detailed introduction or support.

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A further advantage of the described embodiment is that by movement of the previous central raster field 7 opposite to the navigation direction, an orientation dot, which is for example present within the central raster field, is available further on for the viewer so that handling of the display and presentation method is further improved.

A more extensive acceleration of the reloading process can be obtained by reducing or by compressing the data quantity or the files themselves, as is already known.

The general problems associated with creation of high resolution and highly compressed data material by means of the inventive compression method, will first be discussed.

Two standard graphic formats are presently available on the internet, namely GIF and JPEG. The two formats show different behaviour with respect to file size or possible compression and detail-true representation. In connection with the ratio of possible compression rates and detail-trueness, which are of importance for selecting a format, the GIF format shows better results with a reduced colour palette and with avoidance of dithering. In particular text which is oriented in an inclined position such as street names, as may be unavoidable in connection with map inscriptions, loses substantial readability with the absence of colour levels due to limited or no longer available antialiasing. In contrast colour surfaces such as, for example, streets and cultivated areas substantially do not need antialiasing for clear definition thereof. With high-contrast boundaries a single intermediate stage only may produce good results. With the use of pastels, as is common for example in connection with city maps, such an effect is not necessary. Also no dithering needs to be applied to areas to be displayed in order to obtain as high a compression factor as possible. This can be usefully realised if it is dealt with a given predetermined colour palette.

The above requirements cannot be realised within a common single processing step by using the usual graphic tools. According to the inventive method a maximum of 16 colours, i.e. a 4-bit colour depth, is made use of as is differentiated application of antialiasing for text but no antialiasing for surface areas. Moreover, no dithering is applied.

Surprisingly it turns out that for acceptable antialiasing 5 to 6 grey levels (grey stages) (black, white and 3 to 4 intermediate levels or stages) are

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sufficient. With a desirable palette of 16 colours, therefore, 10 colours remain for the display of colour areas and lines, i.e. map objects.

According to the invention the map material is basically formed or read in by means of a vector graphics program. The use of vectorized map material makes possible subsequent comfortable editing and updating of the starting materials. Map objects and text are deposited on separate levels so as to separately export them and import them into the pixel graphics program. The object file is read in with high colour depth and is converted into a 16-colour palette without dithering. The file including the graphics text is read in the same way. With a palette conversion the available 5 to 6 grey levels come into use, whereby clear antialiasing is possible. Both files are converted into RGB colour depth and are mounted one above the other. The resulting graphics consist substantially of colours of the 16 colour palette as a whole, and therefore can be converted to the GIF graphic format with a given 16 colour palette without loss of quality. After the GIF formation horizontal and vertical lines can be inserted. According to the last step individual map fields are produced by a cut and paste operation.

It is pointed out that it is within the scope of the invention to realize the steps of the method automatically, whereby individual steps may be combined. It is also no longer necessary to separate the transformation and the subsequently following placement operation of both files (text and image), if by means of automatic processing, the text objects are stored during the converting process with antialiasing by using the 5 to 6 grey levels, whilst colour areas are stored without antialiasing with only 10 colour levels from the palette. The complex automatic algorithm can be transferred into a file format provided for the algorithm after the formation and reading in of the vectorized map material separated according to the levels for the text and other objects with the use of colours present within a "vector palette" for a direct export of the map material. After reading in of the starting material internally a converting operation is realized into a pixel format, wherein antialiasing is applied with the 5 to 6 grey levels in connection with text elements, and for other objects 10 colour values are used without antialiasing and the dithering effect. The graphics are then provided with lines during the automatic processing and are deposited or stored as squares.

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In connection with the hereinafter described embodiment, the creation of vectorized data starting material separated according to levels for text and other objects, i.e. graphic or image data, for realizing compression of files will first be explained. Herewith exclusive use is made of the usable colours contained within a 16 colour palette. The advantage of the vectorized data starting material, such as for example map material, resides in the possibility of subsequently editing and updating thereof. Thereafter the present vectorized map material will be exported separated into text and object levels so as to realize a colour reduction. Thus, colour reduction according to the embodiment is realised separated for text and object levels or files, wherein for the text at least 5 grey levels (grey stages) are used while the remaining colour depth is available for graphic or image information, i.e. the object level. Following the separated colour reduction step a mounting operation or multiplication of the separated files is realised, whereby a further reduction of the sum colour palette is available.

The raster field separation lines mentioned above are then inserted into the colour-reduced files, combined as indicated above, and sub-files are produced in the raster format. In comparison with the known reduction or compression methods, the advantage of the present embodiment in particular is that losses in quality do not occur in connection with text such as street names.

The disadvantage of the conventional reduction methods is that with only a reduction of the pixel quantity or undifferentiated colour reduction by a no longer present antialiasing, readability or recognisability of text detail images is reduced or limited.

Surprisingly it turns out that 5 to 6 grey levels, i.e. black, white and 3 to 4 intermediate levels are sufficient for acceptable antialiasing. With a desirable palette of 16 colours, i.e. of a 4-bit colour depth, 10 tones or shades for displaying colour areas and lines remain sufficient.

All in all the described method allows large files to be graphically displayed through online connections resulting in increased user acceptance. New possibilities also arise such as for example, logically navigable city information systems.

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Finally, it is to be understood that various alterations, modifications and/or additions may be introduced into the constructions and arrangements of parts previously described without departing from the spirit or ambit of the invention.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Method for displaying and navigating large data files containing graphic elements in which relevant portions of the data files are displayed or presented on a monitor having a display surface, said method including the steps of:

visually subdividing the display surface of the monitor into a grid including a central field and marginal fields surrounding the central field and loading the data files necessary for first display from a main data base;

assigning navigation directions and reload commands to each marginal field of said grid so that when one of the marginal fields is activated the data file content representing the activated field becomes the central field while the data file content which was hitherto not displayed and was on the marginal field or adjacent the marginal fields can be reloaded from the main data base and the remaining non-activated marginal fields which were adjacent the hitherto central field are moved away from the selected navigation direction or are removed from the display surface, wherein during navigation reloading of the adjacent data file content takes place by means of the marginal fields and movement of the existing data files to the central field and by means of the marginal fields which are not activated during navigation, so as to accelerate the display process.

2. A method according to claim 1 wherein said grid includes Cartesian co-ordinates.

3. A method according to claim 1 or 2, wherein the central field is provided with a zoom function.

4. A method according to claim 2 or 3, wherein the fields which lay nearest to the activated marginal fields in the direction of navigation are reloaded from the main data base.

5. A method according to claim 4, wherein the first files to be reloaded are those which lay immediately adjacent in the direction of navigation.

6. A method according to any one of the preceding claims, wherein a navigation direction associated with a marginal field is represented by a graphic symbol, which can be activated by clicking on with a computer mouse.

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7. A method according to any one of the preceding claims suitable for displaying land and city maps, signposts and the like with a navigation facility, wherein the main data base is spatially remote and can be accessed online.

8. A method for compressing data files containing text and graphic or image data for use in displaying and navigating large data files, wherein display of the compressed data files or portions thereof is realized on a monitor according to any one of the preceding claims, said method including the automatically realizable steps of:

creating in any known manner vectorized data starting material separated into levels according to textual and graphic or image data using a maximum 4-bit colour depth to indicate a number of basic colours;

separating the colour reduced data with respect to text and graphic or image data, wherein at least 5 grey levels are used for the text and the remaining colour depth is used for the graphic or image data, and

recombining the separated and colour-reduced data.

9. Method according to claim 8, wherein the vectorized data makes use of 16 basic colours, and wherein 5 to 6 grey levels are available for textual data and 10 to 11 colours are available for graphic or image data.

10. Method according to claim 8 or 9, including the steps of inserting raster fields into the recombined and colour-reduced data and producing sub-files in a raster format.

11. A method for displaying and navigating large data files containing graphic elements substantially as herein described with reference to the accompanying drawings.

12. A method for compressing data files containing text and graphic or image data substantially as hereinbefore described with reference to the accompanying drawings.

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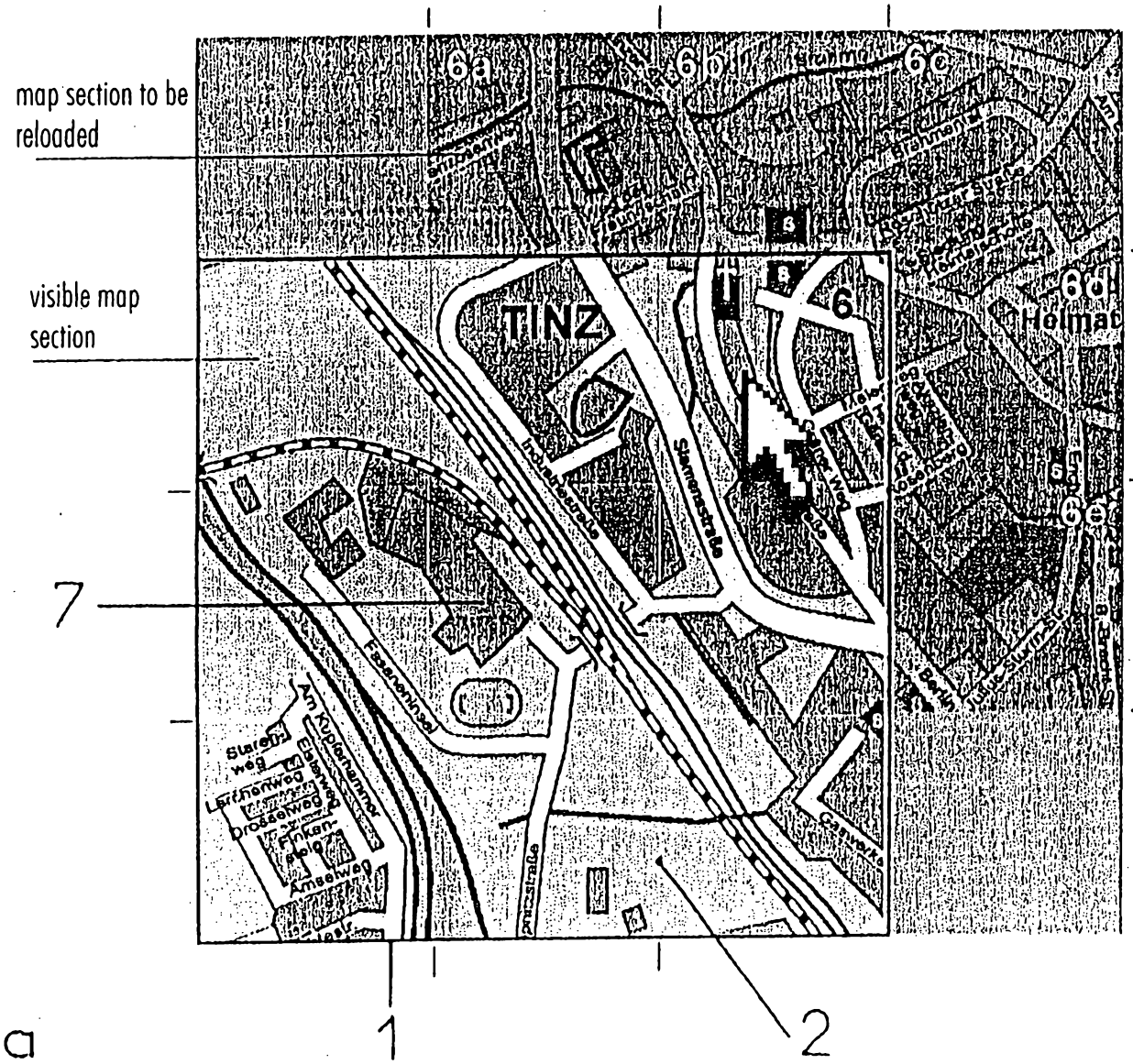

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visible map section
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6b
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Fig.1a

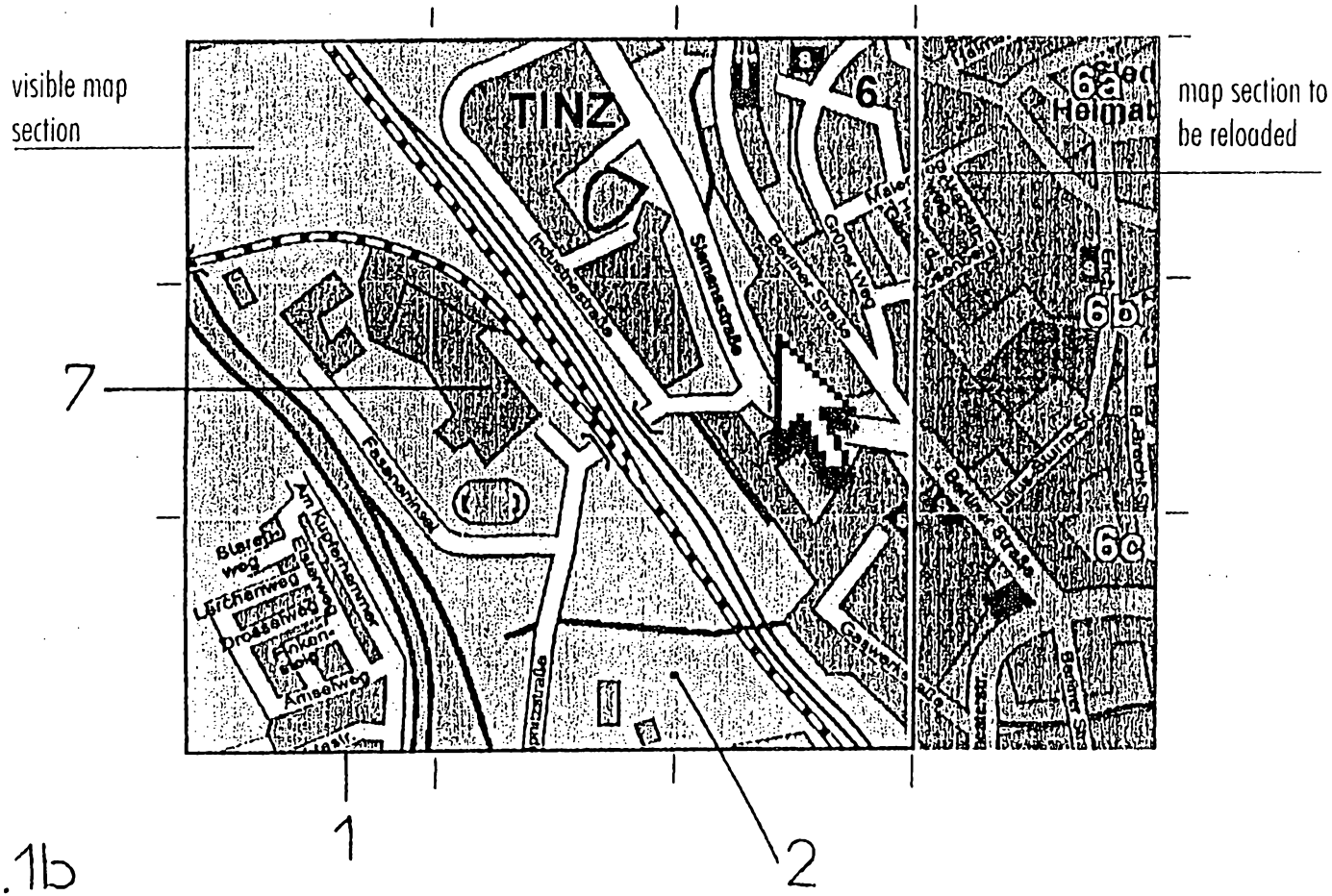

visible map section
map section to be reloaded
7
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2
TINZ
6
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Industriestraße
Schienenstraße
Berliner Straße
Gaswerkstraße
Gaswerk

Fig.1b

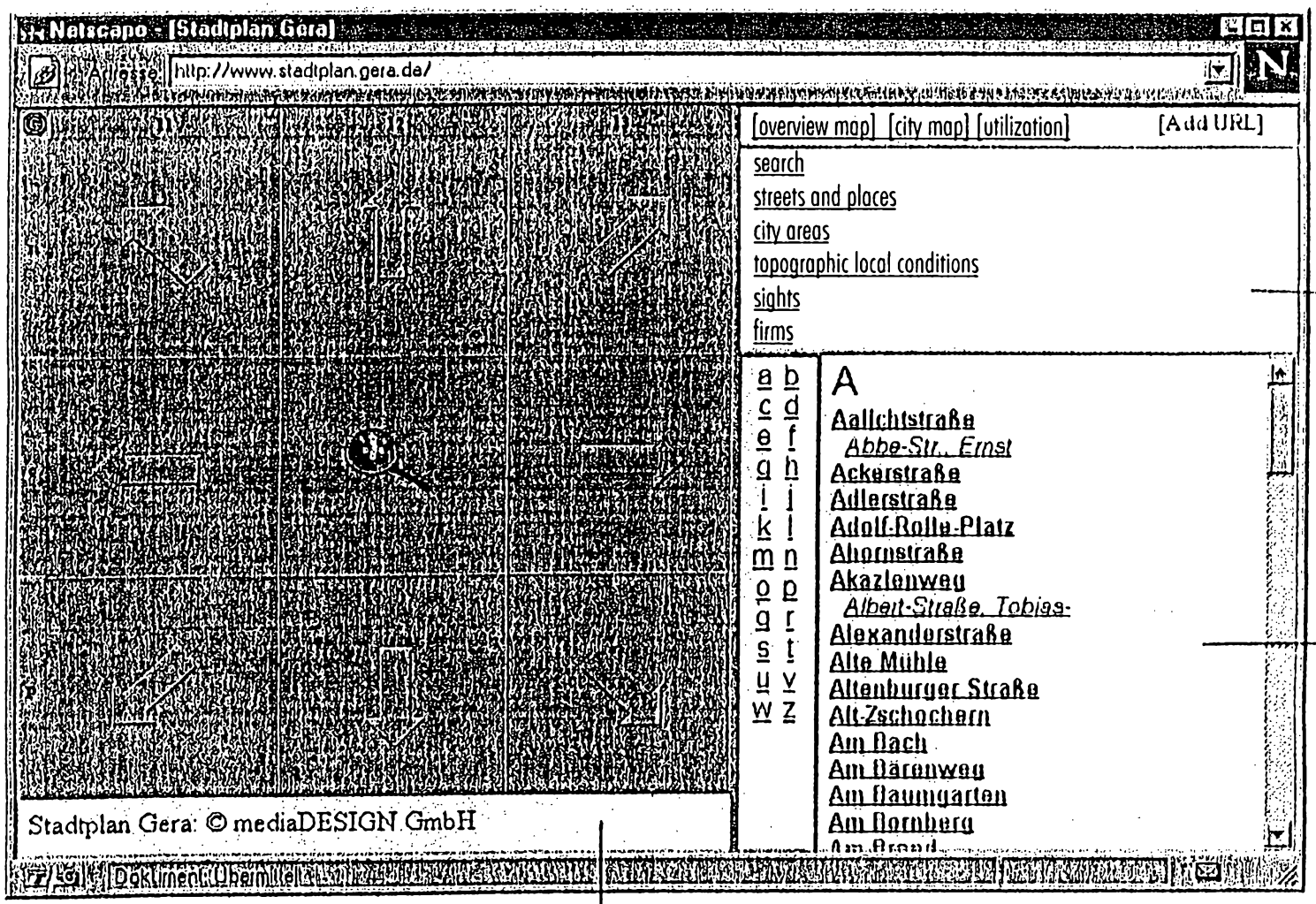

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Fig. 2