

DESCRIPTION

METHOD AND APPARATUS FOR PROCESSING A TABLE

5 Technical Field

The present invention relates to a method and apparatus for processing a table in units of cells which constitute the table, and more particularly to a method and apparatus for processing a table which
10 allows an image data process in units of cells in a data processing apparatus.

Background Art

In a conventional table processing apparatus incorporated in a computer system or the like, which
15 has a function of forming a table in units of cells, the types of data input to the cells constituting the table are limited to two: numerical and character data. If numerical or character data (cell data) is to be mixed with another type of data (e.g., image or
20 sound data) in the table, the latter type of data is expressed in data structure and managing method different from those of the cell data.

For example, an operation of editing normal cell data is restricted within cell frames. On the other
25 hand, in the case of expressing image data in a table, an arbitrary region irrespective of cell frames is set as an image data frame, and an operation of pasting



desired image data in the image data frame is required.
The image data frame and the image data are processed
by the data structure and managing method different
from those of processing numerical and character cell
5 data of the table.

The conventional table processing apparatus
described above has the following drawbacks. To
incorporate data other than numerical or character data
(e.g., image or sound data) in a table, the data is
10 processed by the data structure and managing method
different from those of processing numerical and
character cell data. Therefore, for example, to
edit cell data when image data or sound data is
incorporated in the table, it is difficult for the user
15 to understand an operation for the above purpose due to
the difference between the operations for processing
the numerical or character data and image or sound
data, and the operation procedures are complicated.

Thus, the operation of treating image data and
20 sound data in the tabling process is complex, resulting
in low operability of the table processing apparatus.
Disclosure of Invention

An object of the present invention is to provide a
method and apparatus for processing a table, in which
25 image data is stored as cell data of table data, so
that an operation and procedure for processing the
image data as cell data (e.g., an image process of



the image data or an output of the image data to a designated cell of the table) can be simple and the manner of expressing cell data can be diversified.

According to the present invention, there is
5 provided a method for processing table data in a form of a table consisting of a plurality of cells, the method comprising the steps of storing data including image data in a storing device so as to respectively correspond to cells of the table data; discriminating
10 whether data in a designated cell of the table data to be processed is numerical data, character data or image data; if the data in the designated cell is discriminated as image data, producing an image based on the image data stored in the storing device
15 in correspondence with the designated cell; and outputting the produced image to an output region of the designated cell.

Brief Description of Drawings

FIG. 1 is a block diagram of a computer system
20 according to a first embodiment of the present invention;

FIG. 2 is a diagram showing a data structure of cell data stored in the table data file shown in FIG. 1;

FIG. 3 is a flowchart of an image definition
25 process executed by the computer system of the first embodiment;

FIGS. 4A to 4C are diagrams showing image definition



input screens displayed on the display through the image definition process shown in FIG. 3;

FIG. 5 is a diagram showing the structure of image data stored in the input data region shown in FIG. 2 by the image definition process shown in FIG. 3;

FIG. 6 is a flowchart showing a table data output process executed by the computer system of the first embodiment;

FIG. 7 is a diagram showing an example of display data displayed on the display by the table data output process shown in FIG. 6;

FIG. 8 is a diagram showing a data structure of cell data processed by a computer system according to a second embodiment of the present invention;

FIGS. 9A to 9C are diagrams showing examples of images modified by modification information of the cell attribute shown in FIG. 8;

FIG. 10 is a flowchart showing a table data output process executed by the computer system of the second embodiment; and

FIG. 11 is a diagram showing an example of display data displayed on the display by the table data output process shown in FIG. 10.

Best Mode of Carrying Out the Invention

(First Embodiment)

A first embodiment of the present invention will be described with reference to FIGS. 1 to 7.

First, the structure of the embodiment will be described.

FIG. 1 is a block diagram of a computer system 1 according to the first embodiment.

5 As shown in FIG. 1, the computer system 1 comprises a CPU (Central Processing Unit) 2, an input unit 3, a mouse 4, a ROM 5, a processing work memory 6, a table data file 7, an image reader 8, a printer unit 9, a sound converting unit 10, a loud speaker 11, a display unit 12, an image file 13 and a sound file 14. These components are connected to a bus 15.

The CPU 2 controls the components of the computer system 1 and executes various information processes in accordance with control programs stored in the ROM 5.

15 When executing a tabling process, the CPU 2 causes items, numeric values and formula input via the input unit 3 and the mouse 4 to be stored in the table data file 7 through table calculation processes. When executing a table data output process (to be described later), the CPU 2 discriminates the cell type of a designated cell of the table; i.e., whether the cell stores numerical data, character data, image data or sound data. In accordance with the discriminated cell type, the CPU 2 reads the corresponding data from the

20 table data file 7, the image file 13 or the sound file 14 and outputs the read data to the output region of the display unit 12, which corresponds to the

25

designated cell of the table.

When executing a table definition process (to be described later), the CPU 2 causes the display unit 12 to display a sub-window for image definition, so that the name of the image file corresponding to the cell, subjected to image definition, can be designated. Then, the CPU 12 reads the image data corresponding to the designated image file name from the image file 13 to perform an image data editing process, and outputs the edited image to the output region of the designated cell so as to display it in the table. The image data defined by the image definition in the designated cell is stored in an input data region of the cell data shown in FIG. 2 in the form of the data structure to be described later.

The input unit 3 comprises function keys, numeric keys, character keys and others. It outputs to the CPU 2 various instruction signals corresponding to key input operations of the user.

The mouse 4 is a pointing device to perform operations supplementary to the input through the input unit 3. It outputs operation signals to the CPU 2.

The ROM 5 stores various control programs executed by the CPU 2, a table data output processing program and an image definition processing program.

The processing work memory 6 forms a memory region for editing image data output from the image file 13

when the CPU 2 executes the table data output process.

The table data file 7, to which numerical, character or image data is input, stores table data constituted by a plurality of cell data processed by the CPU 2. The data structure of the stored cell data is shown in FIG. 2. Referring to FIG. 2, the cell data is constructed by regions for storing cell position coordinate data (two dimensional coordinates (X, Y)) representing the position of a cell in the table; cell type data representing the type of cell data (e.g., 0: numerical data, 1: character data, 2: image data, 3: sound data); "direct" or "indirect" data; cell attribute data; and real data, i.e., input numerical, character, image, or sound data. The data "direct" means that the image or sound data is stored in the input data region as cell data, whereas the data "indirect" means that the image or sound data is stored in the image file 13 or the sound file 14. The cell attribute data include character size data (e.g., 0: 8 point, 1: 10 point), character style data (e.g., 0: Ming-style, 1: Gothic style), layout data (e.g., 0: left-justification, 1: centering, 2: right-justification), and numerical form data (0: standard, 1: 3-digit punctuation).

The image reader 8 scans a set original to be read, reads an image thereon with a predetermined resolution, and stores the read image in the image

file 13 as image data.

The printer unit 9 prints table data output through the table output process executed by the CPU 2 on a preset paper sheet.

5 The sound converting unit 10 converts, into a sound signal, sound data which is output as a result of the table data output process executed by the CPU 2, when the content of the cell data in the designated cell is sound data. It outputs the sound signal
10 through the loud speaker 11.

The display unit 12, comprising a CRT (Cathode Ray Tube), displays key input data input via the CPU 2 and developed table data.

15 The image file 13 is a memory which stores a plurality of image data read by the image reader 8. The sound file 14 stores a plurality of sound data to be output to cells.

An operation of the first embodiment will now be described.

20 First, an image definition process executed by the computer system 1 will be described with reference to the flowchart shown in FIG. 3.

In the image definition process shown in FIG. 3, when an image definition object cell (in this embodiment,
25 cell coordinates C3) is designated in table data displayed on the display screen of the display unit 12 by a predetermined operation of the input unit 3 or the

mouse 4 (Step S1), a pull down menu including the item
"Image Definition" is displayed on the table data as
shown in FIG. 4A. When the item "image definition" is
selected from the pull down menu (Step S2), a sub-
5 window for image definition is superimposed on the
table data as shown in FIG. 4B (Step S3).

The sub-window for image definition includes
definition items, such as "File Name", "Magnification"
(XL, YL), and "Rotation", which should be input by the
10 user. By the item "File Name", the name of an image
data file stored in the image file 13 is designated.
By the item "Magnification", a display magnification of
an image to be output in the output region of the
designated cell position is designated in the X
15 (horizontal) and Y (vertical) directions. By the item
"Rotation", placement (e.g., an rotation angle of 90
°) of the image to be output in the output region of
the designated cell position is designated.

When definition items are input in the sub-
20 window for image definition (Step S4), the image data
corresponding to the input file name is read from the
image file 13 into the processing work memory 6 (Step
S5). The read image data is edited in accordance with
the definition items of magnification and the rotation
25 input in Step S4 (Step S6).

Subsequently, the edited image is output from the
processing work memory 6 to the designated cell

position, and the image is displayed in the output region of the designated cell C3 of the table data displayed on the display unit 12 (Step S7). Thus, the process is completed.

5 The image data displayed in the designated cell has the data structure as shown in FIG. 5. It is stored in the input data region of the cell data, as shown in FIG. 2, which corresponds to the designated cell C3 of the table data file 7. Referring to FIG. 5,
10 the image data is constituted by a header information portion and an image substance portion. The header information portion stores control data necessary to display the image, such as the number of dots (size) in the X and Y directions, the resolution and the
15 placement, as defined in Step S4. The image substance portion stores real data of the image data edited in Step S6.

 A table data output process executed by the computer system 1 will be described with reference to
20 the flowchart shown in FIG. 6.

 First, when the name of a file of the table data displayed on the display unit 12 is designated by a predetermined operation of the input unit 3 or the mouse 4, the table data corresponding to the designated
25 file name is retrieved from the table data file 7. Cell data of each of the cells constituting the retrieved table data is obtained (Step S11). Then, it

is determined, with reference to the cell position coordinates of the obtained cell data, whether the cell is included in a preset table data cell region (Step S12).

5 As a result of the determination, if the cell is not included in the predetermined table data cell region, the process is ended. If the cell is included in the predetermined table data cell region, the type of the data stored in the input data region of the cell data discriminated (whether the data is of numerical,
10 character, image, or sound type) with reference to the cell type data set in the cell data (Step S13). If the cell type is discriminated as the numerical or character type, the numerical or character data stored
15 in the input data region of the cell data is read out and displayed on the designated cell (Step S14). Then, the process returns to Step S11.

 If the cell is discriminated as the image type, it is determined whether the image data is indirect or not
20 with reference to the data "direct/indirect" (Step S15). If the image data is direct data, i.e., if the image data is stored in the input data region, it is read out from the input data region, and output to the output region of the designated cell in accordance
25 with the header information of the image data (the display magnification in the X and Y directions, the resolution, and the placement) (Step S18). The process

then returns to Step S11.

5 If the image data is indirect data, i.e., if the image data is not stored in the input data region, the image data corresponding to the image file name stored in the input data region is read out from the image file 13 into the processing work memory 6 (Step S16). The read image data is edited in accordance with the image definition designated in Step S4 (Step S17). The edited image data is output to the output region of the designated cell and displayed (Step S18). The process then returns to Step S11.

15 If the cell is discriminated as the sound type in Step S13, it is determined whether the sound data is indirect or not with reference to the data "direct/indirect" (Step S19). If the sound data is direct data, i.e., if the sound data is stored in the input data region, it is read out from the input data region, and output to the sound converting unit 10. The sound data is converted to a sound, which is output through the loud speaker 11 (Step S21). Then, the process returns to Step S11.

25 If the sound data is indirect data, i.e., if the sound data is not stored in the input data region, the sound data corresponding to the sound file name stored in the input data region is read out from the sound file 14 (Step S20). The readout sound data is output to the sound converting unit 10. The sound data is

converted to a sound, which is output through the loud speaker 11 (Step S21). Then, the process returns to Step S11.

5 The process of the above Steps S13 to S21 is repeated with respect to all the cells in the table data to output the cell data to the respective cells. Then, if it is determined in Step S12 that there is no cell in the table data region, the table data output process is ended.

10 The table data output process as described above is repeatedly executed, so that prestored numerical, character, image and sound data are read in accordance with the cell types (numerical, character, image or sound) set for the respective cells forming the table data, and displayed on the display unit or output as a
15 sound.

20 FIG. 7 shows an example of display data displayed on the display unit 12 through the table data output process. In FIG. 7, numerical or character data are displayed in cell coordinates A1 to A3 and B1 to B3 and image data are displayed in cell coordinates C1 to C3.

25 Thus, with the table processing function incorporated in the computer system 1 of the first embodiment, image data and sound data, as well as numerical and character data, can be processed as cell data of table data. Therefore, operations and procedures for treating image data and sound data in table processing

can be simpler as compared to the conventional art. In addition, the manner of expressing cell data can be more diversified, thereby improving the table processing function and increasing the convenience.

5 In the first embodiment described above, image data or sound data are displayed or output as a sound in the output region of the designated cell position. However, animation data can be displayed as cell data, if it is prestored in the image file 13.

10 Moreover, image data, sound data and animation data can be processed not only individually but can be combined with one another, so that the combination of these data can be displayed or output as a sound. Thus, the manner of expressing cell data can be much
15 more diversified.

(Second Embodiment)

A second embodiment of the present invention will be described with reference to FIGS. 8 to 11.

20 Since the block structure of the computer system of this embodiment is the same as that of the computer system 1 of the first embodiment, a drawing of the structure and a description of the functions thereof are omitted.

25 FIG. 8 is a diagram showing a data structure of cell data stored in the table data file 7 of the computer system 1 shown in FIG. 1.

Referring to FIG. 8, the cell data is constructed

by regions for storing cell position coordinate data (two dimensional coordinates (X, Y)) representing the position of a cell in the table; cell type data representing the type of cell data (e.g., 0: numerical data, 1: character data, 2: image data, 3: sound data, 4: animation data); cell attribute data; input data, i.e., input numerical, character, image, or sound data; and formula data for indicating how to synthesize numerical, image and sound data. The cell attribute data include character size data (e.g., 0: 8 point, 1: 10 point), character style data (e.g., 0: Ming-style, 1: Gothic style), layout data (e.g., 0: left-justification, 1: centering, 2: right-justification), and modification information (0: standard, 1: inverted, 2: mirroring, 3: enclosure). FIGS. 9A to 9C show examples of images based on the modification information.

FIG. 9A shows a case in which the modification information is set to "1: inverted", so that the image is displayed invertedly. FIG. 9B shows a case in which the modification information is set to "2: mirroring", so that the image is displayed as a mirror image (symmetrically). FIG. 9C shows a case in which the modification information is set to "3: enclosure", so that the image is displayed with an enclosure (emphasized with a frame).

The formula data shown in FIG. 8 represents

a content of synthesized data of image data or sound data with a simple formula. For example, the operator "+" means a bit OR process of images to be synthesized and successive generation of the sound of a left-side cell and that of a right-side cell. The operator "*" means a bit AND process of images to be synthesized.

An operation of the second embodiment will now be described.

A table data output process executed by the computer system of the second embodiment will be described with reference to the flowchart shown in FIG. 10.

First, when the name of a file of the table data displayed on the display unit 12 is designated by a predetermined operation of the input unit 3 or the mouse 4, the table data corresponding to the designated file name is retrieved from the table data file 7. Cell data of each of the cells constituting the retrieved table data is obtained (Step S31). Then, it is determined, with reference to the cell position coordinates of the obtained cell data, whether the cell is included in a preset table data cell region (Step S32).

As a result of the determination, if the cell is not included in the table data cell region, the process is ended. If the cell is included in the table data cell region, the type of the data stored in the input

data region of the cell data is discriminated (whether the data is of numerical or character, image, or sound type), with reference to the cell type data set in the cell data (Step S33). If the cell type is discriminated as character, the process advances to Step S38, in which the character data stored in the input data region of the cell is read out and displayed on the output region of the designated cell in accordance with the items set in the cell attribute (the character size, the character style, the layout and the modification information). Then, the process returns to Step S31.

If the cell type is discriminated as numerical, it is determined whether formula data is set in the designated cell (Step S34). If formula data is not set in the cell, the process advances to Step S38, in which the numerical data stored in the input data region of the cell is read out and displayed on the output region of the designated cell in accordance with the items set in the cell attribute (the character size, the character style, the layout and the modification information). Then, the process returns to Step S31.

If formula data is set in the designated cell, the numerical data in the respective cells contained in the formula is read out (Step S35), calculation of the numerical data of the respective cells is performed in accordance with the formula (Step S36), and the result

obtained by the calculation is stored in the input data region of the corresponding cell as numerical data (Step S37). The numerical data stored in the input data region is read out and displayed on the output region of the designated cell in accordance with the items set in the cell attribute (the character size, the character style, the layout and the modification information). Then, the process returns to Step S31.

If the cell type is discriminated as the image type in Step S33, it is determined whether formula data is set in the designated cell (Step S39). On the other hand, if formula data is not set in the cell, the process advances to Step 46, in which the image data stored in the input data region is read out into the processing work memory 6. Then, the readout image data is subjected to a modification process in accordance with the modification information set in the cell attribute of the cell, and a modified image pattern is stored in the processing work memory 6 (Step S42).

Subsequently, it is checked whether numerical or character data is stored in the input data region (Step S43). If numerical or character data is not stored in the input data region, the process advances to Step S47, in which the modified image pattern is read from the processing work memory 6 and stored in the data input region of the cell as input data. The modified image stored in the input data region is read out and

displayed on the output region of the cell (Step S45).
Then, the process returns to Step S31.

5 If numerical or character data is stored, numerical
or character data are synthesized on the modified image
pattern, and the synthesized data is stored in the
input data region of the cell as input data (Step S44).
The synthesized data stored in the input data region is
read out and displayed on the output region of the cell
(Step S45). Then, the process returns to Step S31.

10 If formula data is set in the designated cell in
Step S39, the image data in the respective cells
contained in the formula are read out (Step S40), and
the image data of the cells are pattern-processed (Step
S41). Subsequently, the processed image is subjected
15 to a modification process in accordance with the
modification information set in the cell attribute of
the cell and a modified image pattern is stored in the
processing work memory 6 (Step S42). Then, it is
checked whether numerical or character data is stored
20 in the input data region of the cell (Step S43).

If numerical or character data is not stored, the
process advances to Step S47, in which the modified
image pattern is stored in the input data region of the
cell as input data. The modified image is read from
25 the input data region and displayed in the output
region of the cell (Step S45). Then, the process
returns to Step S31.

An example of the image data synthesizing process using a formula will be described with reference to table data shown in FIG. 11.

In the example of table data shown in FIG. 11,
5 image data are respectively displayed in cell coordinates A1 and B1. If the formula "D1=A1+B1" as shown in FIG. 11 is set using the cell coordinates A1 and B1 as variables, the images of the cell coordinates A1 and B1 are added together and synthesized, and a synthesized
10 image is displayed in cell coordinates D1.

If the formula "D3=A1+(2× B1)" is set as shown in FIG. 11, the image of the cell coordinates A1 is added to (synthesized with) a twice-enlarged B1 image, and the synthesized image is displayed in cell coordinates
15 D3.

The following are examples of the cases where other formulas are set. If the formula "D3=A1× (-2)" is set, a 1/2 A1 image is displayed in cell coordinates D3. If the formula "D3=A1+10" is set, a 10-dot right-
20 shifted A1 image is displayed in cell coordinates D3. If the formula "D3=A1-10" is set, a 10-dot left-shifted A1 image is displayed in cell coordinates D3. If the formula "D3=INV(A1)" is set, a pattern-inverted A1 image is displayed in cell coordinates D3.

25 Sound data in cells can also be synthesized using a formula in the same manner.

The table data output process as described

above is repeatedly executed, so that prestored numerical, character, image and sound cell data are read in accordance with the cell types (numerical, character, image or sound) set for the respective cells constituting the table data, and displayed or output as a sound. Further, image data and sound data are synthesized in various patterns based on modification information in the cell attribute data set in the cell data or formula data, and displayed or output as a sound.

Thus, with the table processing function incorporated in the computer system of the second embodiment, image data and sound data, as well as numerical and character data, can be processed as cell data of table data, and various synthetic patterns of the cell data can be set and presented. Therefore, operations and procedures for treating image data and sound data in table processing can be simpler as compared to the conventional art. In addition, the manner of expressing cell data can be more diversified, thereby improving the table processing function and increasing the convenience.

In the second embodiment described above, image data or sound data, or synthesized data thereof, are displayed or output as a sound in the output region of the designated cell position. However, animation data can be synthesized and displayed as cell data, if it is

prestored in the image file 13.

In the first and second embodiments, image data is output as display data in table data displayed on the display unit 12. However, image data can be output as print data through the printer unit 9.

Further, in the above embodiments, the various control programs, the table data output processing program and the image definition processing program are stored in the ROM 5 shown in FIG. 1. However, these programs can be stored in another memory device which has a memory medium in which programs and data are prestored. The memory medium is formed of a magnetic or optical memory medium or a semiconductor memory. The memory medium may be fixed to the memory device or detachably attached thereto. The programs or data may be supplied to and stored in the memory medium from another device connected to the memory device through a communication line or the like. The other device connected to the memory device through the communication line may comprise a memory device including a memory medium, so that programs and data stored in the memory medium can be used by the apparatus of the present invention through the communication line. The memory medium stores, in the form of program codes which the CPU can read, programs for achieving the functions indicated in the flowcharts shown in FIGS. 3, 6 and 10 illustrating the operations

of the first and second embodiments of the present invention.



C L A I M S

1. A method for processing table data in a form of a table consisting of a plurality of cells, said method comprising the steps of:

5 storing data including image data in a storing device so as to respectively correspond to cells of the table data;

discriminating whether data in a designated cell of the table data to be processed is numerical data, character data or image data;

10 if the data in the designated cell is discriminated as image data, producing an image based on the image data stored in the storing device in correspondence with the designated cell; and

15 outputting the produced image to an output region of the designated cell.

2. A method for calculating table data in a form of a table consisting of a plurality of cells, said method comprising the steps of:

20 storing data in a storing device so as to respectively correspond to cells on the table;

setting a table calculation formula, using cells to which image data correspond as variables, in a cell other than the cells in which the data are input;

25 when executing a calculation based on the table calculation formula, reading image data which correspond to the cells corresponding to variables included in the





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table calculation formula;

image-processing the read image data based on the
table calculation formula; and

5 outputting the image-processed image data to
an output region of the cell in which the table
calculation formula is set.

3. A table processing apparatus for processing
table data in a form of a table consisting of a plurality
of cells, said apparatus comprising:

10 first storing means for storing image data with
image file names;

second storing means for successively storing data
input so as to respectively correspond to cells;

15 designating means for designating image definition
data including an image file name to a designated cell
in which image data is to be output;

first reading means for reading from the first
storing means the image data having the image file name
designated by the designating means;

20 writing means for writing the image data read by
the first reading means along with the image definition
data into a storage region of the second storing means
which corresponds to the designated cell;

25 first discriminating means for, every time a cell
in the table is designated, discriminating a data
content in the second storing means which corresponds
to the designated cell;

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second reading means for reading image data along with image definition data, when the first discriminating means discriminate that the data in the designated cell is image data and the image data is stored in the second storing means;

image editing means for editing the read image data based on the image definition data read along with the image data; and

first outputting means for outputting data edited by the image editing means to an output region of the designated cell.

4. The table processing apparatus according to claim 3, further comprising third reading means for reading image data from the first storing means with the file name stored in the second storing means as the image definition data corresponding to the designated cell, when the first discriminating means discriminate that the designated cell is an image cell and image data is not stored in the storage region of the second storing means which corresponds to the designated cell.

5. The table processing apparatus according to claim 3, further comprising:

second discriminating means for discriminating whether image modifying data is added to data corresponding to the designated cell in the second storing means;

image modifying means for, when the second





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discriminating means discriminate that image modifying data is added to the data of the designated cell, image-modifying the image data edited by the image editing means based on the image modifying data; and

5 second outputting means for outputting the image data modified by the image modifying means to the output region of the designated cell.

6. A memory medium including computer-readable program codes for processing table data in a form of a table consisting of a plurality of cells, said memory medium comprising:

a computer-readable program code storing data including image data in a storing device so as to respectively correspond to cells of the table data;

15 a computer-readable program code for discriminating whether data in a designated cell of the table data to be processed is numerical data, character data or image data;

20 a computer-readable program code for, if the data in the designated cell is discriminated as image data, producing an image based on the image data stored in the storing device in correspondence with the designated cell; and

25 a computer-readable program code for outputting the produced image to an output region of the designated cell.

7. A memory medium including computer-readable

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program codes for calculating table data in a form of a table consisting of a plurality of cells, said memory medium comprising:

5 a computer-readable program code for storing data in a storing device input so as to respectively correspond to cells on the table;

10 a computer-readable program code for setting a table calculation formula, using cells to which image data correspond as variables, in a cell other than the cells in which the data are input;

15 a computer-readable program code for, when executing a calculation based on the table calculation formula, reading image data which correspond to the cells corresponding to variables included in the table calculation formula;

a computer-readable program code for image-processing the read image data based on the table calculation formula; and

20 a computer-readable program code for outputting the image-processed image data to an output region of the cell in which the table calculation formula is set.

