

A SYSTEM AND METHOD FOR GENERATING A GRAPHIC FILE

FIELD OF INVENTION

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The present invention relates to a system for creating plant images and graphic pages from Plant Design documents.

BACKGROUND OF THE INVENTION

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In the prior art, when Plant Design documents are not available in an editable format, design engineers have to create an image of the documents from scratch. The images are needed for the configuration of graphic pages or graphical user interfaces. The configured graphical pages or graphical user interfaces are used for monitoring the performance of field devices in a plant or the process for manufacturing or treatment of a product. Figure 1A is an example of a Plant Design document and Figure 1B is the corresponding image which has been configured as a graphic page.

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Figure 2 illustrates a system 200 of the prior art in which a plant design document 202 is used as a visual reference. A graphic design engineer 204 uses an engineering tool 206 to create a graphic file 208 from scratch by selecting and connecting the symbols in the engineering tool according to the Plant design document. If the graphic design engineer is unable to identify the symbol in the document, he has to check with the field engineer who understands the document better. This is very inefficient.

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A lot of effort is spent selecting the correct symbol and building the relationships between the symbols. After creating the graphic file, more effort and concentration is required for verification. Verification is done by visually comparing the graphic file with the Plant Design document. The visual comparison is very tedious and time consuming. Hence, the turnover time for each graphic file for a Plant Design document is very long. Further, there is a high chance of having errors since both the creation and verification processes are done manually.

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In addition, if there are changes in the original Plant Design document, it is inefficient to update the changes in the graphic file.

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Accordingly, it is apparent that there is a need to provide a solution to provide a system and method to reduce the engineering efforts when an editable copy of the plant design document is not available.

SUMMARY OF THE INVENTION

5 The invention comprises a system for generating an editable graphic file of a non-editable image having a plurality of symbols including a recognition tool for identifying the symbols, a repository of predefined symbols, and a tracing guide.

BRIEF DESCRIPTION OF THE DRAWINGS

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Figure 1A is an example of a Plant Design document and Figure 1B is its corresponding graphic image.

Figure 2 is an illustration of the prior art system.

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Figure 3 is an illustration of a preferred embodiment of the invention.

Figure 4 is a process diagram of the invention.

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Figures 5A and 5B are examples of different symbols used to represent a given device.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

25 The present invention is a system for generating an editable graphic file of a non-editable image having multiple symbols. Each symbol represents a field device, and the image shows the relationships between the multiple field devices. The editable graphic file is suitable for creating a graphical user interface for monitoring field devices in a plant or process for making or treatment of a product.

30 A preferred embodiment of the system is illustrated in Figure 3 as a system 300. A hardcopy 302 of a plant design image is scanned with a scanner and converted into a non-editable image 304. The desired parts of the non-editable image having symbols and their relationships 306 are selected. Optionally, the selected part 306 of the image is stored in an engineering tool 308. The engineering tool includes a recognition engine
35 310, a repository 312 of predefined symbols and predefined rules for the relationships between the symbols and a tracing guide 314.

The stored image 306, the repository 312 and the tracing guide 314 are input to the recognition engine 310. The recognition engine identifies the symbols and their

relationships using the repository 312. Preferably, the recognition engine is configurable for a user to choose whether or not to identify the relationships between the symbols. The recognition engine uses the tracing guide to map the identified symbols and their relationships, generating an editable graphic file 316.

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An overview of a method of the invention is described which is followed by a more detailed description of the method.

Figure 4 is one embodiment of the method for generating an editable graphic file of a plant design document which is also known as P & ID diagrams. The generated editable graphic file is a plant image which is suitable to be applied as a graphic page for configuring a graphical user interface.

In Step 401, the P & ID diagram is converted into a non-editable P & ID image. Step 402 imports the converted image to an engineering tool 308. In the engineering tool, Step 403 generates an editable graphic file 316. The graphic file is published in Step 404 and is then used as a graphic page or configured and linked to the actual field devices for monitoring purposes.

20 A more detailed description of the method is provided below.

A hardcopy of a P & ID diagram is scanned and converted to a P & ID image. In the P & ID image, a required portion is selected for generating into an editable graphic file. The required portion can be simply one symbol which represents a field device. Otherwise, the required portion includes multiple symbols and the relationships between the symbols. The selection can be done by using any commercially available image selection software, such as Microsoft Photo Editor, Microsoft® Paint. For example, if the image is input to Microsoft Paint, the required portion is selected and cut.

30 A repository 312 of predefined symbols for field devices, and predefined rules for the relationships between the symbols is provided. In an alternative embodiment, the predefined rules can be in a different repository. The repository 312 can be modified at any time. An example of a modification is to define the symbols in the repository. For example, an Exchanger, which is a heat-transfer device, is sometimes represented by different engineers as two different symbols illustrated in Figures 5A and 5B. During the modification, an engineer can indicate which one of the two symbols he prefers to use for defining a Heat Exchanger. This ensures that there is consistency in the generated editable graphic file 316. The repository may include information such as the symbol

name, symbol mnemonic and description. In this case, the symbol name is "Heat Exchanger", the symbol mnemonic is "XCHG" and the description is "Heat transferral equipment".

5 When the repository is ready, the P & ID image is input to a recognition engine 310, which is in the engineering tool 308. The recognition engine processes the P & ID image using the repository. During the process of the configured recognition engine, each symbol is identified by matching to the repository of predefined symbols. The recognition engine is configurable whether or not to identify the relationships using the predefined
10 rules in the repository.

Preferably, artificial intelligence is applied in the identification process of the symbols and their relationships according to the configuration of the recognition engine. In the preferred embodiment, the recognition engine further uses a tracing guide 314 is to map
15 the identified symbols and their relationships, generating a layout of the P & ID image as an editable graphic file 316. In addition, the recognition engine can be configured and updated to recognise different sets of symbols and their relationships.

By using the invention, there is considerable reduction in manual engineering effort for
20 generating graphic files from scratch. A substantial portion of the graphics, components and their relationships in the P & ID diagram are automatically generated by the recognition engine in the editable graphic file. With the auto-generation of the editable graphic file, this system and method further helps to reduce engineering time. Advantageously, new engineers who are generating editable graphic files have a shorter
25 learning curve. Productivity is increased even for new engineers because of the reduction in engineering time and effort.

In the preferred embodiment, the engineer uses a module in the engineering tool, in this example, a Graphic Builder, to open the generated editable graphic file. The engineering
30 tool imports the P & ID image or its selected part which is previously input to the Recognition Engine. The imported image or part is applied as a tracing guide.

The engineer uses the tracing guide as a reference for further configuring and refining the graphic file manually. The positions of the symbols and their relationships can be
35 matched to the tracing guide, allowing a close reproduction of the P & ID diagram for an ease of verification. Further, the engineer uses the engineering tool to configure the positions of the symbols and their relationships and the opacity of the P & ID image in the tracing guide.

Advantageously, engineering effort and time is further reduced since verification using the tracing tool is more convenient and easier compared to visual verification. Less effort is required for the maintenance and synchronization of the P & ID images with the diagrams.

Thus, the invention allows valuable engineering time to be spent on the configuration of the graphic file, which has more value.

Further, additional or missing symbols and their relationships can be added to the graphic file. The identified symbols or their relationships can be modified. These steps are performed to improve the accuracy of the graphic file.

We claim :

1. A system for generating an editable graphic file of a non-editable image having a plurality of symbols including :

- 5 a. a recognition engine configurable for identifying said symbols;
 b. a repository of predefined symbols and predefined rules; and
 c. a tracing guide.

2. A system as claimed in claim 1 further including an engineering tool for importing a
10 repository of predefined symbols and configuring the positions of said identified symbols and the opacity of said tracing guide.

3. A method of generating an editable graphic file of a non-editable image having a symbol including the steps of :

- 15 a. inputting the image to a recognition engine;
 b. identifying said symbol using the recognition engine by matching the identified symbol to a predefined symbol; and
 c. generating the graphic file with the identified symbol for said selected part.

20 4. A method as claimed in claim 3 further including the step of adding a symbol to said graphic file.

5. A method as claimed in claim 3 further including the step of substituting said identified symbol in said graphic file.

25 6. A method as claimed in claim 3 further including the step of providing a tracing guide as a reference for positioning the identified symbol.

7. A method of generating an editable graphic file from a non-editable image having a
30 plurality of symbols including the steps of :

- a. selecting a part of said non-editable image, said part having a plurality of symbols;
 b. inputting the selected part to a recognition engine;
 c. identifying said plurality of symbols by matching each of said plurality of
35 identified symbols to a predefined symbol; and
 d. generating the graphic file with the identified symbol for each of said plurality of symbols.

8. A method as claimed in claim 7 further including the step of choosing whether to identify the relationships between the symbols; and

when the relationships are chosen to be identified, the method further includes identifying the relationships by applying predefined rules in the recognition engine.

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9. A method as claimed in claim 7 or 8 further including the step of adding a symbol or relationship to said graphic file.

10. A method as claimed in claim 7 or 8 further including the step of substituting an identified symbol or relationship in said graphic file.

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11. A method as claimed in claim 7 or 8 further including the step of providing a tracing guide as a reference for positioning the identified symbols or relationships.

12. A method of generating an editable graphic file from a hardcopy of a drawing including the steps of :

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a. scanning a hardcopy of said drawing and converting scanned drawing into a non-editable image;

b. selecting a part of said non-editable image, said part having a symbol;

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c. inputting the selected part to a symbol recognition tool;

d. identifying said symbol by matching the identified symbol to a predefined symbol; and

e. generating the graphic file with the identified symbol for said selected part.

13. A method as claimed in claim 12 further including the step of adding a symbol to said graphic file.

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14. A method as claimed in claim 12 further including the step of substituting said identified symbol in said graphic file.

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15. A method as claimed in claim 12 further including the step of providing a tracing guide as a reference for positioning the identified symbol.

16. A method as claimed in claim 15 wherein said step of providing a tracing guide includes the step of providing said non-editable image as a tracing guide.

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17. A method of generating an editable graphic file from a hardcopy of a drawing including the steps of :

- a. scanning a hardcopy of said drawing and converting the scanned drawing into a non-editable image;
- b. selecting a part of said non-editable image, said part having a plurality of symbols;
- 5 c. inputting the selected part to a symbol recognition tool;
- d. identifying said plurality of symbols by matching each of said plurality of identified symbols to a predefined symbol; and
- e. generating the graphic file with the matched predefined symbol for each said plurality symbols.

10 18. A method as claimed in claim 17 further including the step of choosing whether to identify the relationships between the symbols; and
when the relationships are chosen, the method further includes identifying the relationships by applying predefined rules in the recognition engine.

15 19. A method as claimed in claim 17 or 18 further including the step of adding a symbol to said graphic file.

20 20. A method as claimed in claim 17 or 18 further including the step of substituting an identified symbol or relationship in said graphic file.

21. A method as claimed in claim 16 further including the step of providing a tracing guide as a reference for positioning the identified symbols or relationships.

25 22. A method as claimed in claim 21 wherein said step of providing a tracing guide includes the step of providing said non-editable image as a tracing guide.

23. A method as claimed in any of the preceding claims 3 to 22 wherein the step of identifying the symbol or the relationship further includes using artificial intelligence.