Citation List

Patent Literature

[0003]

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Summary of Invention

Technical Problem

[0004]

In the technology disclosed in PTL 1, while the process value can be displayed in a time-series graph, determining whether the operation state of the plant is normal or abnormal may be difficult with only a single type of graph.

[0005]

Embodiments of the present invention provide a display device, a display method, a control device, a control method, and a computer program that can display an operation state of a plant using a plurality of graphs and that can contribute to analysis of the operation state from various viewpoints.

Solution to Problem

[0006]

According to a first aspect of the present invention, there is provided a display device that displays an operation state of a plant, wherein a plurality of types of graphs representing the operation state of the plant are displayed in a first region as selection options, and the operation state of the plant is displayed in a second region using the plurality of types of graphs, the plurality of types of graphs including a graph showing in time series a history of process

data indicating the operation state of the plant and a graph showing in non-time series the history of the process data common to the graph indicated in the time series, wherein in a case where a specific graph is selected from the plurality of types of graphs displayed in the first region and parameters of a vertical axis and a horizontal axis in generating the specific graph, a history of a specific process data indicating the operation state of the plant is displayed in the second region using the specific graph and the parameters, and a history of the specific process data is displayed in the second region using a specific graph selected by a specific user in a past for the specific process data and parameters of the vertical axis and the horizontal axis set by the specific user for the specific graph.

[0007]

According to a second aspect of the present invention, there is provided a display method of displaying an operation state of a plant, the display method including: a selection option display step of displaying a plurality of types of graphs representing the operation state of the plant in a first region as selection options, the plurality of types of graphs including a graph showing in time series a history of process data indicating the operation state of the plant and a graph showing in non-time series the history of the process data common to the graph indicated in the time series; and an operation state display step of displaying the operation state of the plant in a second region using any graph among the plurality of types of graphs displayed in the selection option display step, wherein in the operation state display step, in a case where a specific graph is selected from the plurality of types of graphs displayed in the first region and

parameters of a vertical axis and a horizontal axis in generating the specific graph, a history of a specific process data indicating the operation state of the plant is displayed in the second region using the specific graph and the parameters, and a history of the specific process data is displayed in the second region using a specific graph selected by a specific user in a past for the specific process data and parameters of the vertical axis and the horizontal axis set by the specific user for the specific graph.

[0008]

According to a third aspect of the present invention, there is provided a control device that controls a display device that displays an operation state of a plant, the control device including: an acquisition unit that acquires process data of the plant; a generation unit that generates a plurality of types of graphs representing the operation state of the plant based on the process data acquired by the acquisition unit, the plurality of types of graphs including a graph showing in time series a history of process data indicating the operation state of the plant and a graph showing in non-time series the history of the process data common to the graph indicated in the time series; and a display control unit that displays the plurality of types of graphs in a first region of the display device as selection options and that displays the operation state of the plant in a second region of the display device using the plurality of types of graphs, wherein in a case where a specific graph is selected from the plurality of types of graphs displayed in the first region and parameters of a vertical axis and a horizontal axis in generating the specific graph, the display control

unit displays a history of a specific process data indicating the operation state of the plant in the second region using the specific graph and the parameters, and displays a history of the specific process data in the second region using a specific graph selected by a specific user in a past for the specific process data and parameters of the vertical axis and the horizontal axis set by the specific user for the specific graph.

[0009]

According to a fourth aspect of the present invention, there is provided a control method of controlling a display device that displays an operation state of a plant, the control method including: an acquisition step of acquiring process data of the plant; a generation step of generating a plurality of types of graphs representing the operation state of the plant based on the process data acquired in the acquisition step, the plurality of types of graphs including a graph showing in time series a history of process data indicating the operation state of the plant and a graph showing in non-time series the history of the process data common to the graph indicated in the time series; and a display control step of displaying the plurality of types of graphs in a first region of the display device as selection options and of displaying the operation state of the plant in a second region of the display device using the graphs, wherein in the display control step, in a case where a specific graph is selected from the plurality of types of graphs displayed in the first region and parameters of a vertical axis and a horizontal axis in generating the specific graph, a history of a specific process data indicating the operation state of the plant is displayed in the second region using the

specific graph and the parameters, and a history of the specific process data is displayed in the second region using a specific graph selected by a specific user in a past for the specific process data and parameters of the vertical axis and the horizontal axis set by the specific user for the specific graph.

[0010]

According to a fifth aspect of the present invention, there is provided a storage unit stores a computer program causing a computer to execute a control method of controlling a display device that displays an operation state of a plant, wherein the control method includes an acquisition step of acquiring process data of the plant, a generation step of generating a plurality of types of graphs representing the operation state of the plant based on the process data acquired in the acquisition step, the plurality of types of graphs including a graph showing in time series a history of process data indicating the operation state of the plant and a graph showing in non-time series the history of the process data common to the graph indicated in the time series, and a display control step of displaying the plurality of types of graphs in a first region of the display device as selection options and of displaying the operation state of the plant in a second region of the display device using the plurality of types of graphs, wherein in the display control step, in a case where a specific graph is selected from the plurality of types of graphs displayed in the first region and parameters of a vertical axis and a horizontal axis in generating the specific graph, a history of a specific process data indicating the operation state of the plant is displayed in the second region using the specific graph and

the parameters, and a history of the specific process data is displayed in the second region using a specific graph selected by a specific user in a past for the specific process data and parameters of the vertical axis and the horizontal axis set by the specific user for the specific graph.

[0011]

In a case where such configurations and methods are employed, the plurality of types of graphs representing the operation state of the plant can be displayed in the first region of the display device as selection options. Accordingly, an operator can select any graph from the plurality of types of graphs displayed in the first region of the display device and can display the operation state of the plant in the second region of the display device using the selected graph. Accordingly, since the operation state of the plant can be displayed using the plurality of graphs, it is possible to contribute to analysis of the operation state from various viewpoints.

[0012]

As the plurality of types of graphs in each aspect of the present invention, a plurality of types of graphs representing a history of process data indicating the operation state of the plant may be employed. In addition, as the plurality of types of graphs, a plurality of types of graphs representing the common process data in different aspects (for example, a plurality of types of graphs including both of a graph showing the history of the process data in time series and a graph showing the history of the process data in non-time series) may be employed.

[0013]

By doing so, the operation state of the plant that cannot be found using only a time-series graph (for example, an operation state having a strong possibility of gradually transitioning to an abnormal state) can be specified using a non-time-series graph, and proactive measures can be performed by identifying a cause of abnormality in the plant early. It is possible to contribute to continuation of stable operation of the plant.

[0014]

The display control unit in the third aspect of the present invention may store the graphs generated by the generation unit in a storage unit. In the display control step in the fourth and fifth aspects of the present invention, the graphs generated in the generation unit may be stored in a storage unit.

[0015]

In a case where such a configuration and a method are employed, a graph that is generated in the past and used can be stored. Accordingly, for example, by storing an operator and a graph used by the operator in association with each other, it is possible to refer to a graph used by a skilled operator in the past.

[0016]

The display control unit in the third aspect of the present invention may read the graphs stored in the storage unit and display the graphs in the second region of the display device. In the display control step in the fourth and fifth aspects of the present invention, the graphs stored in the storage unit may be read and displayed in the second region of the display device.

[0017]

In a case where such a configuration and a method are employed, for example, a graph (a graph for which various items are set) used by a specific skilled operator in the past can be read, and the graph can be displayed in the second region of the display device. Accordingly, even a relatively inexperienced operator can perceive which graph is used in which arrangement (item setting) by a skilled operator in the past. Accordingly, it is possible to learn about a monitoring point, and it is possible to easily improve an operation skill level.

Advantageous Effects of Invention

[0018]

According to embodiments of the present invention, it is possible to provide a display device, a display method, a control device, a control method, and a computer program that can display an operation state of a plant using a plurality of graphs and that can contribute to analysis of the operation state from various viewpoints.

Brief Description of Drawings

[0019]

Fig. 1 is a schematic diagram illustrating an overall configuration of a plant as a target to be monitored in an embodiment of the present invention.

Fig. 2 is a diagram illustrating a functional configuration of an operation support system in the embodiment of the present invention.

Fig. 3 is a diagram illustrating an example of a graph selection setting screen displayed on a display device according to the embodiment of the present invention.

CLAIMS

1. A display device that displays an operation state of a plant,

wherein a plurality of types of graphs representing the operation state of the plant are displayed in a first region as selection options, and the operation state of the plant is displayed in a second region using the plurality of types of graphs, the plurality of types of graphs including a graph showing in time series a history of process data indicating the operation state of the plant and a graph showing in non-time series the history of the process data common to the graph indicated in the time series,

wherein in a case where a specific graph is selected from the plurality of types of graphs displayed in the first region and parameters of a vertical axis and a horizontal axis in generating the specific graph, a history of a specific process data indicating the operation state of the plant is displayed in the second region using the specific graph and the parameters, and a history of the specific process data is displayed in the second region using a specific graph selected by a specific user in a past for the specific process data and parameters of the vertical axis and the horizontal axis set by the specific user for the specific graph.

2. A display method of displaying an operation state of a plant, the display method comprising:

a selection option display step of displaying a plurality of types of graphs representing the operation state of the plant in a first region as selection options, the plurality of types of graphs including a graph showing in time series a history of process data indicating the operation state of the plant and a graph showing in non-time series the history of the process data common to the graph indicated in the time series; and

an operation state display step of displaying the operation state of the plant in a second region using any graph among the plurality of types of graphs displayed in the selection option display step,

wherein in the operation state display step, in a case where a specific graph is selected from the plurality of types of graphs displayed in the first region and parameters of a vertical axis and a horizontal axis in generating the specific graph, a history of a specific process data indicating the operation state of the plant is displayed

in the second region using the specific graph and the parameters, and a history of the specific process data is displayed in the second region using a specific graph selected by a specific user in a past for the specific process data and parameters of the vertical axis and the horizontal axis set by the specific user for the specific graph.

3. A control device that controls a display device that displays an operation state of a plant, the control device comprising:

an acquisition unit that acquires process data of the plant;

a generation unit that generates a plurality of types of graphs representing the operation state of the plant based on the process data acquired by the acquisition unit, the plurality of types of graphs including a graph showing in time series a history of process data indicating the operation state of the plant and a graph showing in non-time series the history of the process data common to the graph indicated in the time series; and

a display control unit that displays the plurality of types of graphs in a first region of the display device as selection options and that displays the operation state of the plant in a second region of the display device using the plurality of types of graphs,

wherein in a case where a specific graph is selected from the plurality of types of graphs displayed in the first region and parameters of a vertical axis and a horizontal axis in generating the specific graph, the display control unit displays a history of a specific process data indicating the operation state of the plant in the second region using the specific graph and the parameters, and displays a history of the specific process data in the second region using a specific graph selected by a specific user in a past for the specific process data and parameters of the vertical axis and the horizontal axis set by the specific user for the specific graph.

4. The control device according to claim 3, further comprising:

a reception unit that receives a selection of a graph,

wherein in a case where a selection of a specific graph from the plurality of types of graphs displayed in the first region is received by the reception unit, the display

control unit displays the operation state of the plant in the second region using the specific graph.

5. The control device according to claim 3 or 4,

wherein the display control unit stores the graphs generated by the generation unit in a storage unit.

6. The control device according to claim 5,

wherein the storage unit records a learning result of machine learning of a correlation between a specific operation state of the plant and a specific graph selected by a specific user in the specific operation state, and

wherein in a case that it is determined that the specific operation state has occurred based on the process data, the display control unit reads the graphs selected by the specific user in the specific operation state based on the learning result stored in the storage unit and displays the graphs in the second region of the display device.

7. A control method of controlling a display device that displays an operation state of a plant, the control method comprising:

an acquisition step of acquiring process data of the plant;

a generation step of generating a plurality of types of graphs representing the operation state of the plant based on the process data acquired in the acquisition step, the plurality of types of graphs including a graph showing in time series a history of process data indicating the operation state of the plant and a graph showing in non-time series the history of the process data common to the graph indicated in the time series; and

a display control step of displaying the plurality of types of graphs in a first region of the display device as selection options and of displaying the operation state of the plant in a second region of the display device using the graphs,

wherein in the display control step, in a case where a specific graph is selected from the plurality of types of graphs displayed in the first region and parameters of a vertical axis and a horizontal axis in generating the specific graph, a history of a specific

process data indicating the operation state of the plant is displayed in the second region using the specific graph and the parameters, and a history of the specific process data is displayed in the second region using a specific graph selected by a specific user in a past for the specific process data and parameters of the vertical axis and the horizontal axis set by the specific user for the specific graph.

8. The control method according to claim 7, further comprising:

a reception step of receiving a selection of a graph,

wherein in the display control step, in a case where a selection of a specific graph from the plurality of types of graphs displayed in the first region is received in the reception step, the operation state of the plant is displayed in the second region using the specific graph.

9. The control method according to claim 7 or 8,

wherein in the display control step, the graphs generated in the generation step are stored in a storage unit.

10. The control method according to claim 9,

wherein the storage unit records a learning result of machine learning of a correlation between a specific operation state of the plant and a specific graph selected by a specific user in the specific operation state, and

wherein in the display control step, in a case that it is determined that the specific operation state has occurred based on the process data, the graphs selected by the specific user in the specific operation state based on the learning result stored in the storage unit are read and displayed in the second region of the display device.

11. A storage unit stores a computer program causing a computer to execute a control method of controlling a display device that displays an operation state of a plant,

wherein the control method includes

an acquisition step of acquiring process data of the plant,

a generation step of generating a plurality of types of graphs representing the operation state of the plant based on the process data acquired in the acquisition step, the plurality of types of graphs including a graph showing in time series a history of process data indicating the operation state of the plant and a graph showing in non-time series the history of the process data common to the graph indicated in the time series, and

a display control step of displaying the plurality of types of graphs in a first region of the display device as selection options and of displaying the operation state of the plant in a second region of the display device using the plurality of types of graphs,

wherein in the display control step, in a case where a specific graph is selected from the plurality of types of graphs displayed in the first region and parameters of a vertical axis and a horizontal axis in generating the specific graph, a history of a specific process data indicating the operation state of the plant is displayed in the second region using the specific graph and the parameters, and a history of the specific process data is displayed in the second region using a specific graph selected by a specific user in a past for the specific process data and parameters of the vertical axis and the horizontal axis set by the specific user for the specific graph.

12. The storage unit according to claim 11,

wherein the control method further includes a reception step of receiving a selection of a graph, and

in the display control step, in a case where a selection of a specific graph from the plurality of types of graphs displayed in the first region is received in the reception step, the operation state of the plant is displayed in the second region using the specific graph.

13. The storage unit according to claim 11 or 12,

wherein in the display control step, the graphs generated in the generation step are stored in a storage unit.

14. The storage unit according to claim 13,

wherein the storage unit records a learning result of machine learning of a correlation between a specific operation state of the plant and a specific graph selected by a specific user in the specific operation state, and

wherein in the display control step, in a case that it is determined that the specific operation state has occurred based on the process data, the graphs selected by the specific user in the specific operation state based on the learning result stored in the storage unit are read and displayed in the second region of the display device.