SYSTEM AND METHOD FOR BIG DATA MAP VISUALIZATION BASED ON INTERNET OF THINGS AND COMPUTER PROGRAM FOR SAME

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to a system and method for big data map visualization based on Internet of things and a computer program for the same. More particularly, the present invention relates to a system and method for big data map visualization based on Internet of things and a computer program for the same, the system and method being configured to detect the state of the facility to be stored in a big data platform and display the state of the facility as visualized data.

Description of the Related Art

The Internet of Things (IoT) refers to a technology that allows various physical objects that are embedded with sensors and communication functions to become independent devices connected over the Internet, thereby providing data acquired by the objects from an external environment to a user or allowing the user to remotely control the objects. For example, when a sensor that is connected over the Internet and has its own internet protocol (IP) address transmits the sensing

information to a central server over the Internet, the user can access the server and perform processing of the sensing information, such as searching, collecting, and analyzing.

A solution was developed to monitor the state of the facility by placing sensors at each location of the facility using such an Internet of things technology.

However, since the data collected by the sensor was provided to the user without processing according to the solution in related art, and only the distribution of the data was displayed even in a case that the visualization function was provided, there was a problem that it was difficult for the user to accurately identify the state of the facility through the data.

[Documents in related art]

[Patent Document 1] Korean Patent No. 10-1783884

SUMMARY OF THE INVENTION

The present invention has been made keeping in mind the above problems occurring in the related art, and an objective of the present invention is to provide a system and method for big data map visualization based on Internet of things and a computer program for the same, the system and method being configured to be capable of detecting the state of the facility

by an Internet of things-based sensor for old facilities that are difficult to monitor continuously and providing a user with the detected data after visualizing the same, thereby accurately identifying the state of the facility.

In addition, another objective of the present invention is to provide a system and method for big data map visualization based on Internet of things and a computer program for the same, the system and method being configured to be capable of detecting and displaying various states of the facility in a complex manner, thereby enabling accurate accident prediction.

In addition, another objective of the present invention is to provide a system and method for big data map visualization based on Internet of things and a computer program for the same, the system and method being configured to be capable of accident prediction of a facility for various scenarios by utilizing public data such as weather, along with state information detected at the facility.

In addition, another objective of the present invention is to provide a system and method for big data map visualization based on Internet of things and a computer program for the same, the system and method being configured so that when a facility is found to be in a dangerous state, it is possible to easily identify whether there is a correlation with a nearby facility located around the facility.

The above objectives may be achieved by a system for big

data map visualization including a ~~complex~~ multi-sensor device detecting a state of a facility; and an information providing server analyzing time series data of the state information of the facility detected by the ~~complex~~ multi-sensor device, and providing at least one of the state information of the facility and accident prediction information of the facility as visualized data on the basis of the analyzed result.

The visualized data may include data on a type, coordinates, and color of the object, which correspond to the facility.

The data on the color may correspond to a risk level of the facility.

The information providing server may include a second communication unit receiving the state information and the time series data of the facility from the ~~complex~~ multi-sensor device; a database storing the facility information and the time series data which are received; an analysis unit analyzing the time series data; a visualization unit converting the facility information and the time series data into the visualized data; and a second control unit controlling the analysis unit to store the facility information and the time series data in the database and to generate the accident prediction information by analyzing the stored time series data, when the facility information and the time series data are received.

The second control unit may control the visualization unit so that the state of the facility is converted into the visualized data that sequentially changes for a predetermined time on the basis of the time series data.

The second control unit may control the visualization unit so that a color of the object corresponding to the facility is changed and displayed according to the state of the facility expected for a predetermined period from the present according to the accident prediction information.

The information providing server may receive public data from an external data portal server, and provide the state information and the accident prediction information of the facility by analyzing the detected state information, basic information of the facility, and the received public data.

The second control unit may control the analysis unit to analyze time series data of nearby facilities located around the facility and generate information on whether there is a correlation, as a result of analyzing the time series data, when a risk level of the facility is greater than or equal to a predetermined value, and control the visualization unit to convert the state information of the nearby facilities into visualized data to be provided together.

The system may further include an API server creating an interface that receives the accident prediction information from the information providing server and provides information

on a dangerous situation corresponding to the received accident prediction information to the outside.

Meanwhile, the above objective is achieved by a method for big data map visualization including detecting, by a ~~complex~~ multi-sensor device, a state of a facility; analyzing, by an information providing server, time series data of the detected state information of the facility; and providing, by the information providing server, at least one of the state information of the facility and accident prediction information of the facility as visualized data, on the basis of the analyzed result.

The visualized data may include data on a type, coordinates, and color of an object corresponding to the facility.

The data on the color may correspond to a risk level of the facility.

The providing as the visualized data may include converting the state of the facility into visualized data that sequentially changes during a predetermined time on the basis of the time series data and providing the same.

The providing as the visualized data may be performed by providing the visualized data in which a color of the object corresponding to the facility changes sequentially, according to the expected state of the facility for a predetermined period from the present on the basis of the accident prediction

information.

The analyzing of the time series data may be performed by analyzing time series data of nearby facilities located around the facility to generate information on whether there is a correlation when a risk level of the facility is greater than or equal to a predetermined value, as a result of analyzing the time series data; and the providing of the visualized data is performed by converting the state information of the nearby facilities into the visualized data to be provided.

The method may further include creating an API interface that transmits information on a dangerous situation corresponding to the accident prediction information to the outside.

A system and method for big data map visualization based on Internet of things and a computer program for the same according to the present invention have an advantage that it is possible to detect the state of the facility by an Internet of things-based sensor for old facilities that are difficult to monitor continuously and provide a user with the detected data after visualizing the same, thereby accurately identifying the state of the facility.

In addition, a system and method for big data map visualization based on Internet of things and a computer program for the same according to the present invention have an advantage that it is possible to detect and displaying various

states of the facility in a complex manner, thereby enabling accurate accident prediction.

In addition, a system and method for big data map visualization based on Internet of things and a computer program for the same according to the present invention have an advantage that it is possible to perform accident prediction of a facility for various scenarios by utilizing public data such as weather, along with information, such as temperature and/or humidity, slope, frequency, crack condition, etc., which are detected at the facility.

In addition, a system and method for big data map visualization based on Internet of things and a computer program for the same according to the present invention have an advantage that when a facility is found to be in a dangerous state, it is possible to easily identify whether there is a correlation with a nearby facility located around the facility.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objectives, features, and other advantages of the present invention will be more clearly understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a block diagram illustrating the configuration of a system for big data map visualization based on Internet of

things according to an embodiment of the present invention;

FIG. 2 is a block diagram illustrating the configuration of a system for big data map visualization based on Internet of things according to another embodiment of the present invention;

FIG. 3 is a block diagram illustrating the configuration of a composite sensor device according to an embodiment of the present invention;

FIG. 4 is a block diagram illustrating the configuration of a ~~complex~~ multi-sensor device according to another embodiment of the present invention,

FIG. 5 is a block diagram illustrating the configuration of an information providing server according to an embodiment of the present invention;

FIG. 6 is a diagram illustrating a data analysis process in a system for big data map visualization according to an embodiment of the present invention;

FIGS. 7A and 7B are views illustrating a user interface provided by a system for big data map visualization according to an embodiment of the present invention; and

FIG. 8 is a flowchart illustrating a method for big data map visualization according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Hereinafter, a system and method for big data map visualization based on Internet of things and a computer program for the same according to embodiments of the present invention will be described in detail with reference to the accompanying drawings.

FIG. 1 is a block diagram illustrating the configuration of a system for big data map visualization according to an embodiment of the present invention. As shown in FIG. 1, the system for big data map visualization according to an embodiment of the present invention includes a ~~complex~~ multi-sensor device 10 and an information providing server 20.

The ~~complex~~ multi-sensor device 10 detects the state of a facility 1 using at least one Internet of things-based device. Here, the facility 1 may include not only a building, but also various facilities, such as overpasses, bridges, tunnels, and retaining walls, which require accident prediction.

The information providing server 20 analyzes time series data of the state information of the facility 1 detected by the ~~complex~~ multi-sensor device 10, and provides the state information of the facility 1 as visualized data on the basis of the analyzed result.

Here, the visualized data includes data on a type, coordinates, and color of the object corresponding to the facility, and a risk level of the facility is displayed in

color so that a user may intuitively check the risk level of the facility.

Meanwhile, although not shown in the drawings, a system for big data map visualization based on Internet of things according to an embodiment of the present invention may include a gateway server for transmitting and receiving information detected by the ~~complex~~ multi-sensor device 10 with the information providing server 20. The system and devices described herein may have an aspect of entire hardware, or an aspect of partial hardware and partial software. That is, the system for big data map visualization and each device associated with the system according to the embodiments may be collectively referred to as hardware and software related thereto, which store data of a specific format and content or exchange data in an electronic communication method.

FIG. 2 is a block diagram illustrating the configuration of a system for big data map visualization based on Internet of things according to another embodiment of the present invention. As shown in FIG. 2, the system for big data map visualization according to another embodiment of the present invention may include a user device 30 and a data portal server 40.

The user device 30 receives at least one of state information of the facility 1 and accident prediction information of the facility 1 from the information providing

server 20. The user device 30 according to the present invention displays the state information and accident prediction information of the facility 1 as visualized data, receives a control command for management and control of the facility, and transmits the same to the information providing server 20.

The user device 30 according to the present invention is not limited to that shown in FIG. 1, and may also be implemented in the form of any computing device, for example, mobile communication terminals such as smartphones, personal computers, personal digital assistants (PDAs), tablets, set-top boxes for Internet Protocol Television (IPTV), etc.

The data portal server 40 provides the information providing server 20 with public data on the weather, precipitation, typhoon or heavy rain, earthquake, wind direction, wind speed, floating population, and moving vehicles at the location where the facility 1 is installed. Herein, the data portal server 40 may provide the information providing server 20 with the public data in various forms such as a data set and an API.

The information providing server 20 may define simulation on the basis of a user input received from the user device 30 and display the simulation result to the user. For example, when Internet of things-based devices are applied to simulation for the purpose of optimizing energy and/or reducing risk of

accidents, the simulation result displayed to the user may be an energy consumption amount or energy production amount corresponding to an environmental condition (e.g., time zone, temperature, humidity, weather, space, etc.), a frequency, or a crack state. When different algorithms are applied, as a result of comparing the above-described energy consumption, energy production, or accident probability, a series of control commands based on an optimal algorithm may be included.

FIG. 3 is a block diagram showing the configuration of a ~~complex~~ multi-sensor device according to an embodiment of the present invention. As shown in FIG. 3, the ~~complex~~ multi-sensor device 10 according to an embodiment of the present invention includes a basic sensor unit 11, a first communication unit 12, and a control unit 13.

The basic sensor unit 11 may include a tilt sensor, a vibration sensor, a temperature sensor, and a humidity sensor.

The tilt sensor may measure a tilt of the facility 1 by using a gyroscope method, physically opening and closing an electrical signal with reference to gravity, or using a measuring axis.

The vibration sensor may measure the vibration of the facility 1 by measuring the amplitude of acceleration in such a manner as to measure three-axis acceleration and three-axis geomagnetic.

The temperature sensor and the humidity sensor may measure

the temperature and humidity for the facility 1 or a specific location within the facility 1.

The first communication unit 12 transmits the state information of the facility 1 detected by the basic sensor unit 11 to the information providing server 20. The first communication unit 12 according to the present invention may support a multi-protocol for communication. For example, the ~~complex~~ multi-sensor device 10 is configured to be capable of communication with the information providing server 20 by using HyperText Transfer Protocol (HTTP), WebSocket, Message Queuing Telemetry Transport (MQTT), Extensible Messaging and Presence Protocol (XMPP), Bluetooth Low Energy (BLE), or LoRa WAN, LTE communication method.

The first control unit 13 collects and processes the state information of the facility 1 detected by the basic sensor unit 11, implement a wake up/sleep function, and controls the first communication unit 12 so that the state information of the facility 1 is provided to the information providing server 20 in real time or according to a predetermined time interval.

FIG. 4 is a block diagram illustrating the configuration of a ~~complex~~ multi-sensor device according to another embodiment of the present invention. As shown in FIG. 4, the ~~complex~~ multi-sensor device 10 according to another embodiment of the present invention may further include an extended sensor unit 11a and a battery unit 16.

The extended sensor unit 11a is a portion where other sensor other than the sensors included in the basic sensor unit 11 are capable of attaching and detaching, and the other sensor mounted on the extended sensor unit 11a may include a crack sensor that detects a crack state of the facility 1. The crack sensor may capture an image of a specific location of the facility 1 and then measure the separation distance in an enlarged state of the captured image, thereby detecting the crack state.

The battery unit 16 supplies power to the basic sensor unit 11, the extended sensor unit 11a, and the first communication unit 12. Meanwhile, the ~~complex~~ multi-sensor device 10 according to the present invention is connected to a battery unit 16 and a solar module 14 to enable charging. Herein, a converter 15 may be installed to provide the solar power to each component of the ~~complex~~ multi-sensor device 10.

FIG. 5 is a block diagram illustrating the configuration of an information providing server 2 according to an embodiment of the present invention. As shown in Fig. 5, the information providing server 20 according to an embodiment of the present invention includes a second communication unit 21, an analysis unit 22, a database 23, a visualization unit 24, and a second control unit 25.

The second communication unit 21 receives information on the facility 1 and state information on the facility 1 from the

~~complex~~ multi-sensor device 10. The second communication unit 21 according to the present invention may support a multi-protocol for communication and transceives information with the ~~complex~~ multi-sensor device 10 using LoRaWAN and LTE communication methods, like the first communication unit 12.

The analysis unit 22 analyzes time series data received from the second communication unit 21 under the control of the second control unit 25.

Specifically, the analysis unit 22 according to the present invention may predict an accident through trend analysis of the state data of the facility 1. The analysis unit 22 calculates a change in numerical values of the past state data of the facility 1, and determines whether the data change value exceeds the expected range.

To this end, the analysis unit 22 according to the present invention calculates a variable value in a linear or quadratic equation by regression analysis and determines that the risk of an accident is high when the received state data of the facility 1 is determined to be out of the value predicted by the calculated equation, thereby generating accident prediction information.

Further, the analysis unit 22 according to the present invention calculates a risk level on the basis of a deviation between the state data value of the facility 1 received from the ~~complex~~ multi-sensor device 10 and the value predicted by

the calculated equation. Herein, the risk level may be generated as accident prediction information. Accordingly, it is possible to provide a user with more accurate prediction information about the risk of an accident of the facility 1 as visualized data.

In addition, according to another embodiment of the present invention, the analysis unit 22 compares time series data of an analysis-target facility 1 with time series data of a nearby facility 1 located around the analysis-target facility 1 under the control of the second control unit 25, thereby further analyzing a correlation with dangerous state of the nearby facility 1.

Specifically, the analysis unit 22 checks structural characteristics or risk factors of the nearby facility 1, and reflects information on the same in the accident prediction information to be provided together. For example, when it is determined that the frequency of the analysis target facility 1 exceeds the predicted frequency, by providing information on a facility 1 which is currently under construction, among the nearby facilities 1, a user may utilize the information as a reference when determining whether the facility 1 is in dangerous state.

Here, the analysis unit 22 receives public data, such as temperature, humidity, typhoons, earthquakes, and the like, together with information on the nearby facility, and analyzes

a correlation with the nearby facility.

Meanwhile, the system for big data map visualization according to another embodiment of the present invention may further include an API server (not shown) creating an application programming interface (API) which receives the state information and accident prediction information of the facility from the information providing server 20 and providing information on dangerous situations corresponding to the same to the outside. Accordingly, the user may input data detected by the Internet of things-based device to generate accident prediction information and utilize the accident prediction information in the form of public data.

The database 23 stores information and time series data on the facility 1, which are received from the second communication unit 21 under the control of the second control unit 24, and additionally store data analyzed by the analysis unit 22. Here, the information on the facility 1 may include architectural information of the facility 1, information on the structural characteristics of the facility 1, and information on a risk factor inherent in the facility 1.

The visualization unit 24 converts the information and time series data of the facility 1 into visualized data under the control of the second control unit 25. Here, the visualized data is information for displaying an object that is capable of being displayed in 2D or 3D coordinates, and

includes information, such as a type of the object, coordinates of the object, and a color of the object.

The second control unit 25 stores the information and time series data of the facility 1 in the database 23 when the information on the facility 1 is received, and controls the visualization unit 24 to convert the stored time series data into visualized data.

In addition, the second control unit 25 according to the present invention may control the visualization unit 24 to generate accident prediction information and convert the generated accident prediction information into a form of visualized data. Here, the visualized accident prediction information may include a type of the predicted accident in the form of a text or image, an accident occurrence time, and the like.

Accordingly, the user may intuitively identify the state of the facility 1, and thus predict an accident according to the danger of the facility 1.

FIG. 6 is a diagram illustrating a data analysis process of a system for big data map visualization according to an embodiment of the present invention. As shown in FIG. 6, the analysis unit 22 according to the present invention quantifies the state information of the facility and calculates a variable value in a linear or quadratic equation by regression analysis. When it is determined that the received state data of the

facility 1 deviates from the predicted value by the calculated equation, the analysis unit 22 determines that a risk of an accident is higher, thereby generating accident prediction information. A shaded area in FIG. 6 indicates a confidence interval capable of predicting in the future. The analysis unit 22 may determine that the facility 1 is in a dangerous state when data corresponding to the state information of the facility deviates from the confidence interval.

FIGS. 7A and 7B are diagrams illustrating a user interface provided by the system for big data map visualization according to an embodiment of the present invention.

As shown in FIGS. 7A, the user interface according to the present invention may include a facility 1, a visualized state of the facility 1, and identification information of the facility 1 such as a building name. Here, the identification information of the facility 1, and location information and map data used for displaying the facility 1 on the user interface may be received from the data portal server 40 or previously stored.

In FIGS. 7A, an object corresponding to the facility 1 may be displayed in a plurality of colors, and the color of the facility 1 may be distinguished by a risk level according to the state of the facility 1. For example, when the facility 1 is displayed in red, this may mean that the facility 1 has a high risk level and thus requires inspection, and when the

facility 1 is displayed in blue, this may mean that the facility 1 has a low risk level and thus is safe.

In addition, the user may check detailed state information of the facility 1 corresponding to the object, by placing a mouse on the object corresponding to the facility 1 or directly touching the object, on the user interface. The user device 40 may store the state information of the facility 1 received from the information providing server 20, and additionally display state information of the facility 1 corresponding to the object on which the user locates the mouse or which is directly touched by the user.

FIG. 7B shows a user interface provided by a system for big data map visualization according to another embodiment of the present invention. As shown in FIG. 7B, according to another embodiment of the present invention, when the risk level of an analysis-target facility 1 is equal to or more than a predetermined value, the user interface compares time series data of the analysis-target facility 1 with time series data of nearby facilities located around the facility to additionally analyze a correlation with a dangerous state of the nearby facilities, thereby providing the state information of the nearby facilities together as visualized data.

In addition, the system for big data map visualization according to the present invention may display the state of the facility 1 as visualized data that sequentially changes for a

predetermined time on the basis of the time series data.

Specifically, the second control unit 25 of the system for big data map visualization according to the present invention controls the visualization unit 24 so that the color of the object corresponding to the facility 1 is changed to be displayed according to time series data on the state of the facility 1 for a predetermined time from a specific point in the past to the present.

In addition, in the system for big data map visualization according to the present invention, the second control unit 25 may control the visualization unit 24 so that the color of the object is changed to be displayed according to the expected state of the facility 1 for a predetermined period from the present according to the accident prediction information analyzed by the analysis unit 22.

Accordingly, the user may intuitively identify the state of the facility 1 through the user interface.

FIG. 8 is a flowchart illustrating a visualization method of a system for big data map visualization according to an embodiment of the present invention.

First, the ~~complex~~ multi-sensor device 10 detects the state of the facility 1 (S10).

In addition, the information providing server 20 analyzes time series data of the state information of the facility 1 detected in step S10 (S20).

The information providing server 20 provides the state information of the facility 1 as visualized data on the basis of the result analyzed in step S20 (S30).

Here, in step S20, the time series data is analyzed to generate accident prediction information, and in step S30, the accident prediction information is provided as visualized data.

Herein, in step S30, the state of the facility 1 may be converted into visualized data that changes sequentially for a predetermined time and provided on the basis of the time series data, and the visualized data, in which the color of the object corresponding to the facility 1 changes sequentially, may be provided according to the expected state of the facility 1 for a predetermined period from the present on the basis of the accident prediction information

In addition, the visualization method of the system for big data map visualization according to another embodiment of the present invention may be configured so that time series data of a nearby facility 1 located around the facility 1 is analyzed to generate information on whether there is a correlation with the nearby facility, when the risk level of the facility 1 is greater than or equal to a predetermined value as an analysis result of the time series data in step S20, and the state information of the nearby facility 1 is converted into visualized data to be provided together in step S30. Accordingly, when the state of the facility 1 is in a

dangerous state and thus requires inspection, it is possible to visually identify the cause.

In addition, the visualization method of the system for big data map visualization according to another embodiment of the present invention may further include generating an API interface which transmits information on a dangerous situation corresponding to the accident prediction information to the outside. Accordingly, the accident prediction information may be used in various ways in a platform that monitors whether the facility 1 is in a dangerous state.

The operation of the visualization method of the system for big data map visualization according to the embodiments described above may be implemented at least partially as a computer program and recorded in a computer-readable recording medium. A computer-readable recording medium in which a program for implementing an operation by the method for automatically generating product information according to the embodiments is recorded and includes all types of recording devices in which data that can be read by a computer is stored. Examples of computer-readable recording media include ROM, RAM, CD-ROM, magnetic tapes, floppy disks, and optical data storage devices. In addition, the computer-readable recording medium may be distributed over a computer system connected through a network, and computer-readable codes may be stored and executed in a distributed manner. In addition, functional programs,

codes, and code segments for implementing the present embodiment may be easily understood by those skilled in the art to which the present embodiment belongs.

What has been described above is only an embodiment for implementing a system and method for big data map visualization based on Internet of things and a computer program for the same according to the present invention, and the present invention is not limited to the above embodiments. Without departing from the gist of the present invention claimed in the following claims, anyone of ordinary skill in the art to which the present invention pertains will have the technical spirit of the present invention to the extent possible by making various changes.

WHAT IS CLAIMED IS:

1. A system for big data map visualization, the system comprising:

a ~~complex~~ multi-sensor device detecting a state of a facility; and

an information providing server analyzing time series data of the state information of the facility detected by the ~~complex~~ multi-sensor device, and providing at least one of the state information of the facility and accident prediction information of the facility as visualized data on the basis of the analyzed result,

wherein the information providing server comprises:

a second communication unit receiving the state information and the time series data of the facility from the multi-sensor device;

a database storing the facility information and the time series data which are received;

an analysis unit analyzing the time series data;

a visualization unit converting the facility information and the time series data into the visualized data; and

a second control unit controlling the analysis unit to store the facility information and the time series data in the database and to generate the accident prediction information by analyzing the stored time series data, when the facility

information and the time series data are received,

wherein the information providing server receives public data including at least one of the weather, precipitation, typhoon or heavy rain, earthquake, wind direction, wind speed, floating population, and moving vehicles at the location from an external data portal server; and

provides the state information and the accident prediction information of the facility by analyzing the detected state information, basic information of the facility, and the received public data along with information including at least one of temperature, humidity, slope, frequency and crack condition which are detected at the facility,

controls the analysis unit to analyze time series data of nearby facilities located around the facility and generate information on whether there is a correlation, as a result of analyzing the time series data, when a risk level of the facility is greater than or equal to a predetermined value

and controls the visualization unit to convert the state information of the nearby facilities into visualized data to be provided together.

2. The system of claim 1, wherein the visualized data includes data on a type, coordinates, and color of the object, which correspond to the facility.

3. The system of claim 2, wherein the data on the color corresponds to a risk level of the facility.

~~4. The system of claim 1, wherein the information providing server comprises:~~

~~a second communication unit receiving the state information and the time series data of the facility from the complex sensor device;~~

~~a database storing the facility information and the time series data which are received;~~

~~an analysis unit analyzing the time series data;~~

~~a visualization unit converting the facility information and the time series data into the visualized data; and~~

~~a second control unit controlling the analysis unit to store the facility information and the time series data in the database and to generate the accident prediction information by analyzing the stored time series data, when the facility information and the time series data are received.~~

~~5~~4. The system of claim 1~~4~~, wherein the second control unit controls the visualization unit so that the state of the facility is converted into the visualized data that sequentially changes for a predetermined time on the basis of the time series data.

~~6~~5. The system of claim ~~5~~4, wherein the second control unit controls the visualization unit so that a color of the object corresponding to the facility is changed and displayed according to the state of the facility expected for a predetermined period from the present according to the accident prediction information.

~~7. The system of claim 4, wherein the information providing server~~

~~receives public data from an external data portal server; and~~

~~provides the state information and the accident prediction information of the facility by analyzing the detected state information, basic information of the facility, and the received public data.~~

~~8. The system of claim 4, wherein the second control unit~~

~~controls the analysis unit to analyze time series data of nearby facilities located around the facility and generate information on whether there is a correlation, as a result of analyzing the time series data, when a risk level of the facility is greater than or equal to a predetermined value, and~~

~~controls the visualization unit to convert the state information of the nearby facilities into visualized data to be~~

~~provided together.~~

~~9~~6. The system of claim ~~4~~1, further comprising:

an API server creating an interface that receives the accident prediction information from the information providing server and provides information on a dangerous situation corresponding to the received accident prediction information to the outside.

~~10~~7. A method for big data map visualization, the method comprising:

detecting, by a ~~complex~~ multi-sensor device, a state of a facility;

analyzing, by an information providing server, time series data of the detected state information of the facility; and

providing, by the information providing server, at least one of the state information of the facility and accident prediction information of the facility as visualized data, on the basis of the analyzed result~~.~~,

wherein the analyzing time series data includes generating the accident prediction information by analyzing the stored time series data

providing as visualized data is performed by converting the accident prediction information into the visualized data to be provided,

wherein the information providing server

receives public data on the weather, precipitation, typhoon or heavy rain, earthquake, wind direction, wind speed, floating population, and moving vehicles at the location from an external data portal server; and

provides the state information and the accident prediction information of the facility by analyzing the detected state information, basic information of the facility, and the received public data along with information including at least one of temperature, humidity, slope, frequency and crack condition which are detected at the facility,

wherein the analyzing of the time series data is performed by analyzing time series data of nearby facilities located around the facility to generate information on whether there is a correlation when a risk level of the facility is greater than or equal to a predetermined value, as a result of analyzing the time series data; and

the providing of the visualized data is performed by converting the state information of the nearby facilities into the visualized data to be provided.

~~11~~8. The method of claim ~~10~~7, wherein the visualized data includes data on a type, coordinates, and color of an object corresponding to the facility.

~~12~~9. The method of claim ~~11~~8, wherein the data on the color corresponds to a risk level of the facility.

~~13~~10. The method of claim ~~10~~7, wherein the providing as the visualized data includes converting the state of the facility into visualized data that sequentially changes during a predetermined time on the basis of the time series data and providing the same.

~~14~~11. The method of claim ~~13~~10, wherein the providing as the visualized data is performed by providing the visualized data in which a color of the object corresponding to the facility changes sequentially, according to the expected state of the facility for a predetermined period from the present on the basis of the accident prediction information.

~~15. The method of claim 10, wherein the analyzing of the time series data is performed by analyzing time series data of nearby facilities located around the facility to generate information on whether there is a correlation when a risk level of the facility is greater than or equal to a predetermined value, as a result of analyzing the time series data; and~~

~~the providing of the visualized data is performed by converting the state information of the nearby facilities into~~

~~the visualized data to be provided.~~

~~16~~12. The method of claim ~~10~~7, further comprising:

creating an API interface that transmits information on a dangerous situation corresponding to the accident prediction information to the outside.

~~17~~13. A computer program combined with hardware and stored in a recording medium to execute the system and method for big data map visualization based on Internet of things according to any one of claims ~~10~~ 7 to ~~16~~12.