DESCRIPTION

INDUSTRIAL VEHICLE REMOTE OPERATION SYSTEM, COMMUNICATION DEVICE, INDUSTRIAL VEHICLE, AND COMPUTER READABLE STORAGE MEDIUM FOR STORING INDUSTRIAL VEHICLE REMOTE OPERATION PROGRAM

TECHNICAL FIELD

[0001] The present invention relates to an industrial vehicle remote operation system, a communication device, an industrial vehicle, and a computer-readable storage medium for storing an industrial vehicle remote operation program.

BACKGROUND ART

[0002] Patent Document 1 describes a remote controller that is used as a communication device for remote operation of a forklift, which is an industrial vehicle. The remote controller uses a remote operation means, which serves as an operation controller, to remotely control the cargo handling operation of a forklift from a position that is separated from the forklift.

PRIOR ART DOCUMENT

Patent Document

[0003] Patent Document 1: Japanese Laid-Open Patent Publication No. 2002-104800

SUMMARY OF THE INVENTION

Problems that the Invention is to Solve

[0004] For convenience reasons, the operator who remotely operates an industrial vehicle may want to use a plurality of types of operation controllers according to the remote operation mode. Further, there may be situations where the operator wants to add a new operation controller for remote operation that differs in type from the operation controller currently used.

[0005] It is an objective of the present invention to

provide an industrial vehicle remote operation system, a communication device, an industrial vehicle, and a computer-readable storage medium for storing an industrial vehicle remote operation program that have improved convenience.

Means for Solving the Problems

[0006] In accordance with a first aspect of the present disclosure, an industrial vehicle remote operation system is provided that includes an industrial vehicle including a vehicle communication portion and a communication device configured to be used for remote operation of the industrial vehicle. The industrial vehicle includes a first signal conversion portion configured to convert a remote instruction signal of a predetermined data format into a control signal of a data format different from the data format of the remote instruction signal. The industrial vehicle is configured to operate based on the control signal converted by the first signal conversion portion. The communication device includes a reception portion configured to receive an operation signal, which is output by an operation controller, an obtainment portion configured to obtain a conversion program for converting the operation signal into the remote instruction signal, a storage portion configured to store the conversion program, a second signal conversion portion configured to convert the operation signal into the remote instruction signal using the conversion program stored in the storage portion, and a communication device communication portion configured to send the remote instruction signal to the vehicle communication portion. The reception portion is configured to receive a plurality of types of operation signals that are output by a plurality of types of operation controllers and have different data formats. The communication device includes an update portion configured to update information stored

in the storage portion so as to enable addition, deletion, or change of one or more of the operation signals that are convertible by the second signal conversion portion.

[0007] In accordance with a second aspect of the present disclosure, a communication device is provided that includes a vehicle communication portion configured to receive a remote instruction signal of a predetermined data format and a first signal conversion portion configured to convert the remote instruction signal into a control signal of a data format different from the data format of the remote instruction signal. The communication device is configured to be used for remote operation of an industrial vehicle that operates based on the control signal converted by the first signal conversion portion. The communication device further includes a reception portion configured to receive an operation signal, which is output by an operation controller, an obtainment portion configured to obtain a conversion program, which converts the operation signal into the remote instruction signal, a storage portion configured to store the conversion program, a second signal conversion portion configured to convert the operation signal into the remote instruction signal using the conversion program stored in the storage portion, and a communication device communication portion configured to send the remote instruction signal to the vehicle communication portion. The reception portion is configured to receive a plurality of types of operation signals that are output by a plurality of types of operation controllers and have different data formats. The communication device includes an update portion configured to update information stored in the storage portion so as to enable addition, deletion, or change of one or more of the operation signals that are convertible by the second signal conversion portion.

[0008] In accordance with a third aspect of the present disclosure, an industrial vehicle configured to

operate based on a control signal is provided. The industrial vehicle includes a reception portion configured to receive an operation signal, which is output by an operation controller, an obtainment portion configured to obtain a control conversion program, which converts the operation signal into the control signal, a storage portion configured to store the control conversion program, and a signal conversion portion configured to convert the operation signal into the control signal using the control conversion program stored in the storage portion. The reception portion is configured to receive a plurality of types of operation signals that are output by a plurality of types of operation controllers and have different data formats. The industrial vehicle includes an update portion configured to update information stored in the storage portion so as to enable addition, deletion, or change of one or more of the operation signals that are convertible by the signal conversion portion.

[0009] In accordance with a fourth aspect of the present disclosure, a computer-readable storage medium is provided that stores an industrial vehicle remote operation program used for an industrial vehicle remote operation by a communication device. The industrial vehicle includes a vehicle communication portion configured to receive a remote instruction signal of a predetermined data format, and a first signal conversion portion configured to convert the remote instruction signal into a control signal of a data format different from the data format of the remote instruction signal. The industrial vehicle is configured to operate based on the control signal converted by the first signal conversion portion. The communication device includes a reception portion configured to receive an operation signal, which is output by an operation controller, a storage portion configured to store a conversion program for converting the operation signal into the remote instruction signal, a communication device

communication portion configured to communicate with the vehicle communication portion, and a second signal conversion portion configured to convert the operation signal into the remote instruction signal. The industrial vehicle remote operation program includes instructions for executing, using the communication device, processes of: causing the second signal conversion portion to convert the operation signal into the remote instruction signal using the conversion program stored in the storage portion; instructing the communication device communication portion to send the remote instruction signal to the vehicle communication portion; and updating information stored in the storage portion so as to enable addition, deletion, or change of an operation signal that is convertible by the second signal conversion portion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Fig. 1 is a schematic view showing an industrial vehicle remote operation system of a first embodiment.

Fig. 2 is a block diagram schematically showing the electrical structure of the industrial vehicle remote operation system.

Fig. 3 is a schematic view showing vehicle signal conversion data.

Fig. 4 is a flowchart of a signal conversion process.

Fig. 5 is a flowchart of a conversion program update process.

Fig. 6 is a front view showing a communication device in a state where a request screen is displayed on the touch panel.

Fig. 7 is a flowchart of a selection process.

Fig. 8 is a front view showing the communication device in a state where a selection screen is displayed on the touch panel.

Fig. 9 is a flowchart of a signal conversion process in a second embodiment.

communication device 30. This allows the communication device 30 to identify the standard of the forklift 20. The standard of the forklift 20 may include the possible traveling speed, for example.

[0035] As shown in Fig. 2, the communication device 30 includes a communication device CPU 31, a communication device memory 32, a communication device communication portion 35, a program obtainment portion 36, a touch panel 37, and a reception portion 38.

[0036] The communication device CPU 31 is configured to perform various processes using various programs stored in the communication device memory 32. The communication device CPU 31 is electrically connected to the communication device communication portion 35 and the reception portion 38 so as to exchange signals with the communication device communication portion 35 and the reception portion 38.

[0037] The communication device memory 32 includes a conversion program storage area 33, which stores conversion programs TP used for converting operation signals SGx into remote instruction signals SGb, and a remote operation program 34, which is used for remote operation of the forklift 20. The conversion program storage area 33 may be a readable and writable RAM or a flash memory. The conversion program storage area 33 corresponds to a storage portion, and the remote operation program 34 corresponds to an industrial vehicle remote operation program. The communication device memory 32 corresponds to a computer-readable storage medium, which stores the industrial vehicle remote operation program. The computer-readable storage medium may be any storage medium that stores various computer programs in any form such as electronic, magnetic, optical, or electromagnetic form. The computer-readable storage medium may include a non-transitory computer-readable storage medium.

[0038] The remote operation program 34 includes a

signal conversion execution program 34a, which causes the communication device CPU 31 to perform a signal conversion process, and an update execution program 34b, which causes the communication device CPU 31 to perform a conversion program update process. These programs are described below. The remote operation program 34 includes instructions for performing various processes using the communication device 30.

[0039] The communication device communication portion 35 is configured to exchange signals with the vehicle communication portion 28. In the present embodiment, the communication device communication portion 35 communicates wirelessly with the vehicle communication portion 28, allowing the communication device 30 and the forklift 20 to exchange signals between each other. The communication system used between the vehicle communication portion 28 and the communication device communication portion 35 may be any system such as Bluetooth (registered trademark), Zigbee (registered trademark), or Wi-Fi, for example.

[0040] In the present embodiment, the remote instruction signal SGb conforms to the wireless communication system used between the communication device communication portion 35 and the vehicle communication portion 28. Specifically, the data format of the remote instruction signal SGb is set in conformance to the standard of the wireless communication between the communication device communication portion 35 and the vehicle communication portion 28.

[0041] The program obtainment portion 36 is used to obtain conversion programs TP. The program obtainment portion 36 is configured to access a server that stores conversion programs TP via the Internet, for example, and obtain a desired conversion program TP by accessing the server. However, the specific configuration of the program obtainment portion 36 is not limited to this configuration and may be set freely. For example, the program obtainment portion 36 may be a reader or an interface capable of

12. A computer-readable storage medium that stores an industrial vehicle remote operation program used for remote operation by a communication device, wherein

the industrial vehicle includes

a vehicle communication portion configured to receive a remote instruction signal of a predetermined data format, and

a first signal conversion portion configured to convert the remote instruction signal into a control signal of a data format different from the data format of the remote instruction signal,

the industrial vehicle is configured to operate based on the control signal converted by the first signal conversion portion,

the communication device includes

a reception portion configured to receive an operation signal, which is output by an operation controller,

a storage portion configured to store a conversion program for converting the operation signal into the remote instruction signal,

a communication device communication portion configured to communicate with the vehicle communication portion, and

a second signal conversion portion configured to convert the operation signal into the remote instruction signal,

the industrial vehicle remote operation program includes instructions for executing, using the communication device, processes of

causing the second signal conversion portion to convert the operation signal into the remote instruction signal using the conversion program stored in the storage portion,