CLAIMS

1. A device for managing a schedule of a voyage made by a ship sailing on a sailing route from a departure port to a destination port, the ship visiting one or more ports on a remaining part of the sailing route from a reference location to the destination port, comprising:

an acquisition unit that acquires a voyage schedule data set indicating a schedule of the voyage containing a reference time when the ship is located at the reference location, a starting time of a time period during which the ship is docked at a berth of each of the one or more ports, an ending time of the time period and an arrival time when the ship arrives at the destination port; distance data sets indicating a distance between the reference location and a subsequent port and a distance between two ports with regard to each set of two consecutive ports on the remaining part of the sailing route; and fuel consumption rate data sets each indicating a fuel consumption rate when the ship sails at a certain sailing speed,

a calculation unit that calculates a sailing speed at which the ship sails from the reference location to a subsequent port and a sailing speed at which the ship sails from a port to a subsequent port with regard to each set of two consecutive ports on the remaining part of the sailing route, and calculates fuel consumption required for the ship to sail from the reference location to the destination port, based on the voyage schedule data set, the distance data sets and the fuel consumption rate data sets, and

an output unit that outputs a data set indicating the fuel consumption calculated by the calculation unit.

2. The device according to claim 1, wherein

the acquisition unit acquires the voyage schedule data set as a first voyage schedule data set,

the acquisition unit acquires a second voyage schedule data set indicating a schedule of the voyage that is different from the schedule of the voyage indicated by the first voyage schedule data set with regard to at least one of the starting times, the ending times and the arrival time,

the calculation unit calculates the fuel consumption as first fuel consumption,

the calculation unit calculates a sailing speed at which the ship sails from the reference location to a subsequent port and a sailing speed at which the ship sails from a port to a subsequent port with

regard to each set of two consecutive ports on the remaining part of the sailing route, and calculates fuel consumption required for the ship to sail from the reference location to the destination port as second fuel consumption, based on the second voyage schedule data set, the distance data sets and the fuel consumption rate data sets, and

the output unit outputs a data set indicating the second fuel consumption.

3. The device according to claim 2, wherein

the acquisition unit acquires an original voyage data set indicating an original schedule of the voyage containing a starting time of a time period during which the ship is docked at a berth of each of the one or more ports, an ending time of the time period and an arrival time when the ship arrives at the destination port, and

the output unit outputs a data set indicating a difference between an original time and a modified time, the original time being one of the starting times, the ending times and the arrival time contained in the schedule of the voyage indicated by the original voyage schedule data set, the modified time being a time contained in the schedule of the voyage indicated by the modified voyage schedule data set corresponding to the original time.

4. The device according to claim 2 or 3, wherein

the acquisition unit acquires a third voyage schedule data set indicating a schedule of the voyage that is different from the schedule of the voyage indicated by the second voyage schedule data set with regard to at least one of the starting times, the ending times and the arrival time,

the calculation unit calculates a sailing speed at which the ship sails from the reference location to a subsequent port and a sailing speed at which the ship sails from a port to a subsequent port with regard to each set of two consecutive ports on the remaining part of the sailing route, and calculates fuel consumption required for the ship to sail from the reference location to the destination port as third fuel consumption, based on the third voyage schedule data set, the distance data sets and the fuel consumption rate data sets,

the calculation unit compares the second fuel consumption and the third fuel consumption, and

the output unit outputs a data set indicating a result of the comparison performed by the calculation unit.

5. The device according to any one of claims 1 to 4, wherein

each of the fuel consumption rate data sets indicates a fuel

consumption rate when the ship sails at a certain sailing speed under a certain maritime weather condition that affects fuel consumption,

the acquisition unit acquires maritime weather data sets indicating maritime weather conditions under which the ship sails on the remaining part of the sailing route, and

the calculation unit specifies the fuel consumption rate data sets each of which corresponds to a combination of a sailing speed at which the ship sails on a section of the remaining part of the sailing route calculated by the calculation unit and a maritime weather condition under which the ship sails on the section of the remaining part of the sailing route indicated by one of the maritime weather data sets acquired by the acquisition unit, and calculates the fuel consumption required for the ship to sail from the reference location to the destination port based on the specified fuel consumption rate data sets.

6. The device according to any one of claims 1 to 5, wherein

the acquisition unit acquires an actual fuel consumption data set indicating fuel consumption that is used for the ship to sail from the departure port to the reference location, and

the calculation unit calculates total fuel consumption required for the ship to sail from the departure port to the destination port by adding the fuel consumption indicated by the actual fuel consumption data set to the fuel consumption required for the ship to sail from the reference location to the destination port calculated by the calculation unit.

7. The device according to any one of claims 1 to 6, wherein

when the calculation unit calculates the fuel consumption required for the ship to sail from the reference location to the destination port, the calculation unit calculates fuel consumption required for the ship to sail from the reference location to a subsequent port and fuel consumption required for the ship to sail from a port to a subsequent port with regard to each set of two consecutive ports on the remaining part of the sailing route as sectional fuel consumption, and

the output unit outputs data sets indicating the sectional fuel consumption.

8. A program for causing a computer to execute, for managing a schedule of a voyage made by a ship sailing on a sailing route from a departure port to a destination port, the ship visiting one or more ports on a remaining part of the sailing route from a reference

location to the destination port,

acquiring a voyage schedule data set indicating a schedule of the voyage containing a reference time when the ship is located at the reference location, a starting time of a time period during which the ship is docked at a berth of each of the one or more ports, an ending time of the time period and an arrival time when the ship arrives at the destination port,

acquiring distance data sets indicating a distance between the reference location and a subsequent port and a distance between two ports with regard to each set of two consecutive ports on the remaining part of the sailing route,

acquiring fuel consumption rate data sets each indicating a fuel consumption rate when the ship sails at a certain sailing speed,

calculating a sailing speed at which the ship sails from the reference location to a subsequent port and a sailing speed at which the ship sails from a port to a subsequent port with regard to each set of two consecutive ports on the remaining part of the sailing route, and calculating fuel consumption required for the ship to sail from the reference location to the destination port, based on the voyage schedule data set, the distance data sets and the fuel consumption rate data sets, and

outputting a data set indicating the calculated fuel consumption.

9. A computer-readable recording medium continuously storing a program for causing a computer to execute, for managing a schedule of a voyage made by a ship sailing on a sailing route from a departure port to a destination port, the ship visiting one or more ports on a remaining part of the sailing route from a reference location to the destination port,

acquiring a voyage schedule data set indicating a schedule of the voyage containing a reference time when the ship is located at the reference location, a starting time of a time period during which the ship is docked at a berth of each of the one or more ports, an ending time of the time period and an arrival time when the ship arrives at the destination port,

acquiring distance data sets indicating a distance between the reference location and a subsequent port and a distance between two ports with regard to each set of two consecutive ports on the remaining part of the sailing route,

acquiring fuel consumption rate data sets each indicating a fuel consumption rate when the ship sails at a certain sailing speed,

calculating a sailing speed at which the ship sails from the reference location to a subsequent port and a sailing speed at which the ship sails from a port to a subsequent port with regard to each set of two consecutive ports on the remaining part of the sailing route, and calculating fuel consumption required for the ship to sail from the reference location to the destination port, based on the voyage schedule data set, the distance data sets and the fuel consumption rate data sets, and

outputting a data set indicating the calculated fuel consumption.

10. A method for managing a schedule of a voyage made by a ship sailing on a sailing route from a departure port to a destination port, the ship visiting one or more ports on a remaining part of the sailing route from a reference location to the destination port, comprising:

a step for acquiring a voyage schedule data set indicating a schedule of the voyage containing a reference time when the ship is located at the reference location, a starting time of a time period during which the ship is docked at a berth of each of the one or more ports, an ending time of the time period and an arrival time when the ship arrives at the destination port,

a step for acquiring distance data sets indicating a distance between the reference location and a subsequent port and a distance between two ports with regard to each set of two consecutive ports on the remaining part of the sailing route,

a step for acquiring fuel consumption rate data sets each indicating a fuel consumption rate when the ship sails at a certain sailing speed,

a step for calculating a sailing speed at which the ship sails from the reference location to a subsequent port and a sailing speed at which the ship sails from a port to a subsequent port with regard to each set of two consecutive ports on the remaining part of the sailing route, and calculating fuel consumption required for the ship to sail from the reference location to the destination port, based on the voyage schedule data set, the distance data sets and the fuel consumption rate data sets, and

a step for outputting a data set indicating the calculated fuel consumption.

CLAIMS

[Claim 1] A device for managing a schedule of a voyage made by a ship sailing on a sailing route from a departure port to a destination port, the ship visiting one or more ports on a remaining part of the sailing route from a reference location to the destination port, comprising:

an acquisition unit that acquires a reference time when the ship is located at the reference location; distance data sets indicating a distance between the reference location and a subsequent port and a distance between two ports with regard to each set of two consecutive ports on the remaining part of the sailing route; fuel consumption rate data sets each indicating a fuel consumption per unit sailing distance when the ship sails at a certain sailing speed; a first voyage schedule data set indicating a first schedule of the voyage containing a starting time of a time period during which the ship is docked at a berth of each of the one or more ports, an ending time of the time period and an arrival time when the ship arrives at the destination port; and a second voyage schedule data set indicating a second schedule of the voyage that is different from the first schedule of the voyage indicated by the first voyage schedule data set with regard to at least one of the starting times, the ending times and the arrival time,

a calculation unit that calculates, based on the first voyage schedule data set and the distance data sets, a sailing speed at which the ship sails from the reference location to a subsequent port and a sailing speed at which the ship sails from a port to a subsequent port with regard to each set of two consecutive ports on the remaining part of the sailing route; calculates, based on the calculated sailing speed, the distance data sets, and the fuel consumption rate data sets, first fuel consumption required for the ship to sail from the reference location to the destination port; calculates, based on the second voyage schedule data set, the distance data sets, and the fuel consumption rate data sets, a sailing speed at which the ship sails from the reference location to a subsequent port and a sailing speed at

which the ship sails from a port to a subsequent port with regard to each set of two consecutive ports on the remaining part of the sailing route, and calculates, based on the calculated sailing speed, second fuel consumption required for the ship to sail from the reference location to the destination port as second fuel consumption, and

an output unit that outputs a data set indicating the first fuel consumption and the second fuel consumption calculated by the calculation unit.

[Claim 2] The device according to claim 1, wherein

the acquisition unit acquires a third voyage data set indicating a schedule of the voyage containing a starting time of a time period during which the ship is docked at a berth of each of the one or more ports, an ending time of the time period and an arrival time when the ship arrives at the destination port, the schedule being different from the schedule of the voyage indicated by the first voyage schedule data set and the schedule of the voyage indicated by the second voyage schedule data set, with regard to at least one of the starting times, the ending times and the arrival time, and

the output unit outputs a data set indicating a difference between a time and another time, the time being at least one of the starting times, the ending times and the arrival time contained in the schedule of the voyage indicated by the second voyage schedule data set, the other time being a time contained in the schedule of the voyage indicated by the third voyage schedule data set, the other time corresponding to the at least one of the starting times, the ending times and the arrival time contained in the schedule of the voyage indicated by the second voyage schedule data set.

[Claim 3] The device according to claim 1 or 2, wherein

the acquisition unit acquires a fourth voyage schedule data set indicating a schedule of the voyage that is different from the schedule of the voyage indicated by the second voyage schedule data set with regard to at least one of the starting times, the ending times and the arrival time,

the calculation unit calculates, based on the fourth voyage schedule data set, the distance data sets, and the fuel consumption rate data sets, a sailing speed at which the ship sails from the reference location to a subsequent port and a sailing speed at which the ship sails from a port to a subsequent port with regard to each set of two consecutive ports on the remaining part of the sailing route, and calculates, based on the calculated sailing speed, fuel consumption required for the ship to sail from the reference location to the destination port as third fuel consumption,

the calculation unit compares the second fuel consumption and the third fuel consumption, and

the output unit outputs a data set indicating a result of the comparison performed by the calculation unit.

[Claim 4] The device according to any one of claims 1 to 3, wherein

each of the fuel consumption rate data sets indicates a fuel consumption rate when the ship sails at a certain sailing speed under a certain maritime weather condition that affects fuel consumption,

the acquisition unit acquires maritime weather data sets indicating maritime weather conditions under which the ship sails on the remaining part of the sailing route, and

the calculation unit specifies, based on the fuel consumption rate data sets, fuel consumptions each of which corresponds to a combination of a sailing speed at which the ship sails on a section of the remaining part of the sailing route calculated by the calculation unit and a maritime weather condition under which the ship sails on the section of the remaining part of the sailing route indicated by one of the maritime weather data sets acquired by the acquisition unit, and calculates, based on the specified fuel consumptions, the fuel consumption required for the ship to sail from the reference location to the destination port.

[Claim 5] The device according to any one of claims 1 to 4, wherein

the acquisition unit acquires an actual fuel consumption data set indicating fuel consumption that is used for the ship to sail from the departure port to the reference location, and

the calculation unit calculates total fuel consumption required for the ship to sail from the departure port to the destination port by adding the fuel consumption indicated by the actual fuel consumption data set to the fuel consumption required for the ship to sail from the reference location to the destination port calculated by the calculation unit.

[Claim 6] The device according to any one of claims 1 to 5, wherein

when the calculation unit calculates the fuel consumption required for the ship to sail from the reference location to the destination port, the calculation unit calculates, as sectional fuel consumption, fuel consumption required for the ship to sail from the reference location to a subsequent port and fuel consumption required for the ship to sail from a port to a subsequent port with regard to each set of two consecutive ports on the remaining part of the sailing route, and

the output unit outputs data sets indicating the sectional fuel consumption.

[Claim 7] A program for causing a computer to execute, for managing a schedule of a voyage made by a ship sailing on a sailing route from a departure port to a destination port, the ship visiting one or more ports on a remaining part of the sailing route from a reference location to the destination port,

acquiring a reference time when the ship is located at the reference location,

acquiring distance data sets indicating a distance between the reference location and a subsequent port and a distance between two ports with regard to each set of two consecutive ports on the remaining part of the sailing route,

acquiring fuel consumption rate data sets each indicating a fuel consumption per unit sailing distance when the ship sails at a certain sailing speed,

acquiring a first voyage schedule data set indicating a first schedule of the voyage containing a starting time of a time period during which the ship is docked at a berth of each of the one or more

ports, an ending time of the time period and an arrival time when the ship arrives at the destination port,

acquiring a second voyage schedule data set indicating a second schedule of the voyage that is different from the first schedule of the voyage indicated by the first voyage schedule data set with regard to at least one of the starting times, the ending times and the arrival time,

calculating, based on the first voyage schedule data set and the distance data sets, a sailing speed at which the ship sails from the reference location to a subsequent port and a sailing speed at which the ship sails from a port to a subsequent port with regard to each set of two consecutive ports on the remaining part of the sailing route, and calculating, based on the calculated sailing speed, the distance data sets, and the fuel consumption rate data sets, first fuel consumption required for the ship to sail from the reference location to the destination port,

calculating, based on the second voyage schedule data set, the distance data sets, and the fuel consumption rate data sets, a sailing speed at which the ship sails from the reference location to a subsequent port and a sailing speed at which the ship sails from a port to a subsequent port with regard to each set of two consecutive ports on the remaining part of the sailing route, and calculating, based on the calculated sailing speed, second fuel consumption required for the ship to sail from the reference location to the destination port as second fuel consumption, and

outputting a data set indicating the calculated first fuel consumption and the calculated second fuel consumption.

[Claim 8] A computer-readable recording medium continuously storing a program for causing a computer to execute, for managing a schedule of a voyage made by a ship sailing on a sailing route from a departure port to a destination port, the ship visiting one or more ports on a remaining part of the sailing route from a reference location to the destination port,

acquiring a reference time when the ship is located at the reference location,

acquiring distance data sets indicating a distance between the reference location and a subsequent port and a distance between two ports with regard to each set of two consecutive ports on the remaining part of the sailing route,

acquiring fuel consumption rate data sets each indicating a fuel consumption per unit sailing distance when the ship sails at a certain sailing speed,

acquiring a first voyage schedule data set indicating a first schedule of the voyage containing a starting time of a time period during which the ship is docked at a berth of each of the one or more ports, an ending time of the time period and an arrival time when the ship arrives at the destination port,

acquiring a second voyage schedule data set indicating a second schedule of the voyage that is different from the first schedule of the voyage indicated by the first voyage schedule data set with regard to at least one of the starting times, the ending times and the arrival time,

calculating, based on the first voyage schedule data set and the distance data sets, a sailing speed at which the ship sails from the reference location to a subsequent port and a sailing speed at which the ship sails from a port to a subsequent port with regard to each set of two consecutive ports on the remaining part of the sailing route, and calculating, based on the calculated sailing speed, the distance data sets, and the fuel consumption rate data sets, first fuel consumption required for the ship to sail from the reference location to the destination port,

calculating, based on the second voyage schedule data set, the distance data sets, and the fuel consumption rate data sets, a sailing speed at which the ship sails from the reference location to a subsequent port and a sailing speed at which the ship sails from a port to a subsequent port with regard to each set of two consecutive ports on the remaining part of the sailing route, and calculating, based on the calculated sailing speed, second fuel consumption required for the ship to sail from the reference location to the destination port as second fuel consumption, and

outputting a data set indicating the calculated first fuel consumption and the calculated second fuel consumption.

[Claim 9] A method for managing a schedule of a voyage made by a ship sailing on a sailing route from a departure port to a destination port, the ship visiting one or more ports on a remaining part of the sailing route from a reference location to the destination port, comprising:

a step for acquiring a reference time when the ship is located at the reference location,

a step for acquiring distance data sets indicating a distance between the reference location and a subsequent port and a distance between two ports with regard to each set of two consecutive ports on the remaining part of the sailing route,

a step for acquiring fuel consumption rate data sets each indicating a fuel consumption per unit sailing distance when the ship sails at a certain sailing speed,

a step for acquiring a first voyage schedule data set indicating a first schedule of the voyage containing a starting time of a time period during which the ship is docked at a berth of each of the one or more ports, an ending time of the time period and an arrival time when the ship arrives at the destination port,

a step for acquiring a second voyage schedule data set indicating a second schedule of the voyage that is different from the first schedule of the voyage indicated by the first voyage schedule data set with regard to at least one of the starting times, the ending times and the arrival time,

a step for calculating, based on the first voyage schedule data set and the distance data sets, a sailing speed at which the ship sails from the reference location to a subsequent port and a sailing speed at which the ship sails from a port to a subsequent port with regard to each set of two consecutive ports on the remaining part of the sailing route, and calculating, based on the calculated sailing speed, the distance data sets, and the fuel consumption rate data sets, first fuel consumption required for the ship to sail from the reference location to the destination port,

a step for calculating, based on the second voyage schedule data set, the distance data sets, and the fuel consumption rate data sets, a sailing speed at which the ship sails from the reference location to a subsequent port and a sailing speed at which the ship sails from a port to a subsequent port with regard to each set of two consecutive ports on the remaining part of the sailing route, and calculating, based on the calculated sailing speed, second fuel consumption required for the ship to sail from the reference location to the destination port as second fuel consumption, and

a step for outputting a data set indicating the calculated first fuel consumption and the calculated second fuel consumption.