CLAIMS

[Claim 1] A device comprising:

a means for obtaining planned fuel consumption data indicating fuel consumption that is planned to be used for a voyage of a ship from a departure point to a destination point;

a means for obtaining environment data indicating meteorological and/or hydrographic environment on a route from the departure point to the destination point;

a means for obtaining actual fuel consumption data indicating fuel consumption that was required for a voyage of the ship from the departure point to a current location of the ship while the ship sails on the route; and

a means for determining ship speed for a voyage of the ship from the current location of the ship to the destination point so that estimated fuel consumption for the voyage of the ship from the current location of the ship to the destination point in the environment indicated by the environment data does not exceed a value calculated by subtracting the fuel consumption indicated by the actual fuel consumption data from the fuel consumption indicated by the planned fuel consumption data.

[Claim 2] The device according to claim 1, in which:

the means for determining ship speed specifies plural values of estimated fuel consumption each of which is estimated to be required for the ship to sail from the current location of the ship to the destination point in the environment indicated by the environment data at a selected one of plural values of ship speed, and determines one of the plural values of ship speed that causes a value of estimated fuel consumption not exceeding a value calculated by subtracting the fuel consumption indicated by the actual fuel consumption data from the fuel consumption indicated by the planned fuel consumption data as the ship speed for the voyage of the ship from the current location of the ship to the destination point.

[Claim 3] The device according to claim 2, in which:

the means for determining ship speed stores data indicating plural values of fuel consumption each of which is estimated to be required for the ship to sail in one of various conditions each of which is defined by a combination of environment and ship speed for the voyage; and

the means for determining ship speed specifies plural values of

fuel consumption each of which is estimated to be required for the ship to sail in the environment indicated by the environment data at a selected one of the plural values of ship speed on the basis of the stored data.

[Claim 4] The device according to any one of claims 1 to 3, in which:

the means for determining ship speed determines the estimated fuel consumption on the basis of the actual fuel consumption data.

[Claim 5] The device according to any one of claims 1 to 4, in which:

the means for determining ship speed assigns ship speed to each of plural sections divided from the route from the current location of the ship to the destination point, specifies fuel consumption which is estimated to be required for the ship to sail in a section sequentially selected from the plural sections at ship speed assigned to the selected section, and specifies a sum of plural values of fuel consumption each of which is specified for each of the plural sections as the estimated fuel consumption for the voyage of the ship from the current location of the ship to the destination point.

[Claim 6] The device according to claim 5, in which:

the environment data indicating meteorological and/or hydrographic environment pertaining to each of plural timings; and

the means for determining ship speed specifies fuel consumption which is estimated to be required for the ship to sail in a section sequentially selected from the plural sections in an environment indicated by the environment data pertaining to a timing when the ship sails in the selected section at ship speed assigned to the selected section, and specifies a sum of plural values of fuel consumption each of which is specified for each of the plural sections as the estimated fuel consumption for the voyage of the ship from the current location of the ship to the destination point.

[Claim 7] The device according to claim 5 or 6, in which:

the means for determining ship speed repeatedly performs a process for specifying estimated fuel consumption which is estimated to be required for the voyage of the ship from the current location of the ship to the destination point in each of plural cases where ship speed assigned to one or more sections selected from the plural sections is changed in accordance with a predetermined rule, and a process for selecting a set of plural values of ship speed assigned to the plural sections, from among the sets of plural values of ship speed each of which is used for specifying the estimated fuel consumption, which causes a minimum estimated fuel consumption,

until a set of plural values of ship speed that causes a minimum estimated fuel consumption not exceeding the value calculated by subtracting is selected, for determining the ship speed from the current location of the ship to the destination point.

[Claim 8] The device according to any one of claims 1 to 7, in which:

the means for determining ship speed determines the ship speed from the current location of the ship to the destination point in a form of rotation speed of propeller used for the voyage of the ship.

[Claim 9] The device according to claim 8, in which:

the means for determining ship speed determines the ship speed from the current location of the ship to the destination point in a form of combination of rotation speed and blade angle of the propeller used for the voyage of the ship.

[Claim 10] A program that causes a computer to execute:

a process of obtaining planned fuel consumption data indicating fuel consumption that is planned to be used for a voyage of a ship from a departure point to a destination point;

a process of obtaining environment data indicating meteorological and/or hydrographic environment on a route from the departure point to the destination point;

a process of obtaining actual fuel consumption data indicating fuel consumption that was required for a voyage of the ship from the departure point to a current location of the ship while the ship sails on the route; and

a process of determining ship speed for a voyage of the ship from the current location of the ship to the destination point so that estimated fuel consumption for the voyage of the ship from the current location of the ship to the destination point in the environment indicated by the environment data does not exceed a value calculated by subtracting the fuel consumption indicated by the actual fuel consumption data from the fuel consumption indicated by the planned fuel consumption data.

[Claim 11] A storage medium capable of reading from a computer that continuously stores the program that causes a computer to execute:

a process of obtaining planned fuel consumption data indicating fuel consumption that is planned to be used for a voyage of a ship from a departure point to a destination point;

a process of obtaining environment data indicating meteorological and/or hydrographic environment on a route from the departure point to the destination point;

a process of obtaining actual fuel consumption data indicating fuel consumption that was required for a voyage of the ship from the departure point to a current location of the ship while the ship sails on the route; and

a process of determining ship speed for a voyage of the ship from the current location of the ship to the destination point so that estimated fuel consumption for the voyage of the ship from the current location of the ship to the destination point in the environment indicated by the environment data does not exceed a value calculated by subtracting the fuel consumption indicated by the actual fuel consumption data from the fuel consumption indicated by the planned fuel consumption data.

[Claim 12] A method comprising:

a step in which a device obtains planned fuel consumption data indicating fuel consumption that is planned to be used for a voyage of a ship from a departure point to a destination point;

a step in which the device obtains environment data indicating meteorological and/or hydrographic environment on a route from the departure point to the destination point;

a step in which the device obtains actual fuel consumption data indicating fuel consumption that was required for a voyage of the ship from the departure point to a current location of the ship while the ship sails on the route; and

a step in which the device determines ship speed for a voyage of the ship from the current location of the ship to the destination point so that estimated fuel consumption for the voyage of the ship from the current location of the ship to the destination point in the environment indicated by the environment data does not exceed a value calculated by subtracting the fuel consumption indicated by the actual fuel consumption data from the fuel consumption indicated by the planned fuel consumption data.

CLAIMS

[Claim 1] A device comprising:

a means for obtaining planned fuel consumption data indicating fuel consumption that is determined by a human in accordance with a plan to be used for a voyage of a ship from a departure point to a destination point;

a means for obtaining environment data indicating meteorological and/or hydrographic environment on a route from the departure point to the destination point;

a means for obtaining actual fuel consumption data indicating fuel consumption that was required for a voyage of the ship from the departure point to a current location of the ship while the ship sails on the route; and

a means for determining ship speed for a voyage of the ship from the current location of the ship to the destination point which meets a condition that estimated fuel consumption for the voyage of the ship from the current location of the ship to the destination point in the environment indicated by the environment data does not exceed a value calculated by subtracting the fuel consumption indicated by the actual fuel consumption data from the fuel consumption indicated by the planned fuel consumption data as target ship speed.

[Claim 2] The device according to claim 1, in which:

the means for determining ship speed specifies plural values of estimated fuel consumption each of which is estimated to be required for the ship to sail from the current location of the ship to the destination point in the environment indicated by the environment data at a selected one of plural values of ship speed, and determines one of the plural values of ship speed that causes a value of estimated fuel consumption not exceeding a value calculated by subtracting the fuel consumption indicated by the actual fuel consumption data from the fuel consumption indicated by the planned fuel consumption data as the target ship speed for the voyage of the ship from the current location of the ship to the destination point.

[Claim 3] The device according to claim 2, in which:

the means for determining ship speed stores data indicating plural values of fuel consumption each of which is estimated to be required for the ship to sail in one of various conditions each of which is defined by a combination of environment and ship speed for the voyage; and

the means for determining ship speed specifies plural values of fuel consumption each of which is estimated to be required for the ship to sail in the environment indicated by the environment data at a selected one of the plural values of ship speed on the basis of the stored data.

[Claim 4] The device according to any one of claims 1 to 3, in which:

the means for determining ship speed determines the estimated fuel consumption on the basis of the actual fuel consumption data.

[Claim 5] The device according to any one of claims 1 to 4, in which:

the means for determining ship speed assigns ship speed to each of plural sections divided from the route from the current location of the ship to the destination point, specifies fuel consumption which is estimated to be required for the ship to sail in a section sequentially selected from the plural sections at ship speed assigned to the selected section, and specifies a sum of plural values of fuel consumption each of which is specified for each of the plural sections as the estimated fuel consumption for the voyage of the ship from the current location of the ship to the destination point.

[Claim 6] The device according to claim 5, in which:

the environment data indicating meteorological and/or hydrographic environment pertaining to each of plural timings; and

the means for determining ship speed specifies fuel consumption which is estimated to be required for the ship to sail in a section sequentially selected from the plural sections in an environment indicated by the environment data pertaining to a timing when the ship sails in the selected section at ship speed assigned to the selected section, and specifies a sum of plural values of fuel consumption each of which is specified for each of the plural sections as the estimated fuel consumption for the voyage of the ship from the current location of the ship to the destination point.

[Claim 7] The device according to claim 5 or 6, in which:

the means for determining ship speed repeatedly performs a process for specifying estimated fuel consumption which is estimated to be required for the voyage of the ship from the current location of the ship to the destination point in each of plural cases where ship speed assigned to one or more sections selected from the plural sections is changed in accordance with a predetermined rule, and a process for selecting a set of plural values of ship speed assigned to the plural sections, from among the sets of plural values of ship speed each of which is used for specifying the estimated fuel

consumption, which causes a minimum estimated fuel consumption, until a set of plural values of ship speed that causes a minimum estimated fuel consumption not exceeding the value calculated by subtracting is selected, for determining the target ship speed from the current location of the ship to the destination point.

[Claim 8] The device according to any one of claims 1 to 7, in which:

the means for determining ship speed determines the target ship speed from the current location of the ship to the destination point in a form of rotation speed of propeller used for the voyage of the ship.

[Claim 9] The device according to claim 8, in which:

the means for determining ship speed determines the target ship speed from the current location of the ship to the destination point in a form of combination of rotation speed and blade angle of the propeller used for the voyage of the ship.

[Claim 10] A program that causes a computer to execute:

a process of obtaining planned fuel consumption data indicating fuel consumption that is determined by a human in accordance with a plan to be used for a voyage of a ship from a departure point to a destination point;

a process of obtaining environment data indicating meteorological and/or hydrographic environment on a route from the departure point to the destination point;

a process of obtaining actual fuel consumption data indicating fuel consumption that was required for a voyage of the ship from the departure point to a current location of the ship while the ship sails on the route; and

a process of determining ship speed for a voyage of the ship from the current location of the ship to the destination point which meets a condition that estimated fuel consumption for the voyage of the ship from the current location of the ship to the destination point in the environment indicated by the environment data does not exceed a value calculated by subtracting the fuel consumption indicated by the actual fuel consumption data from the fuel consumption indicated by the planned fuel consumption data as target ship speed.

[Claim 11] A storage medium capable of reading from a computer that continuously stores the program that causes a computer to execute:

a process of obtaining planned fuel consumption data indicating fuel consumption that is determined by a human in accordance with a plan to be used for a voyage of a ship from a departure point to a destination point;

a process of obtaining environment data indicating meteorological and/or hydrographic environment on a route from the departure point to the destination point;

a process of obtaining actual fuel consumption data indicating fuel consumption that was required for a voyage of the ship from the departure point to a current location of the ship while the ship sails on the route; and

a process of determining ship speed for a voyage of the ship from the current location of the ship to the destination point which meets a condition that estimated fuel consumption for the voyage of the ship from the current location of the ship to the destination point in the environment indicated by the environment data does not exceed a value calculated by subtracting the fuel consumption indicated by the actual fuel consumption data from the fuel consumption indicated by the planned fuel consumption data as target ship speed.

[Claim 12] A method comprising:

a step in which a device obtains planned fuel consumption data indicating fuel consumption that is determined by a human in accordance with a plan to be used for a voyage of a ship from a departure point to a destination point;

a step in which the device obtains environment data indicating meteorological and/or hydrographic environment on a route from the departure point to the destination point;

a step in which the device obtains actual fuel consumption data indicating fuel consumption that was required for a voyage of the ship from the departure point to a current location of the ship while the ship sails on the route; and

a step in which the device determines ship speed for a voyage of the ship from the current location of the ship to the destination point which meets a condition that estimated fuel consumption for the voyage of the ship from the current location of the ship to the destination point in the environment indicated by the environment data does not exceed a value calculated by subtracting the fuel consumption indicated by the actual fuel consumption data from the fuel consumption indicated by the planned fuel consumption data as target ship speed.