A Method of Determining an Optimal Route.

This disclosure relates to a method of determining an optimal route, and in particular to determining an optimal route which may be traversed by a vessel.

Background

Satellite navigation systems are widely used, in particular in the automotive field. A driver may enter a destination into his or her 'satnav' system, which is then able to determine an optimal route between the driver's current location and a desired destination. It is advantageous not only to calculate the most efficient possible route, but also to calculate the route and respond to the driver's query as quickly as possible.

However, a number of difficulties present themselves when attempting to determine an optimal route for a vessel. The skilled person will appreciate that a graph having nodes connected by edges, each edge having an associated weight or cost, is a pre-requisite for most shortest-route calculation algorithms. While roads and junctions provide structure which may form the basis of such a graph when determining an optimal route for a car, such structure is not available when determining an optimal route for a vessel.

Summary

Aspects of the invention are defined in the independent claims. Some optional features of the invention are defined in the dependent claims.

Thus, it may be possible to address the disadvantages mentioned (and others) encountered in the prior art by providing a method of generating an optimal route for a vessel based on vessel traffic data, as well as a graph suitable for use in such a method.

According to one exemplary arrangement, there is provided a method of determining an optimal route for a vessel based on vessel traffic data, the method comprising receiving vessel traffic data relating to the movement of each of a plurality of vessels in a geographical region; defining sub-regions within the geographical region in which the vessel traffic data has similar characteristics; and determining an optimal route for a vessel between two geographical points using a representation of the geographical

region, the representation comprising nodes, each node being associated with a respective defined sub-region.

The method may further comprise iteratively considering each of a number of proposed sub-regions and, for each proposed sub-region, determining whether the variation of vessel traffic data associated with the proposed sub-region is above a threshold variation value and, if it is, splitting the proposed sub-region into a plurality of smaller proposed sub-regions.

The sub-regions in which the vessel traffic data has similar characteristics may be defined as those proposed sub-regions in which variation of vessel traffic data is not above the threshold variation value.

The vessel traffic data may comprise data relating to the speeds of each of the plurality of vessels.

According to one exemplary arrangement, there is provided a method of producing a representation of a geographical region for use in determining, based on vessel traffic data, an optimal route for a vessel between two geographical points. The method comprises receiving vessel traffic data relating to the movement of each of a plurality of vessels in a geographical region; defining sub-regions within the geographical region in which the vessel traffic data has similar characteristics; and producing the representation of the geographical region, the representation comprising nodes, each node being associated with a respective defined sub-region.

The method of producing a representation may further comprise any of the features discussed above or elsewhere herein in relation to the method of determining an optimal route.

According to one exemplary arrangement, there is provided a computer readable medium, a computer program or a computer program product comprising computer-executable instructions which, when executed by a processor, cause the processor to perform the method of any of the preceding claims.

Figures

Specific embodiments are now described, by way of example only, with reference to the drawings, in which:

Figure 1 depicts a database containing vessel traffic data;

Figure 2 depicts shipping routes which have been identified using vessel traffic data;

Claims

1. A method of determining an optimal route for a first vessel having first characteristics based on vessel traffic data, the method comprising:

receiving vessel traffic data relating to the movement of each of a plurality of vessels in a geographical region;

defining sub-regions within the geographical region in which the vessel traffic data has similar characteristics;

producing a representation of the geographical region comprising nodes, each node being associated with a respective defined sub-region;

joining a first and a second node with a plurality of edges, each respective edge of the plurality of edges being created using different respective vessel journeys identified using the vessel traffic data, the different respective vessel journeys being associated with vessels having different characteristics; and

determining an optimal route for a vessel between two geographical points using the representation of the geographical region and the first characteristics of the first vessel.

2. The method of claim 1, further comprising joining neighbouring nodes in the representation with edges based on vessel journeys identified using the vessel traffic data.

3. The method of claim 1, wherein the nodes are connected by edges each having at least one associated weight, the weights being based on characteristics of vessel journeys identified using the vessel traffic data.

4. The method of claim 3, the at least one weight being representative of at least one of: the average time taken to travel along the edge; the average amount of fuel required to travel along the edge; the average amount of monetary cost

required to travel along the edge; and the number of journeys identified along the edge in the vessel traffic data.

5. The method of any of claim 4, wherein the weights are blended weights, wherein each blended weight is based on at least two respective types of vessel journey identified in the vessel traffic data, the types of vessel journey being associated with different vessel characteristics.

6. The method of claim 1, wherein the optimal route is determined using a shortest-path routing algorithm.

7. The method of claim 1, wherein defining sub-regions within the geographical region in which the vessel traffic data has similar characteristics comprises identifying geographical regions in which variation within the vessel traffic data is below a variation threshold value.

8. The method of claim 7, further comprising iteratively considering each of a number of proposed sub-regions and, for each proposed sub-region:

determining whether the variation of vessel traffic data associated with the proposed sub-region is above a threshold variation value and, if it is, splitting the proposed sub-region into a plurality of smaller proposed sub-regions.

9. The method of claim 8, wherein the sub-regions in which the vessel traffic data has similar characteristics are defined as those proposed sub-regions in which variation of vessel traffic data is not above the threshold variation value.

10. The method of any preceding claim, wherein the vessel traffic data comprises data relating to the speeds of each of the plurality of vessels.

11. A method of producing a representation of a geographical region for use in determining, based on vessel traffic data, an optimal route for a vessel between two geographical points, the method comprising:

receiving vessel traffic data relating to the movement of each of a plurality of vessels in a geographical region;

defining sub-regions within the geographical region in which the vessel traffic data has similar characteristics; and

producing the representation of the geographical region, the representation comprising nodes, each node being associated with a respective defined sub-region; and

joining a first and a second node with a plurality of edges, each respective edge of the plurality of edges being created using different respective vessel journeys identified using the vessel traffic data, the different respective vessel journeys being associated with vessels having different characteristics.

12. A computer readable medium comprising computer-executable instructions which, when executed by a processor, cause the processor to perform the method of any preceding claims.

13. A computer program or computer program product comprising computer-executable instructions which, when executed by a processor, cause the processor to perform the method of any of claims 1 to 11.