Following deprived of Backpedaling - An effective two way sharp technique for control complete ocean

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Abstract: Here a Two way routing technique been proposed, where the concept of backtracking is omitted. This efficiently works on digitized map. The methodology is optimal and complete. Been considered and regression analysis been performed. Upon entering the source and destination points on a digitized map, on the basis of these parameters, best path is suggested.

Index Terms - Two way routing, optimal, complete, digitized map, parameters, backtracking.

INTRODUCTION

Till this twenty first century ocean is the main medium of transport, not only for cargo ships, but also for the passenger ships. However, each month a number of ship wrecks occurs till date and most of them occurs due to selection of wrong or unsafe path. In this paper the goal node searching technique Tracking without Back-Tracking (TBT), is proposed and applied for finding the less hazardous route in the ocean for sailing through, but the methodology could be applied for any other such applications, like roadways also, only by changing the influencing factors. Here the basic intention is not to find only an optimal, but at the same time the safest route as well, between two Points – namely, SOURCE and DESTINATION. There present many connected crosspoints through which a number of routes exist between Source and Destination. Thus the entire problem could be viewed as a graph (weighted) traversal problem, between two given end-points. For determination of the weight of the edges, not only its length (i.e. distance between its two end points), but also various influencing parameters (values are determined from various case studies or previous history) are considered. In this chapter different existing popular goal finding approaches, such as Generate – And – Test , Simple Hill – Climbing, Steepest – Ascent Hill Climbing , Russel's Bi-Directional Search etc. are considered for being applied in the same application area of finding the shortest-cum-safest route. Discussions been made on the problems observed in each case and illustrations been made on how the proposed TBT method could be helpful to overcome some of those demerits. While finding the optimal and safest route, equal importance has given to the distance (has to traverse for reaching destination) and safety measures.

The organization of the chapter is as follows. Section III focuses on implementation and results.

METHODOLOGY

These factors vary from application to application (i.e. factors will be changed while considering routing through road-ways instead of considering routing through ocean). As here, safest route for sailing through ocean is under consideration; among a lot of influencing factors five have found to play very important role. These are —

• Depth of water • Air flow • Water current • Visibility • Presence (possibility) of iceberg/storm

It is the discretion of the implementer that how much weightage should be given for choosing shortest path and how much to safety measures. For the present purpose, without compensating with any one among them equal weightage has given to both. Presently the measure has carried out in a 100 point scale, among which 50 is emerging from distance and remaining 50 from safety measures.

For each route-let (i.e. part of the route, existing between one junction or cross-point to another. During graph representation, it is simply the edge between two nodes) the values of the influencing factors may be fed by the user or be achieved from satellite images. While fixing up the relative weightage of different influencing factors, which one should be prioritize over which, is on the basis of historical data/case studies. For the present purpose, depth of water has given 20 points weightage, whereas next threes (Air flow, Water current and Visibility) have given 10 points each. Presence of iceberg/storm has a Boolean result. Thus each of the five factors has been adjusted to a 10 point scale, so that sum of these five is scaled in 50. The way of fixing out the above mentioned five influencing factors been discussed in the following portion.

Depth of Water

Sailing reports tells that route having depth more than 50 mt. is the best choice (to make it cheapest, 0 point has been offered), whereas route with depth 12 mt. The routes with depth less than 12 mt. are being sidetracked by giving point 20 in the 20 point scale, to make them costlier. Route with depth 25 mt. is also a quite good choice (thus given point 5 in the 20 point scale). These data enable to obtain.

x(mt.) 70 60 50 25 12 11 10 y(scale) 0 0 0 5 10 20 20

The relationship between x and y from the data presented in table has buttoned up using the Regression Analysis [30] strategy. Here 5th degree polynomial curve fitting for Regression Analysis has been considered, which is of the form:

$y = c0+c1.x+c2.x\ 2+c3.x\ 3+c4.x\ 4+c5.x\ 5$

Air Flow

It has become obvious from the reports that route with air flow 89 KM/H or more (in any direction, positive or negative) should be avoided (thus given point 10 in the 10 point scale, to make it costlier). Routes with air flow 45 KM/H in positive direction is the best choice (so given 0 point to make it cheapest).

Water Current

Water current also plays a crucial role in ocean route selection. Paths with current 1.3 m/s is best choice and awarded with 0 point to make it cheapest. Finally path with current 0.85 m/s or 1.9 m/s is a moderate choice, adorned with point 5 in 10 point scale.

Visibility

When the visibility is very low due to heavy fog or alike, that route should be avoided for sidetracking mishaps, hence given point 10 in a 10 point scale to make the route costlier. a best choice, that's why weightage point 0 is associated with this route to make it cheapest. Table illustrates the fact.

Without losing its generality, this data could be fit to a Linear Equation of the form $y = ax+b$

Putting this value of b (i.e. $b = 10$) in equation a, it is found that $0 = a\times10+10$ or, $-10 = a\times10$ or, $a = (-1)$ Thus finally the Linear Equation takes the form $y = (-1)x + 10$

The graphical nature of the polynomial is shown in fig and reflects the fact that visibility 10 km or more is the best choice and the path become poor.

Keeping mind the famous incident of "TITANIC", any route with possibility of presence of iceberg or sea storm is strongly being avoided. becomes so much costly, such that it would not come onto crease even its distance factor is low.

x (Is There any such Possibility?) 0 1 y(scale) 0 99

It may be any scanned image/ satellite image, which is not needed to digitize anyhow, making it less time consumed process. The reference cross points are marked by simply clicking onto them and parametric values like depth of water, air flow, water current, visibility etc. Upon entering the Starting and Destination point of the journey, the technique invoke Tracking without Back-Tracking (TBT) goal searching method and displays the safest cum shortest route by "RED" line.

IMPLEMENTATION AND RESULTS

The results of enactment, design of GUI and all the required operations have been done using Net Beans IDE 8.0.2 (Java) , which is based on flat-file systems without using databases, hence have increased its portability. The work begins with selection of a map (may be a scanned image or likewise) from any location of the computer. The start-up screen and the buttons for loading or adding new map are shown in the fig respectively.

Digitizing Reference Cross-Points

after which the information being fed is saved by clicking "SAVE" button

Setting Parameters

and "SELECT DESTINATION"

At the final step, by clicking onto the "GENERATE PATH" button, the suggested optimal cum safest path from source to destination is displayed graphically by a red line

Optimal Safest Path — Case Study 1

Optimal Safest path — Case Study 2

depicts the fact that in different season, due to change in various influencing factors, the path between a pair of Source and Destination may also change.

COMPARISONS

The output produced by the goal searching algorithm can be considered as Boolean, either Success (able to find the Goal node) or Failure (unable to find the Goal node). Some algorithms might get stuck in an infinite loop and never return an output. For comparing different Graph-based-Goal-Searching Algorithms, the

useful matrices are Completeness, Optimality and Time Complexity. Table reflects a concise comparison among various Graph-based-Goal-Searching Algorithms, with proposed TBT method.

Comparison among various Graph-based-Goal-Searching Algorithms

Algorithm	Time Complexity	Optimal	Complete
Breadth First Search	$O(n^m)$	Yes	Yes
Depth First Search	$O(n^m)$	No	No
Simple Hill Climbing	$O(n^m)$	No	No
Steepest Ascent Hill Climbing	$O(n^m)$	No	No
Best-First Search	$O(n^m)$	Yes	No
Bi-Directional Search	$O(n^{m/2})$	Yes	Yes
Proposed Algorithm	$O(n^{m/2})$	Yes	Yes

CONCLUSIONS

The proposed technique is a kind of goal searching methodology in a weighted graph, where the optimal and low cost (from the present application perspective it has been termed as safest) route between source and destination has found. So this technique could be applied in a number of challenging fields in GIS. Presently one such application area, finding shortest as well as safest route through ocean has outlined.

Till this twenty first century ocean is the main medium of transport of goods for many countries and multinational companies depends very much on cargo ships. In addition to the cargo ships the passenger liners are playing an important role for traveling throughout the world. Frequently it is being heard that many ships loss connectivity with radar, sink due to storm and face many other disasters just due to choose wrong route for traveling. The devastating incident of Titanic, a British passenger liner, is still alive in everybody's mind; which sank in the North Atlantic Ocean in the early morning of This heart touching incident results the premature deaths of more than 1,500 passengers and crew members.

It foretells the captain about the safest route for propelling.

This technique cannot only be applied for the avoidance of road accidents and plane crashes due to selection of wrong route or decrepit road for traveling, by simply changing the influencing factors; but could play as a guide while traveling one place to another by side tracking deteriorated or clumsy roads.

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