Under Water Bed Profile Generation

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Abstract— Hydrographic Surveying is also known as Bathymetric Surveying which is the measurement of physical features under water bed. We can say that it is branch of applied science that compromise with measurement and description of physical elements of seas, coastal areas, oceans, lakes and rivers. It is important for navigational purpose and to assist all marine application which comprise of economic development, maritime defense security, scientific research and environmental conservation. The proposed system includes a vehicle and a subsea docking interface, which gather information and communicates with system. The system provides the information in 3 degrees of freedom motion capability while profiling the water column, and includes a large, customizable data. Bathymetry is essential for vast range applications in research and society. Maritime safety and navigation are essential factors. The Government agencies and private sectors often need to acquire hydrographic data in order to empower safe route and to exploit the physical operating environments above and below water surface for strategic operational advantage.

Keywords: Bathymetric Surveying, Underwater, Navigation, Water surface

I. INTRODUCTION

Hydrographic Surveying is also known as Bathymetric Surveying which is the measurement of physical features under water bed. We can say that it is branch of applied science that compromise with measurement and description of physical element of sea, coastal areas, oceans, lakes and rivers. It is important for navigational purpose and to assist all marine application which comprise of economic development, maritime defense security, scientific research and environmental conservation.[1]

Surveying with multibeam echo sounders is that the primary method of obtaining hydrographic data. By mapping out water depth, the form of the seafloor and coastline, the situation of possible obstructions. Multibeam sonar beams sweep the seafloor because the ship passes over the survey area. Multibeam echo sounder beams bounce off the seafloor and return to the ship where the depth is recorded. The results from a hydrographic survey are normally plotted to supply a bathymetric relief map, which may be a plan of the depth of the ocean bed arranged in such a manner on show lines of equal depth from the coastline. In a hydrographic survey, the particular measurement of the water depth is that the easy part.[1] the main problem isn't knowing how far the survey boat is from the coastline when the depth is recorded.

Bathymetry is essential for vast range applications in research and society. Maritime safety and navigation are essential factors. The Government agencies and private sectors often need to acquire hydrographic data in order to empower safe route and to exploit the physical operating environments above and below water surface for strategic operational advantage.[4]

The proposed system includes a vehicle and a subsea docking interface, which gather information and communicates with system. The system provides the information in 3 degrees of freedom motion capability while profiling the water column, and includes a large, customizable data. The system transferring data and in between missions. This docking infrastructure enables long-term, resident functionality for the system. A complete description of the profiling system, its operation and performance is presented. With the help of the system the critical information of depth at various distance from the bank enabling the commander to take a decision on the bridge to be launched.

II. LITERATURE SURVEY

Following are the Techniques that are used to find missing points in the generated non-continuous graph.

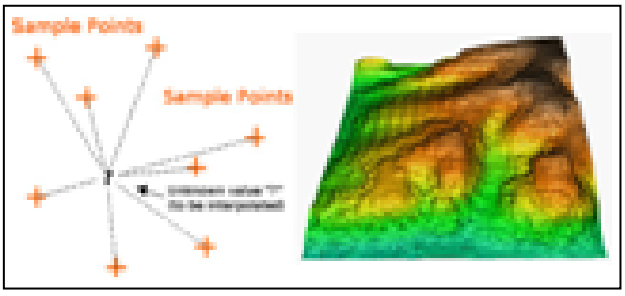
A. Interpolation:

Interpolation is that the process of using known data values to estimate unknown data values. Various interpolation techniques are often utilized in the atmospheric sciences. One of the only methods, linear interpolation, requires knowledge of two points and therefore the constant rate of change between them. With this information, you'll interpolate values anywhere between those two points.

B. Types of Interpolation Methods:

1) Inverse Distance Weighted method (IDW)

The IDW interpolator assumes that every input has a local influence that vanishes with distance. It weights the points nearer to the processing cell greater than those far away. A specified number of points, or all points within a specified radius can be used to conclude the output value of each location. By using this method assumes the variable mapped decreases in influence with distance from its sampled location.



The IDW technique compute a value for each grid node by observing surrounding data points that exist within a user-defined search radius. Some or all of the data points can be used in this process. The node value is computed by averaging the weighted addition of all the points. Data points that exist progressively farther from the node

influence the calculated value far less than those existing nearer to the node.[4]

2) Natural Neighbor Inverse Distance Weighted

NNI has many features, are used for interpolation and extrapolation, and works with clustered scatter points. Another weighted-average method, the essential equation used in NNI is j like the one utilized in IDW interpolation. This method can effectively handle big input point datasets. [4]When using the Natural Neighbour technique, local coordinates gives the amount of influence any scatter point will have on out- put cells. The Natural Neighbour technique could also be a geometrical estimation technique that uses natural neighborhood regions generated around each point within the info set. Like IDW, this method may be a weighted-average interpolation method.

3) Spline

Spline estimates values employing a function which minimizes overall surface curvature, leading to a smooth surface which passes exactly through the input points. The Spline technique of interpolation estimates not known values by bending a surface through known values. There are two spline techniques: regularized and tension. Regularized method creates a smooth and gradually changing surface with values which will present outside the given data range. It incorporates the first derivative (slope), second derivative (rate of change in slope), and third derivative (rate of change within the second derivative) into its minimization calculations.[4]

A created surface with Spline interpolation passes through every sample point and should cross the worth range of the sample point set. Although a Tension spline uses only first and second derivatives, it consist more points within the Spline calculations, which creates smoother surfaces but exceeds the computation time. This technique pulls a surface over the acquired points leading to a stretched effect. Spline uses curved lines to calculate cell values.

III. SYSTEM ARCHITECTURE

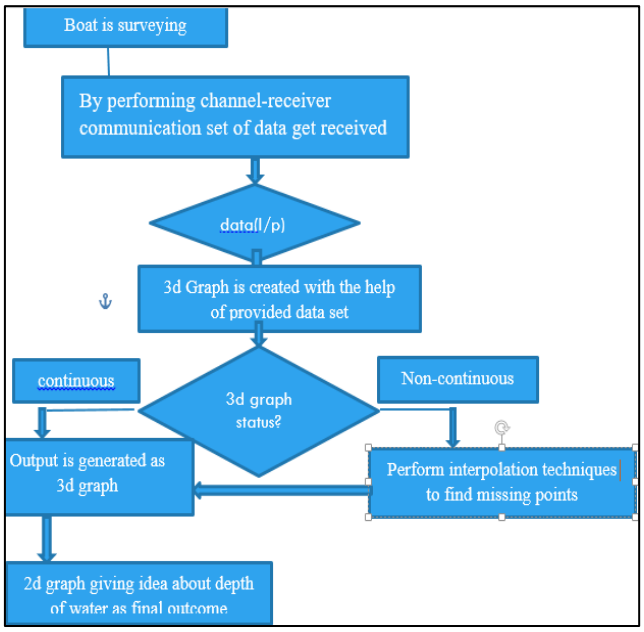


Fig. 2: System Architecture

A. Description:

The flowchart is showing the overall working of the system with the help of various sensors like GPS and ultrasonic sensors the depth of water is going to be get measured. A remote control boat has been developed equipped with an Echo Sounder, DGPS system and a heading sensor providing real time information over wireless channel to an operator console. There would be a Human Machine Interface consist of providing user with a 3d terrain generated over the area surveyed. The received information is structured data consisting longitude, latitude and depth of Water. After receiving the data points with the help of pond graph library the 3d graph will generate showing the actual status of survey. The obtained graph may be continuous or non-continuous depending upon the distance between the input co-ordinates which were provided as input data set. If the generated 3d graph is non-continuous the various techniques like interpolation and curve fitting are used to get the missing co-ordinates.

It displays the exact 3d view of any water surface which has been generated by processing the data set given as input. The 3d graph gives the idea about the co-ordinates with the help of click on event. With the help of this 3d graph one can know the status of the water surface like which is the normal or steepest portion of water.

The final outcome of the system is the 2d view generated by click on event showing the actual depth of water.

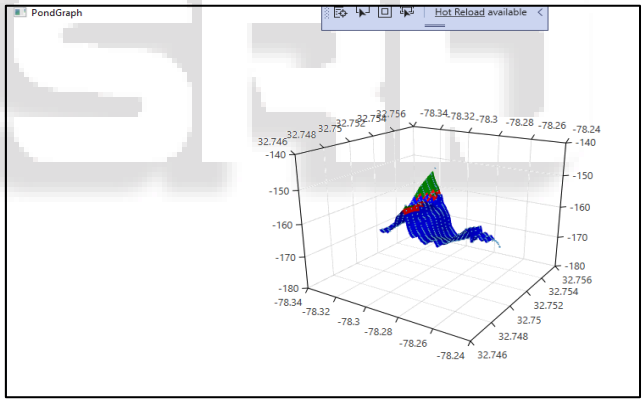


Fig. 3: 3d Graph generated by given data set

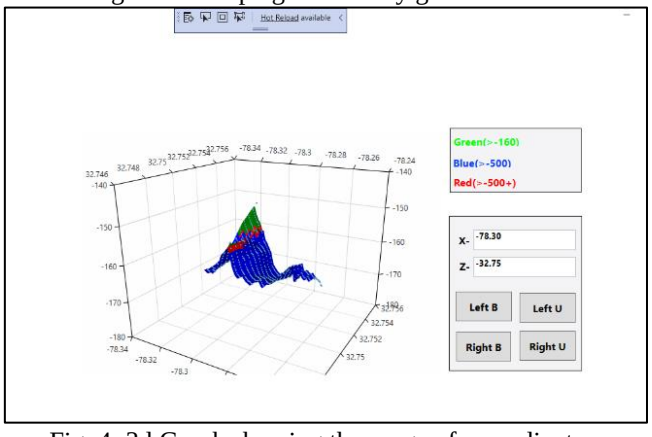


Fig. 4: 3d Graph showing the range of co-ordinates.

As shown in fig 3 the graph is generated by accessing the text file consisting input data set. The above mention fig includes the box showing the four different options for cross sectional view.so with the help of click on

event one can get to know about the 2d view of any particular data point.

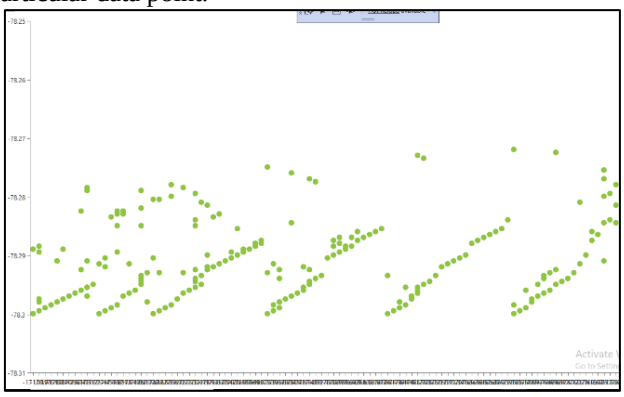


Fig. 5: 2d cross sectional view

As shown in fig 4 the actual cross sectional view of any particular data set is given. it is giving the actual depth of water in 2d form.

So one can easily know that which is the steepest portion and which is the normal portion of water surface.

IV. METHODOLOGY

A. Map integration:

A concept for underwater navigation by combining raw data from different sensors into one scene description is presented. It is helpful to get Direction of different Point and to know the distance between them. To get Best Path of you are going can easily find out. Terrain map often contains inadequate information regarding the terrain and falls in need of the need for a representation which may be utilized for navigation. It is technique to visualize the hidden underwater depth information by plotting longitude and latitude coordinates on a map. There has been a boom within the underwater environmental exploration. Instead of simply creating a map, scientists are trying to see the whole seafloor with maximum possible detail. The task of natural terrain modeling consist variety of issues and hence the quality of the ultimate terrain map may be a function of how these issues are solved. Most important issues are that the transform is unknown, that the large data sets have varying resolution these issues are mainly thanks to the very fact that the platform used for data collection is present within the environment instead of far outside. Hence to solve the various issues the sensor-based terrain map often contains in- adequate information regarding the terrain and falls representation which can be used for the purpose of navigation.[2]

In our project the Map integration technique will help us to display the data set on the surface which will help for visualization. We can say these are Bathymetric maps look lot like topographic maps. Bathymetry is that the measurement of the depth of water in oceans, rivers, or lakes. Bathymetric maps represent the ocean (sea) depth counting on geographical coordinates, even as topographic maps represent the altitude of Earth's surface at different geographic points. These maps are more precise when more depth measurements per surface area unit in the given region are available. The most precise and detailed bathymetric maps are generated using data given by multi-beam echo sounding. The task of terrain modeling consist a number of issues and the quality of the final terrain map is a function of how these issues are solved. Map integration will simply help observer to visualize the entire water floor with maximum possible detail.[3]

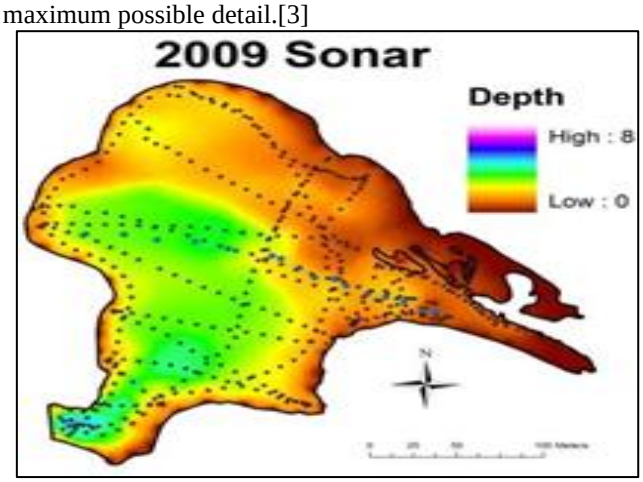


Fig. 6: Map Integration.

V. CONCLUSION

System will provide a higher frequency of inspection, with improved consistency. The system will pro-vide enhanced agility for adaptive subsea monitoring while leveraging navigation solutions developed for confined spaces. The full solution integrates a subsea dock to enable long-term resident deployments. Preliminary testing on the system has shown positive results, and additional testing and design validation in both confined spaces and open-water is planned in the near future.

Underwater Bed profile is a mandatory in surveying for military bridging hence the proposed system providing critical information of the depths at various distance from the bank enabling the commander to take decision on the bridge to be launched.

REFERENCES

[1] Jamal H 2017 Objectives and Uses of Hydrographic Surveying. Surveying and Levelling 29 March 2017.Retrived dated on 22 Nov 2017 from the website https://www.about civil.org/hydrographic-surveying.html.

[2] Yuh, J. 2000. Design Control of Autonomous Underwater Robots: A Survey. Autonomous Robots. 8, 1 (Jan 2000), 7–24.

[3] Dierssen H M and Theberg Jr A E 2014 Bathymetry: History of seafloor mapping. Encyclopedia of Ocean sciences. National Ocean and Atmospheric Administration 2017 Early Hydrographic surveys. Hydrographic Survey Techniques. Retrived dated 5 Dec 2017

[4] Elhassan I 2015 Development of Bathymetric Techniques. FIG Working Week 2015.From the Wisdom of the Ages to the Challenges of the Modern World.Sophia,Bulgaria,17-21 May 2015

