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Underwater Bed Profile Generation

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Abstract - *The system provides the information in three degrees of freedom motion capability while profiling the water column, and includes a large customizable data. This docking infrastructure enables into long-term, resident for functionality of the system. Operational variables include ascent rate, descent rate, depth range and profiling frequency. A complete description of the profiling system, it's operation and performance representation. Firstly, gather the information from the wireless channel which is organized in structured format. A Human Machine Interface will generate a 3D terrain over the area surveyed. On further implementation, the generated area which will provide a cross-sectional view from the particular data-point which gives a clear view of the generated terrain and enhance the precision for the user.*

***Key Words*: Underwater Bed, Data, 3D terrain, Curve Fitting, Cross-sectional view, Interpolation.**

1. INTRODUCTION

Underwater winch systems can provide sustained, real-time high-resolution data from the water column to study high frequency and/or episodic biogeochemical events that are not readily available from other traditional techniques (research vessels, moored buoys or benthic cabled sea floor systems). Having a winch system on the sea floor is an appealing concept as the system has no surface expression, is not impacted by surface weather conditions, and can provide persistent sampling anywhere throughout the water column. Powered winch systems can carry a large scientific payload while supplying the necessary power and bandwidth for high frequency sampling. Underwater winch systems do, however, require significant effort to deploy and maintain and they are usually limited to deployments in pre-determined fixed locations. The quality and quantity of data available in real-time is increasing. Diver access to the deployed system and occasional node recovery has provided excellent feedback on system performance and design improvements are being made. For making a underwater bed profile a remote-control boat has been developed equipped with an Echo Sounder, a DGPS system and a heading sensor providing real time information over wireless channel to an Operator Console through which we are getting the surface co-ordinates which help to generate the 3D-terrain.The generated profile would provide a critical information with the co-ordinates of the depths at various distances from the bank and the different cross-sectional view. There are some highlights which can be seen further for implementation like if the data-points are not collected by the receiver which further leads to loop holes and disconnected terrain shown after the area surveyed. This can be achieved by using fitting methods and interpolation techniques such as b-spline curves, so this can give a better result for the user over the area surveyed.

2. IMPLEMENTATION

While during the approach we first move towards the concept of 2-D Transformation which showed the transformation of 2-D object like Translation, Scaling, Rotation which gives the conceptual idea about the 2-D object to define into a single plane. Now on to generate a 3D terrain, firstly it is done on server platform. The results were shown was conceptually correct but by further flaws to getting it into a server platform was not effective because at the end it needs to connect onto the web browser. On changing the platform taking java concept into consideration it seems to be limited through its libraries and is not getting the proper results as it was earlier implemented. Finally, the limitations of some characteristic features are solved by using C# language. By using this language, it develops a Human Machine Interface which shows a 3D cube, a terrain and a cross sectional view of the particular terrain. The 3D Cube shows the faces of the sides as well as the rotations which help when it come across the 3D Terrain. In the generation of 3D terrain, it was developed in such a way that dataset of any input files in any structured format which describes its longitude, latitude and the depth will be processed and generate the surface. On the surface it describes the actual underwater bed profile by the data points through surveying the bot on that particular river bed. Through echo sounder it calculates the depth and through GPS it calculates the location. By taking into more precision it also gives the data point on the surface as well as the cross-sectional view of the particular terrain for particular data point through different axis. The data point on the surface shows the location of the particular surface where it is located and shows the depth of that particular location. The depth is further categories into three parts which describes the surface layers which is more appropriate for the identification of the particular surface depth. The dependencies are more on the increasing level of precision on the cross-sectional view of the current data point which on choosing divides into four parts of the surface and gives us idea about the planes and easy to understand about the surface will be much easier to the user. The most difficult task through the implementation comes across is about the missing points when are generating the 3D Terrain. By using some techniques like curve fitting and interpolation which gives a good result to overcome this task. The implementation of generating 3D Terrain which helps the user to find the underwater bed profile easily which just surveying the boat onto any water bed.

3. TECHNIQUES USED IN IMPLEMENTATION

Best approaches describe the results in the implementation and research as well as equipment's played important part for the flow of the application.

3.1 Single Beam Echo-Sounder

Single beam echo sounders (SBES), also called depth sounders or fathometers determine water depth by measuring the quantity of a fast sonar pulse, or "ping". The sonar ping is emitted through a transducer positioned slightly below the water surface, so the SBES listens for the return echo from the underside. In reality, the sonar energy is visiting be reflected by anything which is ready to be within the trail of the sound – fish, debris, aquatic vegetation and suspended sediment. Hydrographic survey in a single beam echo sounder which are able to provide most accurate bottom depth by distinguishing the important bottom from any spurious signals within the returned echo. True survey grade in a hydrographic single beam echosounders record with a digital water column as an echogram or else as echo envelope, that encompasses a graphical representation of the return echo. For surveys when suspended particulates are very high, usually when dredging is going on, the low frequency sonar is ready to penetrate the thick resuspended layer and measure the undisturbed hard bottom beneath. Single beam echo sounders are more often in significant cost savings as compared to multibeam echosounder systems which are especially useful in different water bay such as very shallow water, under 5-10m depth.[1] Results which are getting from single beam echosounders are easier to interpret, far less time-consuming to edit, so the SBES equipment could even be operated by less experienced personnel.

3.2 DGPS- Differential Global Positing System

Differential GPS or DGPS. DGPS also uses ground or fixed GPS stations to see the placement, but differs in this it finds the difference between both the satellite and therefore the ground location reading. These ground stations could also be up to 220 nautical miles from the receiver by which it's important to notice that the accuracy deteriorates the further from the bottom station. DGPS is accomplished by a ground station broadcasting a proof which dictates the error between the particular pseudo-range and therefore the measured pseudo-range. This value is calculated by multiplying the speed of sunshine by the time it takes the signal to travel from the satellite to the receiver. As an example, one variety of DGPS is Wide Area Augmentation System or WAAS. Originally developed by the FAA to help aircraft GPS, WAAS uses a system of specifically built ground stations. WAAS holds a selected set of accuracy standards that ground station measurements must meet.[2] WAAS must be accurate to within 7.6 meters 95% of the time. These ground stations send the measurements to other master stations which send the corrections to WAAS satellites in every 5 seconds or faster. From the Satellite, a proof is broadcast back to the receivers on earth where the corrections are wont to improve the GPS accuracy. In some locations, WAAS is in a position to produce an accuracy of 1-meter lateral and 1.5 meters vertically.

3.3 Interpolation

Interpolation is that the process of estimating unknown values that fall between known values. Spatial interpolation calculates an unknown value from a collection of given sample points with known values which are distributed across a section. The space from the cell with unknown value to the sample cells contributes to its final value estimation. You'll be able to use spatial interpolation to form a whole surface from just a tiny low number of sample points; however, more sample points are better if you would like a close surface.[3] In general, the sample points should be well-distributed throughout the study area onto the surface. Some areas, may require a cluster of sample points cause the phenomenon is transitioning more to find or concentrating therein location. For instance, trying to see the dimensions and shape of a hill might require a cluster of samples, whereas the relatively flat surface of the encircling plain might require only some.[4] Whether you're concerned with the quantity of rainfall, concentrations of pollution, or the differences in elevation, it's impossible to live these phenomena at every point within a region. You can obtain a sample of measurements from various locations within the study area and then by using those samples will make inferences about the whole region. Interpolation is that the process that allows you to form such an inference. First assumption of spatial interpolation is that points near one and the another are more alike than those farther away; therefore, any location's values should be estimated supported the values of points nearby. With spatial interpolation, your goal is to form a surface that models the sampled phenomenon within the absolute best way. To do this, you begin with a collection of known measurements and, using an interpolation method, estimate the unknown values for the realm. You then make adjustments to the surface by limiting the dimensions of the sample and controlling the influence the sample points wear the estimated values.

3.4 Curve-Fitting

Curve fitting is that the process of constructing a curve, or function, that has the most effective acceptable a series of information points, possibly subject to constraints. Curve fitting can involve either interpolation, where a precise acceptable the information is required, or smoothing, during which a "smooth" function is built that approximately fits the information.[5] A related topic is multivariate analysis, which focuses more on questions of statistical inference like what proportion uncertainty is present in a very curve that's acceptable data observed with random errors. Fitted curves which are used as an aid for data visualization and to infer the values of a function where no data are available to summarize the relationships between two or more variables. Extrapolation refers to the employment of a fitted curve beyond the range of the observed data, and is subject to a degree of uncertainty since it should reflect the tactic want to construct the curve the maximum amount because it reflects the observed data.

4. RESULTS

There are specific outcomes which defines its uniqueness in the development of the software. It mainly find out the generation a 3D terrain, its cross-sectional view which gives the originality of looking a underwater bed profile in an animated 3D surface which aligns with its co-ordinates and that co-ordinates defines the surface cross-sectional view into its four phases such as left upper, right upper, left lower and right lower. It shows in the 2D view such as a plane which helps to find out the definite location on the underwater surface area.

5. FUTURE SCOPE

In the future we are focusing on the area which defines the location if we want to look about the surveys from where it has been taken and as well as more features for lowering the complexity of the software during the execution as well as in advancement of the features. There will new findings what will be inside the water bed other than just a surface will be taken it into consideration in the further development.

6. CONCLUSION

There are various sectors which helps to build a underwater bed profile generation but the effective one should be simple and easy for the user to operate and get various results efficiently. Thus our implementation of the particular software we developed is taken into the consideration which helps many resources for the bridge to be constructed will be much easier for them to use this kind of software which only need the coordinates getting by the boat surveying and get an exact cross-sectional view to construct a bridge on any water bay. There are many other ways that the software will help to overcome the situation where we find out the under any water bay.

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