A study on the Improvement of the Pre-processing Data for Effective Multi-purpose Data Management System to Bathymetry

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Abstract: Multi-purpose bathymetry is the system to make decision for marine and harbor policy through the bathymetric data. The bathymetry data service reflection time is being increased by the data preprocessing process and the computing resources is used up according to the increase of processing capacity. In this article, such problem were intended to be solved through the automated data preprocessing process through the WPS and marine internet communication.

Keywords: Hydrographical survey, Submarine topography, Web Processing Service

1. Introduction

Multi-purpose bathymetric system is the system to manage the bathymetric data systematically, which is the basic data when making decision related to the sea. For the utilization and analysis of multi-purpose bathymetric system, the sounding survey results are expresses as depth information with point cloud, 3D GIS techniques, etc. In addition, the system that the large size of depth information built are applied fit to S-102 standards, which are the standards for the next generation electronic navigational chart, is being established. Therefore, the multi-purpose bathymetric system should accompany with the many processes and use up the computing resources in using and building the system, and the survey method and the survey equipment are being developed continuously by the development of recent hydrographical survey and IOT technique. Accordingly, it has not only diverse analysis methods and data formats but also the size of outcome is being increased geometrically. To solve such problems, the big data platforms such as Hadoop. etc. are being reflected in the system.

In this study, the measure to reduce the resource used up and to utilize the good quality information through the improvement of data preprocessing process used in building and analyzing the multi-purpose bathymetric data is suggested.

2. Analysis of Existing System and Point to be Improved

The multi-purpose bathymetic system identifies the characteristics of depth data from existing large size of raw data on the depth according to the project type (national fishing port, national basic marine survey, basic costal area survey, coastal area precision survey, port area precision survey) and depth acquisition equipment (single beam, Multi-beam, CZMIL) and provides the service through common standard data format. The data utilized in this system should be complied with S-102 standards, the standards for next generation electronic navigational chart.

S-102 standards refer to the standards of submarine topography of S-10X standards, and are the geographical information standards to express the submarine geography in the form of grid.

Above standards were developed by International Hydrographic Organization based on the BAG format developed by ONSWG (Open Navigation Surface Working Group) to share the submarine topographic information. BAG format by ONSWG was the industrial standards for submarine topographic information, but was recognized officially as the standards regarding the submarine topographic information in the next generation ECDIS and e-Navigation by the enactment of S-102 Standards [1]

In case of existing bathymetric data, the program types are different according to the survey method due to development of bathymetric technology and sounding equipments. The acquisition and compilation program for the single beam bathymetric data is Hypack, the acquisition and compilation program for the multi-beam bathymetric data is Caris hips&sips, and some of EIVA program data, which were used in the past but recently have not been used due to introduction of latest equipments are included. These tools are the PC-based program and should be executed in one PC when preprocessing the data.

The data generated in the PC is stored in the database for depth information service using Hadoop platform. They form the 3D spatial information service through the web service using stored data.

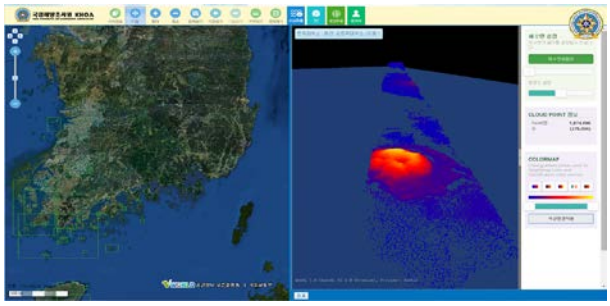

Figure 1. 3D Service of Multi-Purpose Bathymetric System

In the web service, the service is made in the form of 3D DEM and point cloud through WMS and W MTS, which are the OGC service standards. In case of 3D DEM, it is visualized using WEBGL.

3. Improvement of Preprocessing Process thro ugh Automated Collection Process

Through WPS (Web Processing Service) and Real-time Marine Communication

For automated process, the marine communication and WPS (Web Processing Service) techniques can be introduced. WPS is one of OGC (Open source GeoSpatial Consortium) geographic information standards and is used for data processing and analysis in the web. WPS has interface that provides the data with open source vector formats such as Geojson, GML, etc. and can generate Raster-based analysis data.

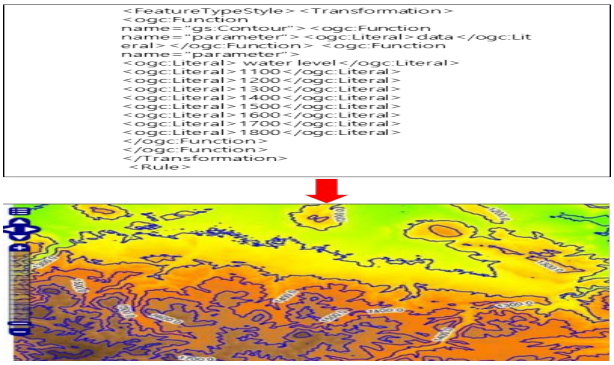

Figure 2. Example of WPS Execution

As shown in Figure 2, WPS has interface that provides the data with open source vector formats such as Geojson, GML, etc. and can generate Raster-based analysis data. In addition, since it has most of the functions to process and generate the data in the bathymetric system due to having the structure that can analyze the Raster data in real-time such as contour, hill shade, etc., it can automate the part currently performed by PC program. To verify if WPS service can preprocess the service data, the representative depth extraction was performed in the wev service. To build the service,

geoserver and iis service-based asp.net service were used as shown in Figure 3.

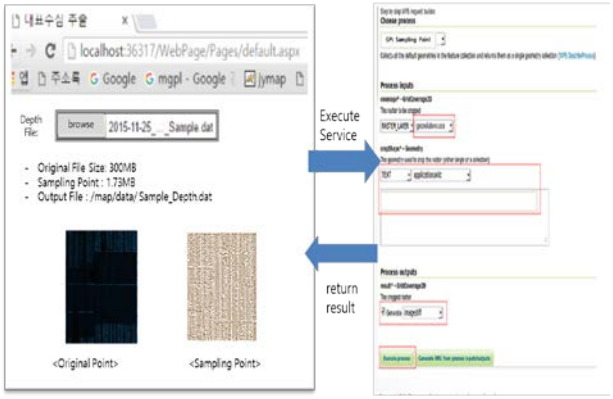

Figure 3. Example of Representive Depth Extraction using WPS Service

The results of analyzing WPS called for provides the convenience for data management and service linked with Hadoop platform. By applying above service, there is effect that the process of data preprocessing stage is reduced.

And since WPS service is executed based on the web, the surveying results can be reflected immediately through the communication interface in the surveying ship for bathymetry. .[2]

In addition, by the development of internet of things and IOT technology, there is the trend that the communication infrastures are gradually used in the surveying. In case of our country, the survey instrument business, etc. are servicing the survey outcome and survey information based on the web mobile.

Figure 4. Web mobile-based Surveying Solution (http://ageo.aktgeo,net)

Due to such changes in communication environment and the surveying instrument development, linking of bathymetric information with web service became possible. If in the multi-purpose bathymetric system, the collection using marine internet from the bathymetric information acquisition is possible, the improvement of preprocessing process is possible to build the data and reflect them as the real-time WPS service is possible.

4. Conclusion

Multi-purpose bathymetric system is the system that provides help for safe navigation and establishing maritime policy. For the system characteristics, to provide the large data service, the construction time is being increased together with using up of the computing infrastructures in data collection and building, which can cause the problem in maintaining the depth data up-to-date. Therefore, through the automated process, the time and computing resources can be saved.

The materialization of WPS service, which is the standard of OGC based-spatial data processing service, and the measure linked to marine communication can be good alternative for automated process. In addition, it was observed that the automated data preprocessing process is partially possible by materializing the representative depth extraction using WPS service.

As a future task, the effect and improvement point should be drawn by executing the automated process through communication in actual coastal area surveying ship and the system reflection measure shoild be designed and tested in the system architecture perspective.

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