

ENC와 DTED 데이터를 이용한 데이터베이스 제작 개선에 대한 연구

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A Study on the Improvement of Database Construction using ENC and DTED

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Abstract

선박조종시뮬레이터는 교육훈련생들에게 실제와 비슷한 환경을 제공하여 교육훈련의 효과를 높일 수 있는 장점을 가지고 있다. 그러므로 선박조종시뮬레이터에는 선박의 정확한 수학적 모델과 실제와 거의 동일한 3차원 화면이 필요하다. 이 연구에서는 전자해도와 고도데이터를 이용한 3차원 영상 제작법에 대해 고찰하고자 한다. 전자해도는 전 세계적으로 표준화 되어 있어 정확성이 가장 뛰어나지만 수심, 항해물표 등 각종 데이터를 가지고 있어 보다 많은 정보를 선박조종시뮬레이터에 적용할 수 있는 장점을 가지고 있다. 그리고 고도데이터의 경우 그 정확성으로 기존의 해상환경 데이터베이스보다 훨씬 현실감을 준다. 전자해도 및 고도데이터를 이용하여 해상환경을 제작 시 정확한 많은 정보의 제공이 가능하며, 기존의 방법에 비해 제작시간을 상당히 감소시킬 수 있을 것으로 판단된다.

Key Words: Ship handling simulators, S-57(Special Publication No. 57), ENC(Electronic Navigational Chart), DTED(Digital Terrain Elevation Data).

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1. Introduction

This study deals with the creation of 2D (2 Dimensional) graphic scene from the data of ENC (Electronic Navigational Chart) and the extension of the scene to 3D (3 Dimensional) circumstance using the DTED (Digital Terrain Elevation Data). And the application of the created 3D environment database to the ship handling simulator is studied to improve training and research circumstances. The proposed method in this study is faster than the conventional method and very precise and, furthermore, can utilize various data of ENC, which will be very helpful for the training and education of the trainees.

ENCs mean the digitized charts which are drawn by the standard format S-57 of IHO (International Hydrographic Organization). ENCs have many advantages such as easiness in using the charts, sorting data and displaying them by user's demand, etc. In order to utilize the ENC in FMSS (Full Mission Ship Handling Simulator), plenty of data included in the ENC must be converted into 2D graphics first, and then visualized into 3D graphic images by using appropriate elevation data.

This paper describes the applying method of ENC and DTED data to FMSS.

2. Conventional Method of Creating 3D Visual Image

Conventional methods of creating 3D images can be divided into 2 groups roughly; the first method is utilizing digitizer, and the second one is using converting software. Figs. 1 and 2 display flowing diagrams of

each method, respectively. In the first method, as shown in Fig. 1, digitizing the chart must be performed by the user's hand and, consequently, the resulting image is depend on the user's skill or characteristics.

In the second method, as shown in Fig. 2, ENC data are analyzed first by using analyzing software, and then store them into appropriate media by appropriate format (usually text file format). After this procedure, the text file must be converted to .dxf format, and then imported into .flt format.

Marine Simulation Center of Korea Maritime University has utilized the conventional methods to create 3D environment visual database; however, the methods can not display important data such as elevation, depth, etc., and very much complicated in making 2D or 3D visual images.

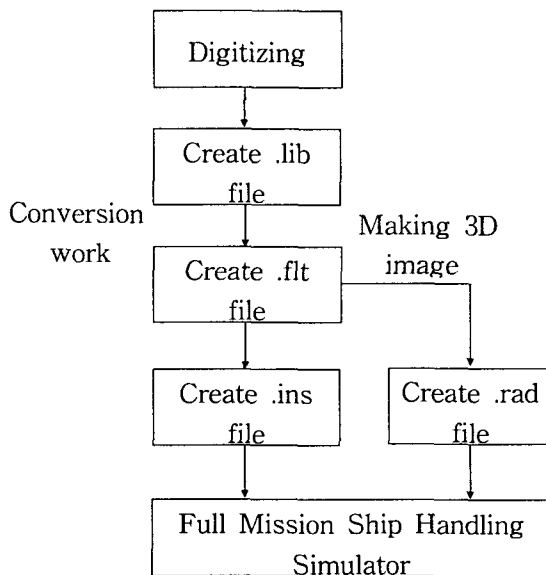


Fig. 1 Creation of 3D Visual Image Using Digitizer

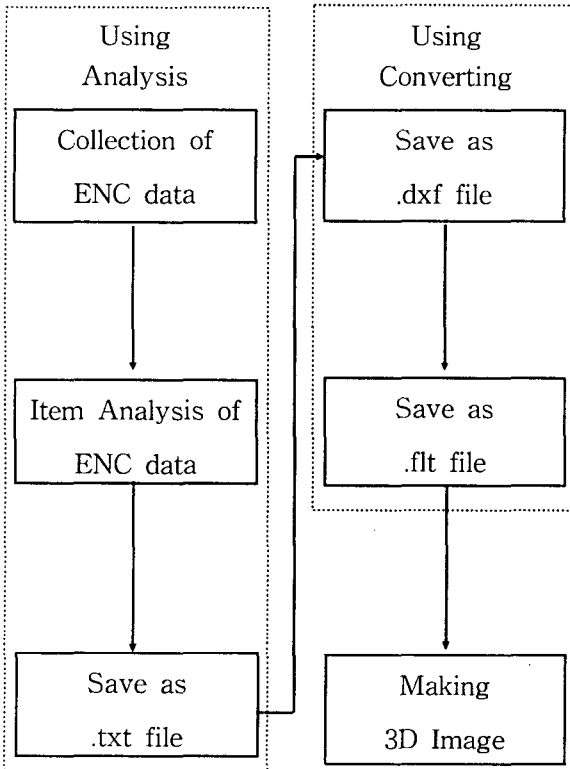


Fig. 2 Creation of 3D Visual Image Using Converting Program

3. Creation of 3D Visual Images Utilizing ENC and DTED

The important point in making 2D images using ENC is to visualize every data in ENC. Especially, the precise display of latitude and longitude is essential in creating 2D graphics because it can not be used for education and training if such position data are not correct.

The 3D visual images are very important in ship handing simulators for efficient education and training. That is, the correct, precise and real-like 3D environmental database is essential in FMSS and its relating applications. The 3D image can be

created by adding 3D data onto 2D graphic database; however, the accurate elevation data are very difficult to display correctly. Therefore, in this paper, the DTED file is introduced and utilized to improve such problems. The MultiGen Creator is used as an image creating software, because almost of all simulation centers in Korea usually use this program as a developing tool for image creation.

First of all, the visualization method of all ENC data in 2D graphics using the MultiGen Creator is displayed in Fig.3. As displayed in the flowing diagram of Fig.3, the ENC data of the target sea area are converted to the import-possible file format using converting program in first stage, and then the converted file is imported into MultiGen Creator. The MultiGen Creator can create and display 2D image easily using the data in the imported file, and finally save the file into .flt format. The 2D images made by the proposed method include every data in ENCs.

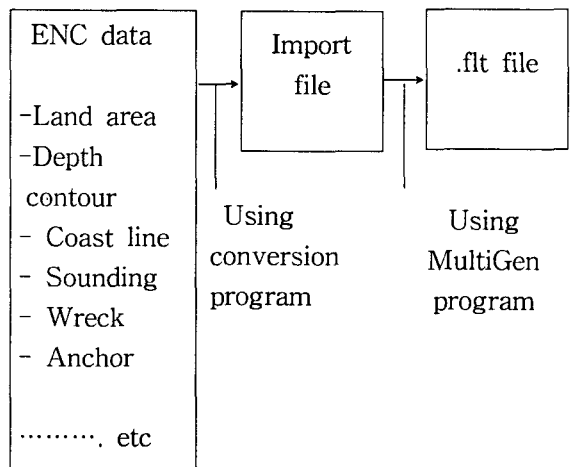


Fig. 3 Creation of 2D Environmental Image Using ENC Data

When the 2D images are made by digitizer, the images can show only contours as shown in Fig. 4. However, the 2D images created by the above mentioned method can display every data of ENC, such as depth, depth contour lines, lights, etc., as illustrated in Fig. 5. The over all data displayed in the 2D image can be applied to the FMSS directly.

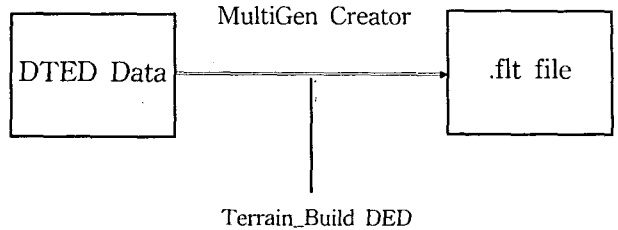


Fig. 6 Generation Method of 3D Images Using DTED Data

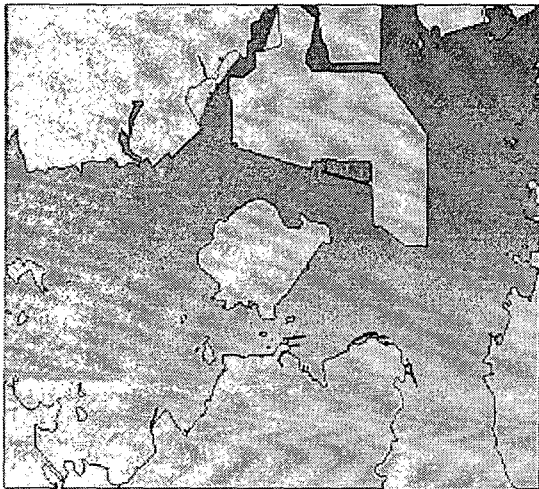


Fig. 4 2D Visual Image Created by Digitizer

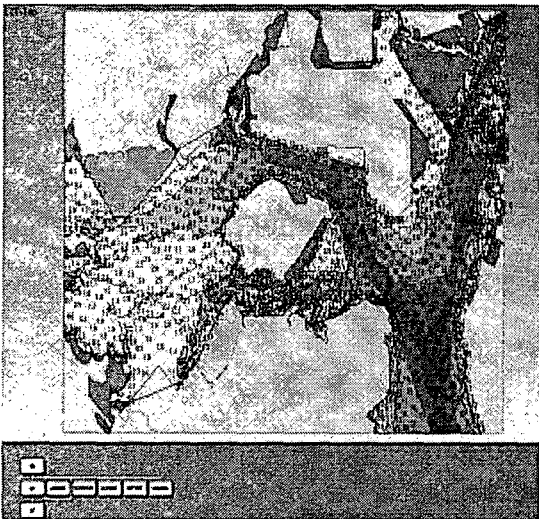


Fig. 5 2D Visual Image Created by MultiGen Creator using ENC Data

The 3D images are generated by applying elevation data onto the created 2D images generally; however, this procedure is difficult because the elevation data can not be obtained easily from ENC data. Therefore, the correct and precise elevation data in DTED file are used to create 3D images in this study.

The creation method of 3D image using DTED data is illustrated in Fig. 6; the DTED data can be imported directly by the MultiGen Creator, and then the elevation data overlaid onto the created 2D .flt file to create 3D images.

Fig. 7 shows the image of the target area which is created using the elevation data of DTED. This image can easily be overlaid onto the 2D image created from ENC data and, as a result, the 3D visual environment database can be obtained as shown in Fig. 8.

Figs. 9 and 10 show an example of the application of the created 3D environment database to ship handling simulator. The 2D graphical images are displayed on the ECDIS panel of the FMSS Bridge as shown in Fig. 9 while the 3D images are projected onto the FMSS screen as shown in Fig. 10.

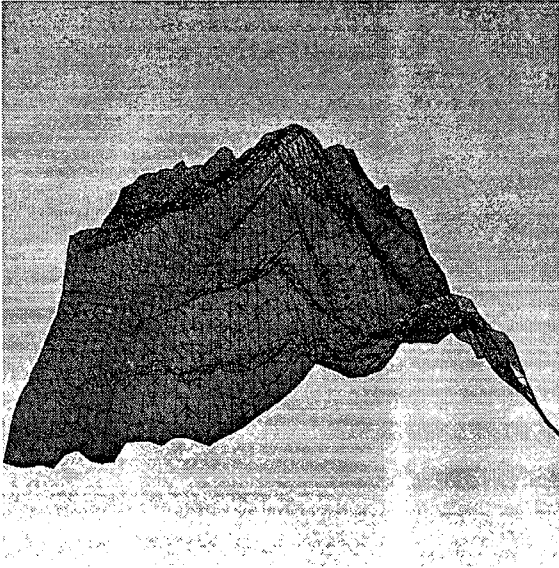


Fig. 7 An Example of the Elevation Data Obtained from DTED

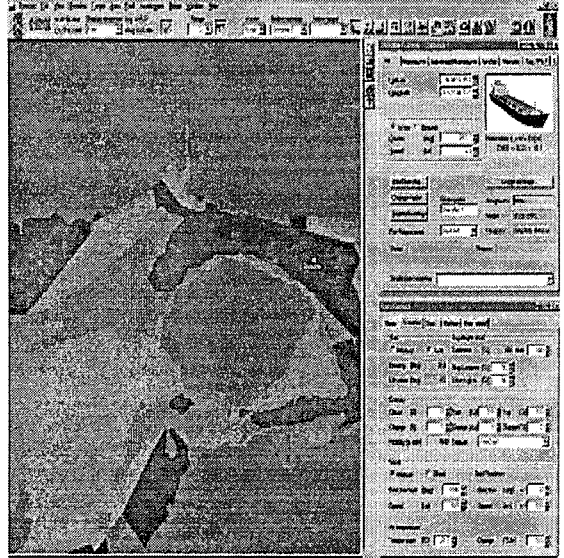


Fig. 9 An Example of the 2D Scene in Central Control Panel of FMSS

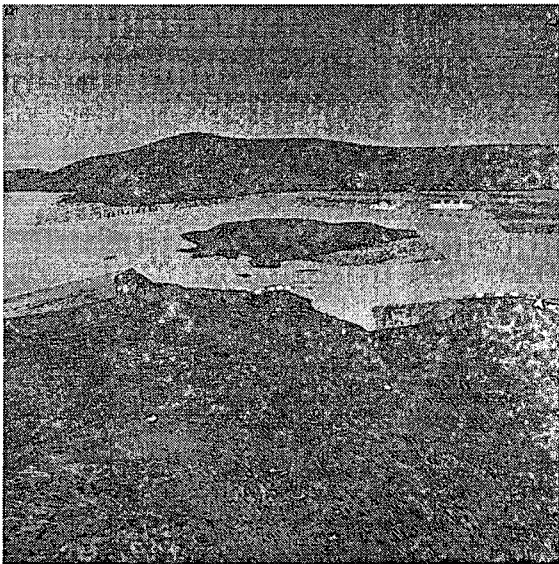


Fig. 8 An Example of the 3D Environment Database Created by ENC and DTED

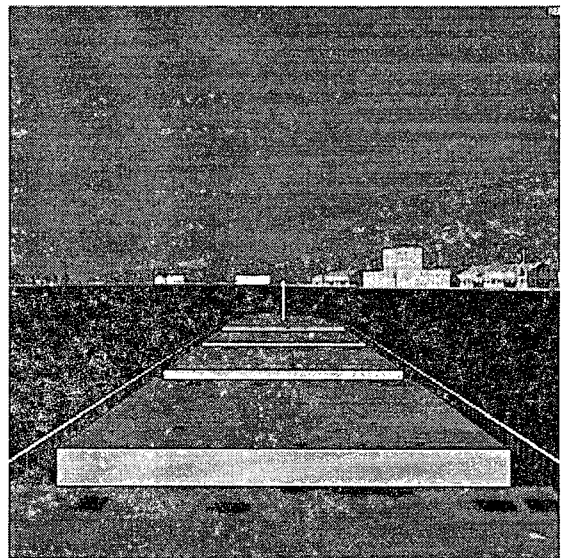


Fig. 10 An Example of 3D Environmental Database Projected onto the FMSS Screen

4. Conclusion

In this paper, the creation method of 3D environmental database utilizing ENC and DTED is proposed. Comparing to the conventional method, the proposed method is easy to handle and make the 3D images, and, furthermore, it can utilize very important data included in the ENC thoroughly. And the method reduces the time and effort in creating 3D images.

The elevation data in DTED files are very precise and easy to process and, therefore, the procedure of making 3D environmental database is improved greatly. MultiGen Creator is utilized as a creating tool for 3D images because almost of all simulation center in Korea uses the software to make environmental database.

As a result, it is proved that the proposed method is very efficient in creating 3D environmental database, and can be applied almost of all simulator operated in Korea.

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