

Application Study on the View Points Analysis for National Roads Route using Digital Elevation Data

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Introduction

This study has been accomplished as a experimental study for field application of 3D Perspective Image Map creation using Digital Topographical Map and based on the Ortho-Projection Image which is generated from Satellite Overlay Images and the precise Relative Coordinates of longitude, latitude and altitude which is corrected by GCP(Ground Control Point). AS to Contour Lines Map which is created by Coordinate conversion of 1:5,000 Topographical Map, we firstly made Satellite Image Map to substitute for Digital Topographical Map through overlapping the original images on top of each Ortho-Projection Image created and checking the accuracy.

In addition to 3D Image Map creation for 3D Terrain analysis of a target district, Slope Gradient Analysis, Aspect Analysis and Terrain Elevation Model generation, multidirectional 3D Image generation by DEM can be carried out through this study. This study is to develop a mapping technology with which we can generate 3D Satellite Images of a target district through the composition of Digital Maps and Facility Blueprint and arbitrarily create 3D Perspective Images of the target district from any view point.

Procedure

1. Basic Data Preparation

use Contour Lines, Road network and Administrative Boundary Layer of 1:25,000 Digital Topographical Map which was made out of National Base Map by National geographic institute (NGI) can be used as the data for Digital Maps. For this kind of 3D Perspective Image Map creation, we can use the Image creation technology using Map Projection and then the original data can be used as DEM image, RGB image, Vector layer

Table 1. original data category of 3D Perspective Image Map

Items	Description
RGB Images	Color Image generatio, by use of Remte Sensing Data
DEM Files	3 D Vector Generation Digital Elevation as link of generals Contour Files
Vector Layers	3Roads abd Buildings are used 3D Birdeys Views

2. DEM Image Creation

Among the various ways of DEM image creation, we choose the way using Contour Line layers of Digital Map which's been already made and purchasable. Standard codes for Contour Lines of Digital Map are as follows;

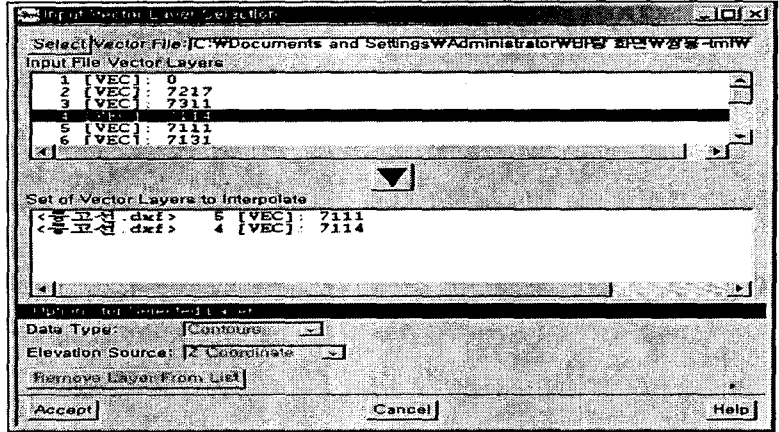


Figure 1. Digital map layers for DEM Generation

In the above window, you can get DEM image file created with clicking the Accept button after registering chosen Contour Line layers in order. Picture 1. shows the created DEM image and Contour Line layers.



Figure 2. DEM Image Generated from Contour files

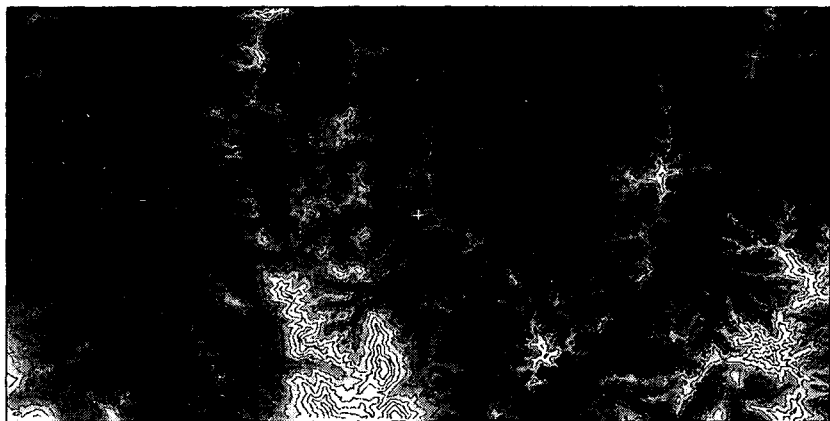


Figure 3. Contours and No.38 Roads line Overlaid on DEM Images

3. 3D Projection Image Creation Process

- (1) making a Perspective Image creation process model using PCI Modeler.

Picture 2. is the 3D Perspective Image Map creation process model. To describe it briefly, the process is as

follows;

Inputting RGB channel, DEM channel and Vector layer through IMPORT module creating projected image through Image Projection Algorithm of PSGIMAG module showing the results on the computer screen through VIEWRGB module creating the files of 3D Perspective Image Map through EXPORT module

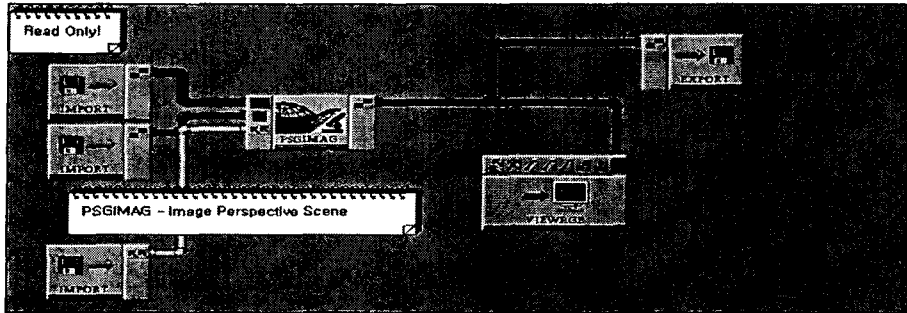


Figure 4. Perspective image Generation Modeler

4. Topographical Simulation Process

Basically we can not create 3D Perspective Image Map of Satellite Image due to absence of RGB Image. But we could make three-dimensional effects for the 3D Topographical Simulation through color-classified Imaging of Topographical accidents by altitudes using DEM files generated from Contour lines of Digital Map and overlapping the National Highway No.38 and the same coordinate..

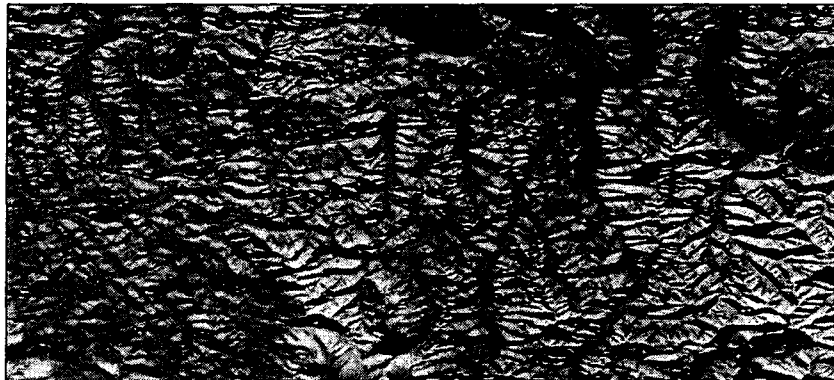


Figure 5. RGB Shading Results Image of DEM Files

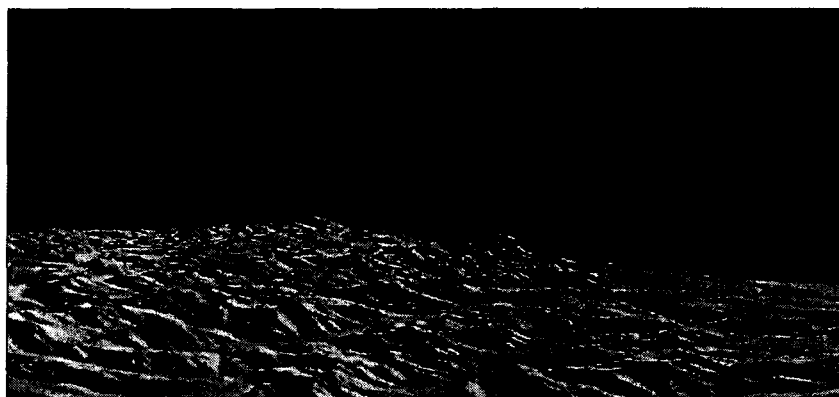


Figure 6. 3 Dimensional Images Generated as Elevation Level

Results

1. View Area Analysis from various view points

The National Highway No.38 is a very important mountain Highway as a hub road in mid eastern area which covers from Jecheon, Choongbuk to Youngwol, Kangwon.

Since this National Highway is now under construction for extension from 2-lanes to 4-lanes, Cement and Limestone producing facilities are expected to be on the increase Around this National Highway. Consequently, the natural environment of this area will be possibly disrupted. To prevent this kind of environmental disruption, Environmental Impact Assessment and View Area Analysis is required to be carried out previously. Therefore, we applied Digital Image Processing as the preparatory operation work to take a view of the target facility district with the shortest path and the minimum height at the 6 main points of the 40km section. And through the step-by-step data processing we completed 3D Perspective Image Map for View Area Analysis of the existing road and the extended road with Geodetic Coordinate of GIS. And also developed a preliminary Simulation test methode through producing moving images for virtual simulation of this section. After all, as the result of this study, instead of the existing method for creating digital topographical models through field survey and converting them into vector in CAD program, you can create 3D topographical map using Laster image files and 3D Perspective Image Map at any view point through simulation when you have just Contour line files of Digital Map, expected route and relative information.

The result of this study will be able to be applied to assessment of Optimum location selection of new factories, halls in Golf links and viewshed analysis for building observation platform, power-transmission tower, mobile radar station, base station.

When we can get more reliable results through specific experimentations later, this technology will be used for Optimum route selection of Expressway and National Highway.

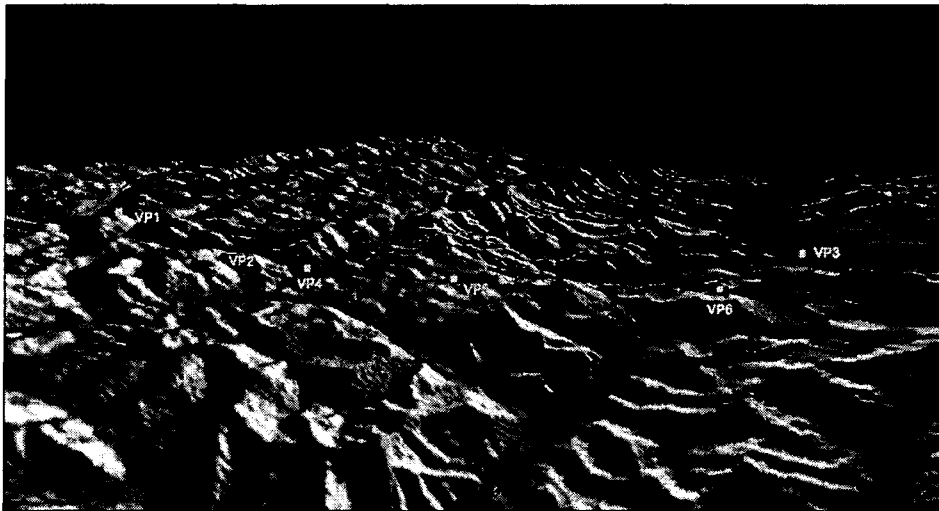


Figure 7. 3D and digital Perspective Image Map which has view points indicated on the National Highway No.38

2. The Final 3D Perspective Image Map



Figure 8. View Point 1

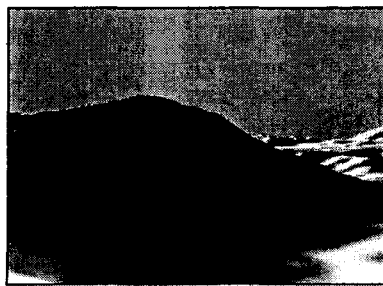


Figure 9. View Point 2

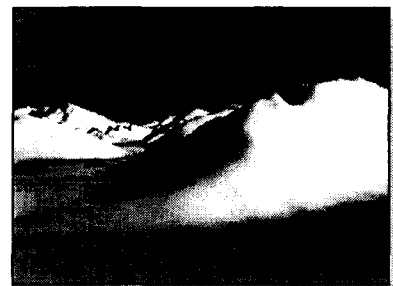


Figure 10. View Point 3



Figure 11. View Point 4

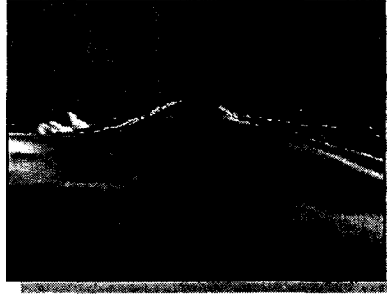


Figure 12. View Point 5

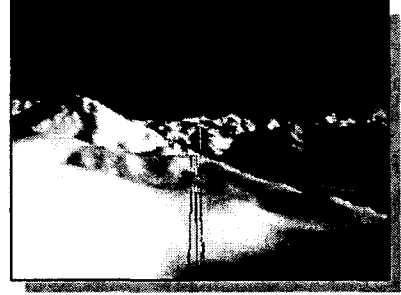


Figure 13. View Point 6

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