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ASSESSMENT OF DIGITAL ELEVATION MODEL OF SPOT SATELLITE USING GEOMATICS TOOLS

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Abstract

In all infrastructure works, engineers and municipal employees need to carry out field surveys to obtain land elevation, due to the conditions of war and terrorist acts in large areas of Iraq after 2003, it has become difficult to carry out this work. In this paper, digital elevation model DEM extracted from stereo satellite images were used and compared with field surveys of limited areas, to study the possibility of using this type of DEM instead of field surveys in dangerous areas. A stereo satellite images from the French satellite Spot 5 with 5 m spatial resolution were used and processed using ERDAS Photogrammetry Software to extract the DEM. Field samples were taken in the Shargat area and comparison was made to obtain high-accuracy results in open areas and agricultural areas, where the accuracy reached less than 1 m, while the accuracy decreased in built-up areas to reach 1 to 2 m. this decrease in accuracy in built-up areas may be due to the low of spatial resolution of the image used, where (5 m) is sufficient to move in place from the road to inside the building, which affects the elevation difference between them.

Keywords: DEM, Field Survey, Geomatic Methods

1. Introduction

Urban development is one of the key issues facing land-use planning departments today. Monitoring the spread of urbanization concerns regions and groups of urban communities. Or even entire countries, and may sometimes span international borders

Regional and local development programs need geographic information to give decision-makers a broad picture that reaches across all sectors. Such programmers have to ensure that land-use provisions are spatially coherent and take environmental issues fully into account.

Collecting uniform and current geographic data for planning purposes is not always an easy task. Tools for tracking built-up areas require map coverage of vast areas that is both accurate and uniform (1). Digital elevation model (DEM) data are arrays of regularly spaced elevation values referenced horizontally either to a Universal Transverse Mercator projection or to a geographic coordinate system. The grid cells are spaced at regular intervals along south to north profiles that are ordered from west to east (2). East View Cartographic maintains an extensive inventory of off-the-shelf Digital Elevation Models for immediate delivery. In addition EVC can provide precision DEMs from various in-stock and easily accessible source materials. Such products include DEMs at 90m, 50m, 30m and higher accuracies for much of the world's surface. Source materials include global coverage topographic maps, stereo satellite imagery, and aerial photography (3).

DEM with other satellite images are used to perform the spatial data needed in vast areas monitoring and management.

2. Materials and methods

2.1 Spot-5 Satellite Images

The SPOT-5 Earth observation satellite was successfully placed into orbit by an Ariane4 from the Guiana Space Centre in Kourou during the night of 3 to 4 May 2002. Compared to its predecessors, SPOT-5 offers greatly enhanced capabilities, which provide additional cost-effective imaging solutions. Thanks to SPOT-5's improved 5m and 2.5m resolution and wide imaging swath, which covers 60x 60 km or 60 km x 120 km in twin instrument mode, the SPOT-5 satellite provides an ideal balance between high resolution and wide area coverage.

SPOT-5's other key feature is the unprecedented acquisition capability of the on-board HRS stereo viewing instrument, which can cover vast areas in a single pass. Stereo pair imagery is

vital for applications that call for 3D terrain modeling and computer environments, such as flight simulator databases, pipeline corridors, and mobile phone network planning (4).

2.2 IKONOS Satellite Images

The IKONOS Satellite is a high-resolution satellite operated by GeoEye. Its applications include both urban and rural mapping of natural resources and of natural disasters, tax mapping, agriculture and forestry analysis, mining, engineering, construction, and change detection. It can yield relevant data for nearly all aspects of environmental study (5).

2.3 ERDAS Imagine Photogrammetry Software

Its a Complete Suite of Photogrammetry Software Tools produced by Hexagon Geospatial. Today, photogrammetry and production mapping experts are under pressure to produce more in less time, while maintaining a rigorous degree of accuracy. Hexagon understands this challenge and builds the tools to help us accomplish your goals on time, in scope, and to the preferred accuracy. IMAGINE Photogrammetry, a seamlessly integrated collection of software tools, enables us to transform raw imagery into reliable data layers required for all digital mapping, raster processing, GIS raster analysis, and 3D visualization needs.

3. Area of Interest

The study area located in Shigat to the North of Baghdad, the area of interest selected for this pilot project as a rectangular of about 5 x 8 km, located between UL(332000, 3937000) and LR (337000, 3925000).

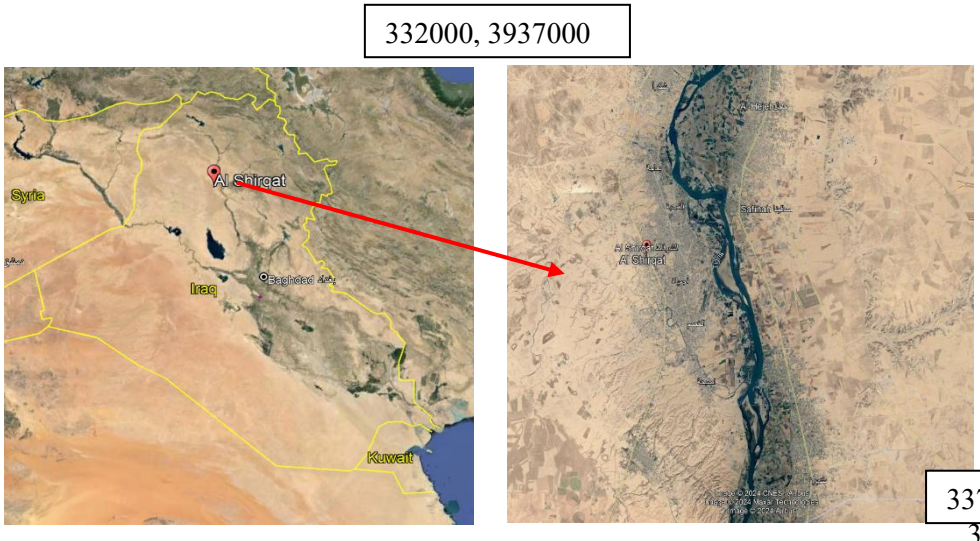

Fig 1. Area of Interest

4. Scope of Work

1- Using Stereo pair SPOT-5 images (Fig 2) to extract DEM, using Imagine Photogrammetry Software. Fig 3.

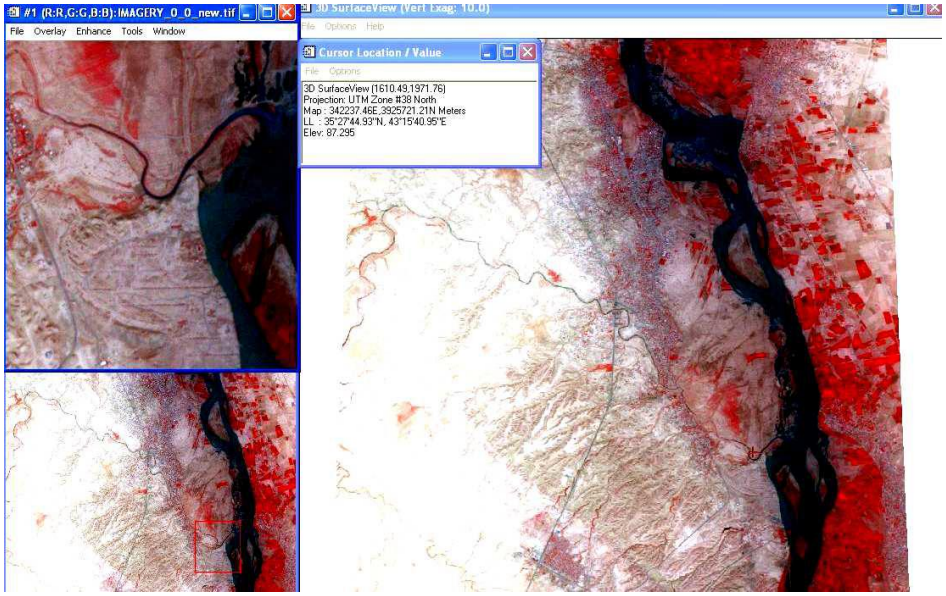

Fig 2. Using Stereo Pair to Extract DEM

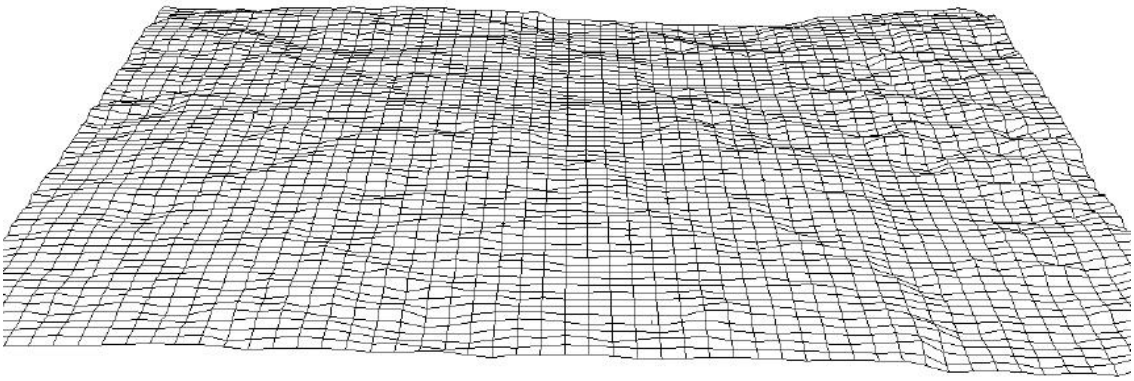

Fig 3. DEM Extracted from Stereo Images

2- Using Ikonos satellite image 1m resolution (which is already corrected, used it as a reference for Geometric correction. Fig 4.

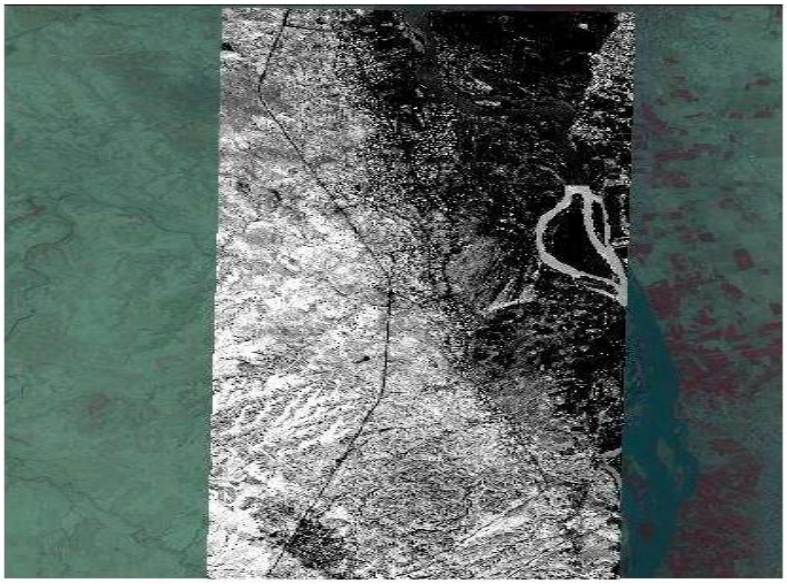

Fig 4. Using IKONOS Images as reference to Correct SPOT Images

3. Digital image processing programs have been used for converting the DEM from raster to vector, to facilitate Geographic Information System (GIS). Fig 5

4. Field surveys have been made to collect GCPS, and upload the GCPs to the GIS as a vector layer. Fig 5

5. Made a comparison between 2 layers, DEM and GCPs.

Fig 5. Vector Comparison

5. Results and Discussion

The DEM extracted for the entire area of interest, GCPs collected using DGPS. Both insert to GIS software as vector layers to make the comparison between them. The results were:

1- The elevation of both layers very close to others in differences ranged between 0.20m to 0.70m in the open areas.
2- The elevation of both layers have more differences ranged between 1.20m to 1.50m in the urban areas.

6. Conclusion

Through the results explained upove, this paper can recomened to use the DEM extracted from SPOT-5 Stere images (5m grid) in the open areas in projects of roads and other project but these data needs more GCPs to increase the accuracy when used in urban areas.

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