A DIFFERENT APPLICATION OF TERRESTRIAL PHOTOGRAMMETRY

SILHOUETTE OF ANCIENT CITY PARTS

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In this study, obtaining of old city silhouette of Istanbul has been intended. In order to obtain an 1:500 scaled silhoutte, the photographs have been taken from the sea from the arbitrary points on board of a sea craft. The control points were marked along the shore. Also, some other features which could be seen on the photographs such as minarets and windows of buildings were measured. UMK 10/1318 photogrammetric camera was used to take photographs and Digital Photogrammetric System (PICTRAN) has been used for evaluation. The problems which were encountered throughout the process were also examined.

1. AIM OF THE STUDY

The aim of this paper is to report on the study in obtaining the photogrammetric silhouette of city parts to give the city planners and architects some hints for the permission of new buildings in this areas so that this new structures don't disturb the city silhouette.

1.1 THE ANCIENT PART OF ISTANBUL

Istanbul is one of the most important historical cities in the world. Therefore, her old structure must be protected. For this purpose , Istanbul Great Municipality and Civilization administration had consult to İTÜ Civil Engineering Faculty, Photogrammetry Division for silhouette of old city having a scale of 1:500 at 8.01.1996. Eminönü-Fatih district is announced as Historical and city sit area., City and Archaeological sit area by the First Istanbul Cultural and Nature Presence Committee. This project will be a basemap for Istanbul Great Municipality, Planning and Civizilation administration planing projects. According to the protocol which was signed between İTU and Istanbul Great Municipality;

- The silhouette of Golden Horn with a scale of 1:500
- The silhouette of Marmara Region with a scale of 1:500

should be obtained by photogrammetric methods.

1.2 CAMLICA HILL, ALTUNIZADE AND ITS SURROUNDING

The second study is obtaining the silhouette of Camlıca Hill, Altunizade and its surrounding which is one of the most historical and touristic parts of Istanbul that can be viewed from different sights, by means of terrestrial photogrammetry.

2. DIGITAL PHOTOGRAMMETRIC METHOD

Digital Photogrammetric methods have greater advantages compared to analogue systems as better stability (geometry and radiometry), greater accuracy, and the ability to process images. It is also possible to display vector data in the images on the screen and to produce transformed images (rectification, orthophoto).

For these reasons, digital photogrammetric method has been choosen for the two silhouette projects of Istanbul.

2.1 OBTAINING OF PHOTOGRAPHS

2.1.1 THE ANCIENT PART OF ISTANBUL

A detailed plan was designed for the silhouette study of the ancient part of Istanbul and according to this plan 255 control points (Figure:1) has been signalized on the Marmara and Golden Horn shore inside of the city walls. This ground control points has been measured with Total Stations and their coordinates established. And then GPS supported transformation to the land coordinate system has been realized. In this study, the photographs have been taken with Zeiss Jena UMK 10/1318 camera on the boat from the sea. (Figure 2)

Figure 1 Control Points along the shore

Figure: 2 Taking photographs from the seacraft

The used camera Zeiss (Jena) UMK 10/1318 is composed of four basic groups of functional units (metric chambers, magazines, mounts and electronic gear) which can be optionally combined in four logical combinations. The specification of the camera are shown below.

Focal Length (mm)	99
Image Size (mm)	120*160
Field Angle (gon)	68*88
Photographic Material	Glass Plate
Focusing Distance (m)	1.4 … ∞
Camera –to-subject distance (m) (approx.)	1 … ∞

Table 1: Characteristics of Zeiss (Jena) UMK 10/1318

This camera was calibrated by using a test field (Figure 3)

The taken pictures has been developed in the labour and glass plates scanned in HP DeskScan II. The resolution of the scanner can be chosen before scanning and depends on the image type to be scanned. With the increasing number of points per inch, the quality and the size of image increases too. To reach the best quality he resolution of the printer or screen must be taken into account. For this study, the images has been scanned with 600 dpi resolution and the images are transferred to the computer media.

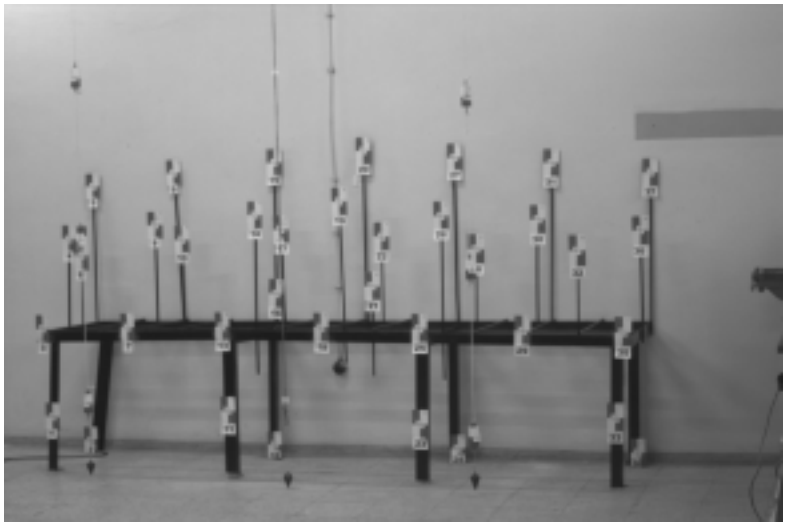

Figure 3 : Test Field

2.1.2 CAMLICA HILL, ALTUNIZADE AND ITS SURROUNDING

Photographs were taken from the coastal band including Asian, European side to obtain different sight views. For this purpose the area was examine, location of control points and exposure centres of the cameras were determined with the help of existing maps and air photographs. The used cameras for this project are Kodak DCS 460 digital Camera and Rollei Rolleiflex 6008 Metric. Photos taken by DCS460 are directly used in the computer media, and the photos taken by Rolleiflex are scanned and then transferred to the computer media. Control points and and very good defined natural points, like building corners, chimneys etc. Are measured with GPS supported systems. The measured and adjusted coordinates of these points are transformed into national coordinate system. This silhouette will be used for the location decision of a new planned large block multi-stored building which is planned to be constructed as a hotel and boreau center at Altunizade, Camlıca.

2.2. PROCESSING OF THE DIGITIZED IMAGES

The measurements of image coordinates in scanned images on the screen is the first step towards digital photogrammetry. Through the application of digital image data photogrammetry becomes a special field of digital image processing, providing still more flexibility and an enormous potential for automation. Digital Photogrammetric systems are on the market. Digital photogrammetric systems are defined as “hardware and software to derive photogrammetric products from digital images using manual and automatic techniques”.

In this study the PC-based system PICTRAN has been used for obtaining of old city silhouette of Istanbul by means of Digital photogrammetric methods. PICTRAN is a software to process digital images. PICTRAN D and PICTRAN E are the base modulesof the software. Pictran E rectifies digital images. The possible results can be three dimensional object coordinates, graphic objects or CAD constructions. (Figure:4 and 5)

The system has different features:

- The number of pictures used is unlimited
- To connect to a CAD system is possible, so the graphic structures can be processed in CAD systems.
- For the measuring of the points on the screen there are two different windows, one for the whole image and the other for a part of this image.
- With template matching is possible to reach precision in subpixel.
- The precision of the result depends on the image distance, resolution of the digital picture, and the camera used.
- Digitizing tablet is not be used

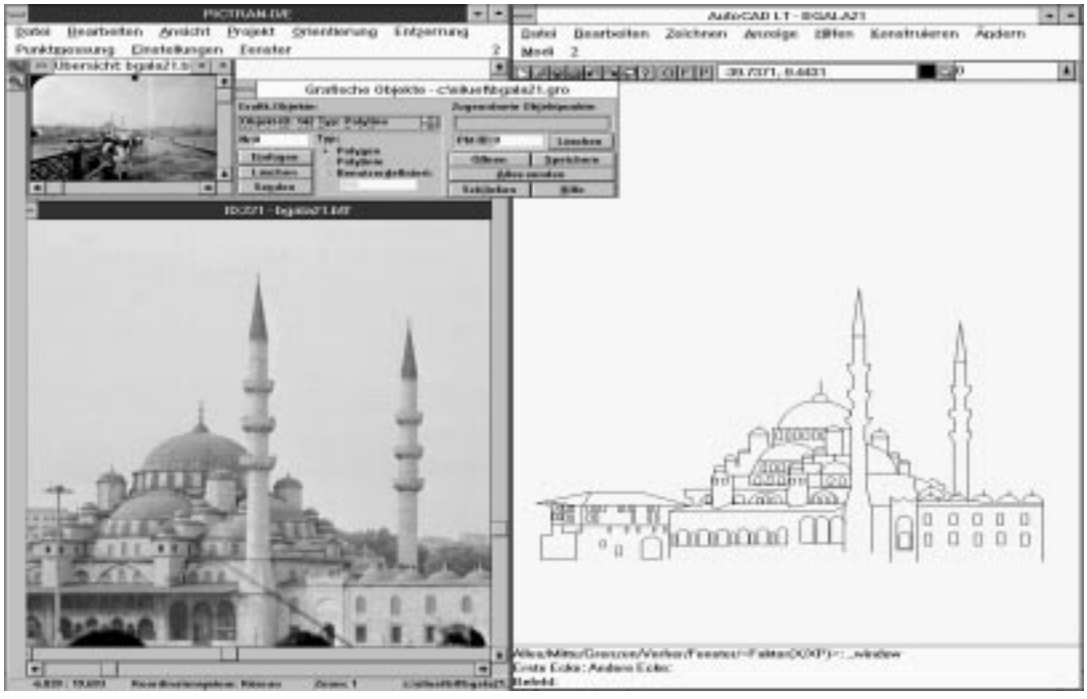

Figure: 4 Digital Evaluation of the Yeni Cami and its CAD Construction

The inner and exterior orientation of the pictures should be completed to obtain 3D plotting. The camera distance and coordinates of the main point can be, if they are unknown, computed with PICTRAN B. The six parameter of the exterior orientation can be determined with the PICTRAN D modul.

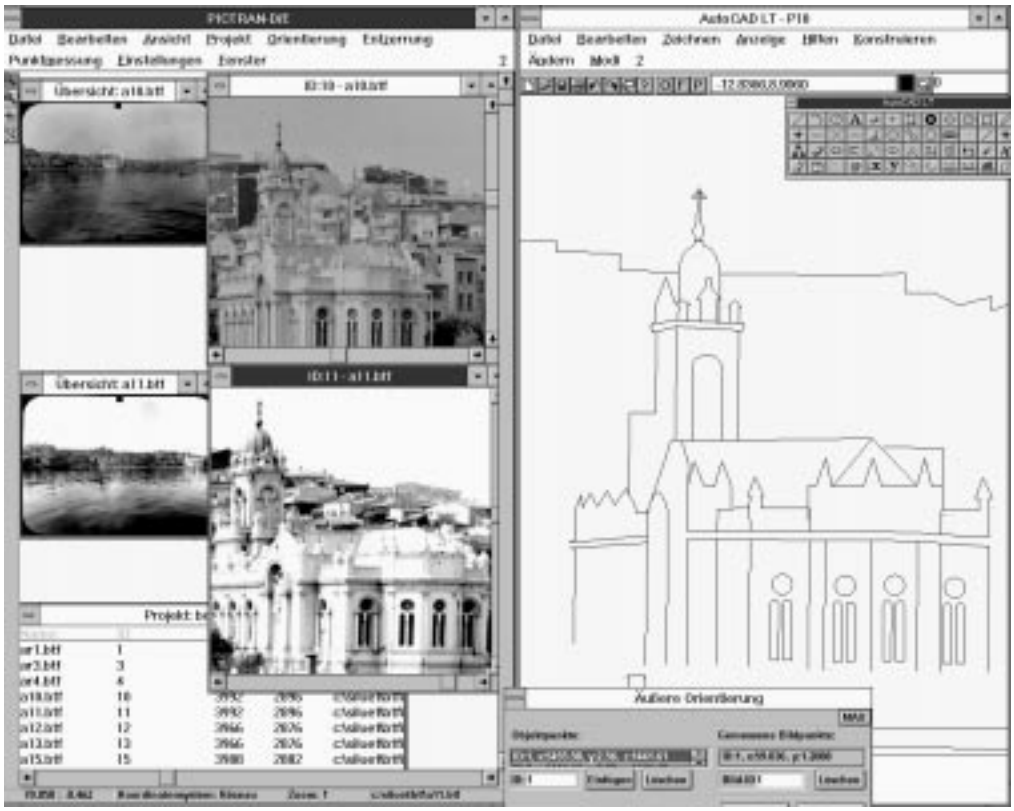

Figure : 5 Digital Evaluation of the Bulgarian Church and its CAD Construction

For obtaining old city silhouette of Istanbul, the digitised images are processed with PICTRAN software. The coordinates of necessary points on the oriented images have been measured by means of conventional methods. The image orientation has been done by integrated bundle adjustment The PICTRAN bundle adjustment runs without initial values for orientation parameters and the unknown object points. Therefore the orientation can run from scratch fully automatically. The results have to be checked for blunders in the observations ; this is supported by data snooping. The orientation is split into three steps whereby the first two provide approximate values for the final step, which is a conventional bundle adjustment. All three steps

are least squares adjustments and therefore support blunder detection by data snooping. Afterwards these points have to be transferred to the AUTOCAD software and graphical drawings has been carried out.The three dimensional coordinates of the points transferred from PICTRAN to AUTOCAD are defined as a three dimensional file. Than the relations between these points can be established and according to these relations the projection of these three dimensional points are drawn. The silhouette was projected on the vertical plane, which is perpendicular to the line connecting camera station and specific target- line on shore.(Figure: 6)

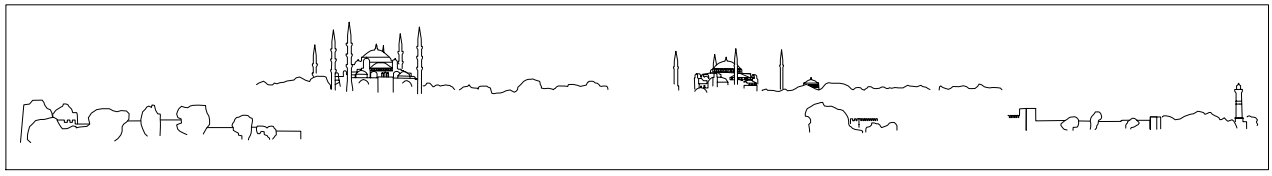

Figure: 6 A part of the silhouette of the ancient part of the city

For the decision of location of the multi-store building silhouettes from different sights are established. (Figure:7,8,9)

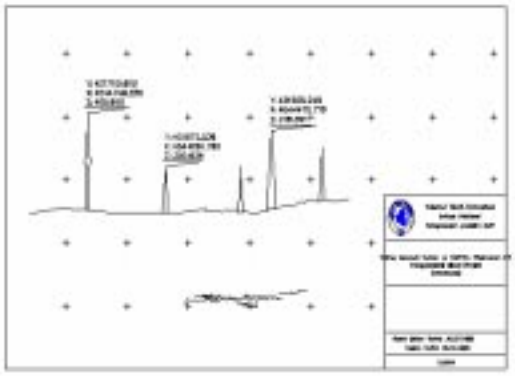

Figure 7 Silhouette of the interested area from east

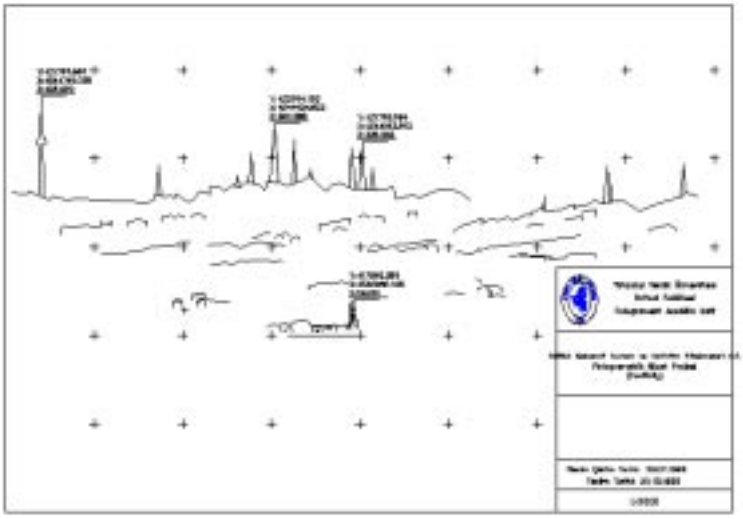

Figure 8 Silhouette of the interested area from west

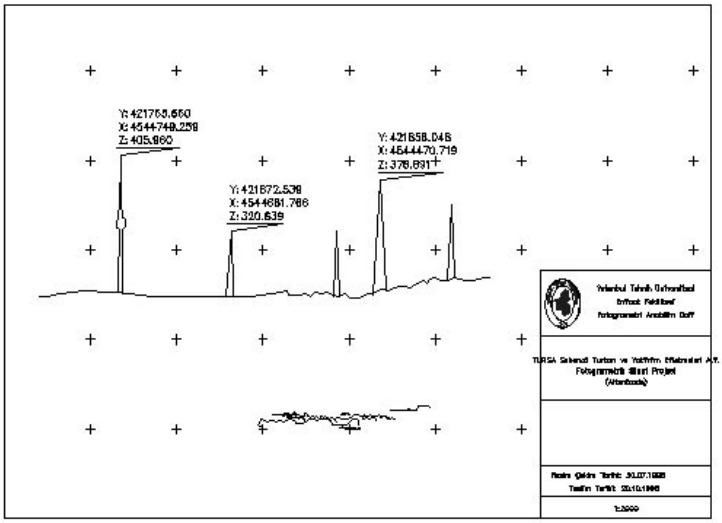

Figure 9 Silhouette of the interested area from south

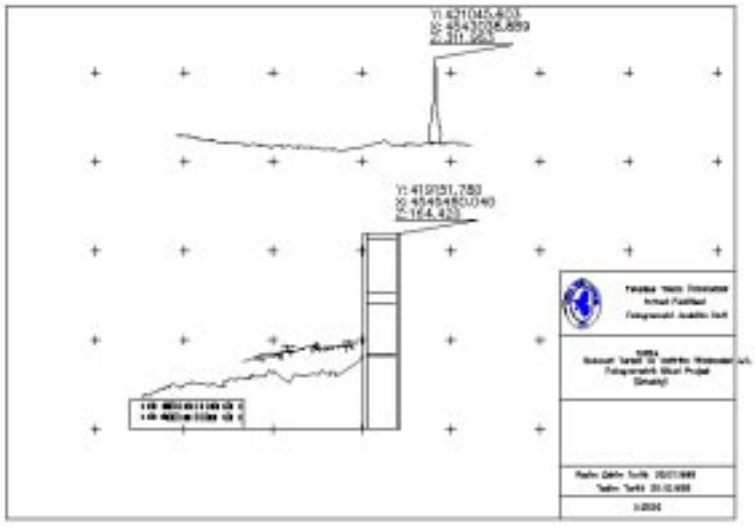

Figure 10 Silhouette of the interested area from north

3. CONCLUSIONS

This study was a real example of integrating digital photogrammetric data capturing systems with Autocad. The silhouette was generated with the digital photogrammetric captured data in Autocad R14 software. An orthogonal projection which is perpendicular to the plane of images at Autocad System was made in order to obtain the evaluation between 1/1000 and 1/3000 scale. With the help of the software, developed by Photogrammetry Division, projections and different sight views with changing from various viewing points are obtained online. The into the national co-ordinate system transformed silhouettes can be used by animation software's, like Studio Max. Taking photos to obtain from a large part of the city such a silhouette in a scale of 1.5000 was a very hard task. Because of the wide distance some details of the objects do vanish and as the photographed part of the city become only a strip in the mid-part of the picture one get problems with the orientation of the photographs. Therefore we had to take additional measurements to get better orientation. For this purpose we introduce some measured lengths between the good defined objects or height differences as additional constrains into the bundle adjustment.

4. LITERATURE

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