DOCUMENTATION OF THE ZAZADIN INN WITH LASER SCANNING

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ABSTRACT:

Technological development has brought a new instrument for 3D object survey in every field, and laser scanner is the latest of these instruments. In this time, laser scanners has been used for obtain data of 3D view in very field. The technique for laser scanner has reduced for survey time and to simplify all operational tasks. Especially, it is most effectively in a 3D view of big dimension object. In this study, Zazadin Inn, built in 1236 by Saadettin, who was the architect and also vizier of Alaeddin Keykubad sultan of Seljuk and dimensions about 94mx32m, was scanned by laser scanner and modeled 3D. Scanning was performed with Optech ILRIS 3D terrestrial laser scanner. Point clouds were matched with applied independent model triangulation by commercial software. All point clouds which was formed one point cloud was transformed in geodetic reference system. Geodetic reference system based Ground Control Points (GCP) is suitable for application of several time and method.

1. INTRODUCTION

Terrestrial laser scanners are enable to survey the 3D surface of complex objects by acquiring a large amount of data in a short time with respect to classical topographic and photogrammetric techniques (Scaioni 2002). Its properties is possible that large object has survey and 3D visualization. Laser scanners are very important instrument for cultural and historical heritage.

Obtained data by laser scanner is scale rate 1:1 and 3D model of the object in RBG mode and gray scale mode. "*The shame of a survey by a laser scanner is similar to a photogrammetric one, necessary to perform acquisitions from different standpoints if the object is too large. The output of a scan from a given station is a 3D point cloud whose coordinates refer in principle to an intrumental reference system, which therefore changes from station to station. All the model points must be put together, transforming their coordinates into a unique object reference system. Depending on the purpose of the survey, the coordinates may have to be referred to a pre-defined references system or may be expressed into an arbitrary one*" (Scaioni 2002). If the surveys obtained in GCP coordinate system, they can be adapted in different relate work also systematical errors can be controlled.

In this study, Zazadin Inn was surveyed by laser scanner and acquisition 3D model by put together of the obtained point clouds in geodesic coordinates. For in this aim, all point clous have put together to selected reference point clouds coordinate system. Afterwards, the model, which is obtained from all the point clouds, has been transformed in geodesic coordinate systems.

The Zazadin Inn is 22 kilometers away from Konya, and 5 kilometers to adjacent Tomek village from Aksaray-Konya road, and The Zazadin Inn, is constructed 1236 by Saadettin, who was architect and also vizier of Alaaddin Keykubad sultan of Seljuk (Altuntas et all 2006).

Figure 1. The Zazadin Inn

2. SURVEY OF THE OBJECT

Object dimensions are 94mx32m approximately. Before laser scanning, control points were signed on the object form least three control points within between different models as common points. It was identified used by specifical signature (Figure 2). Control points of geodesic coordinates were obtained from ground control points by reflectorless total station. The object was scanned by Optec Ilrıs 3D laser scanner. All of the object were scanned from nine stations (Figure 3). From every stations was scanned to object to 40 minutes in form spot space 2cm (x and y direction).
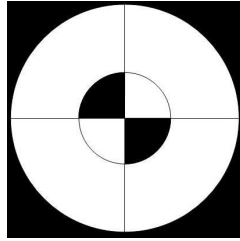

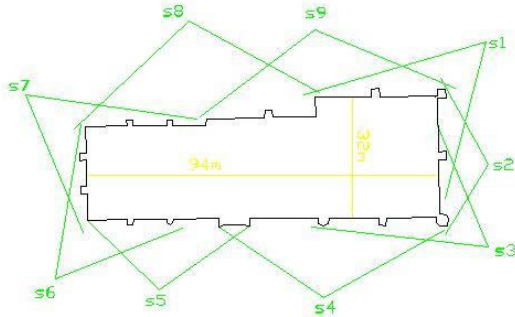Figure 2. Target on the paper A4 size (outer diameter is 15cm)

Figure 3. Laser scanner stations

The targets were sticked on the object on 65 points. Use of the 65 number points are 8 GCP, 16 check point, the other tie points.

3. 3D MODELLING and ORIENTATION

The first model of all the models was selected to reference model and, all the other models are registered to this. For registration of all the other models within the first scan were used tie poins which are sticked on the object. After the 3D model is available, all the models are then globally oriented by using the set of GCPs. For the global registration were used 8 number of GCPs that whole distributed on the object. The residuals of 16 control points were used for accuracy control of the registraiton. Polyworks software (version 9.1.7) were used to processes and orientation of the data. Obtained results have seen in Table 1.

Table 1. Global registration results in with GCPs.

# GCP	# Check points	σ_o (cm)		Residuals on check points (cm)		
				min.	mean.	max.
8	16	7.61	Y	0.01	2.40	6.36
			X	0.94	3.94	7.50
			Z	0.32	6.82	9.60

4. VISUALIZATION

Object 3D models have been obtained in RGB and gray scale mode. In addition, video format of the 3D model has been obtained.
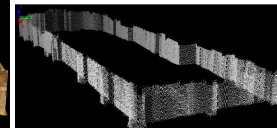

(a)

(b)

(c)

(d) (e)

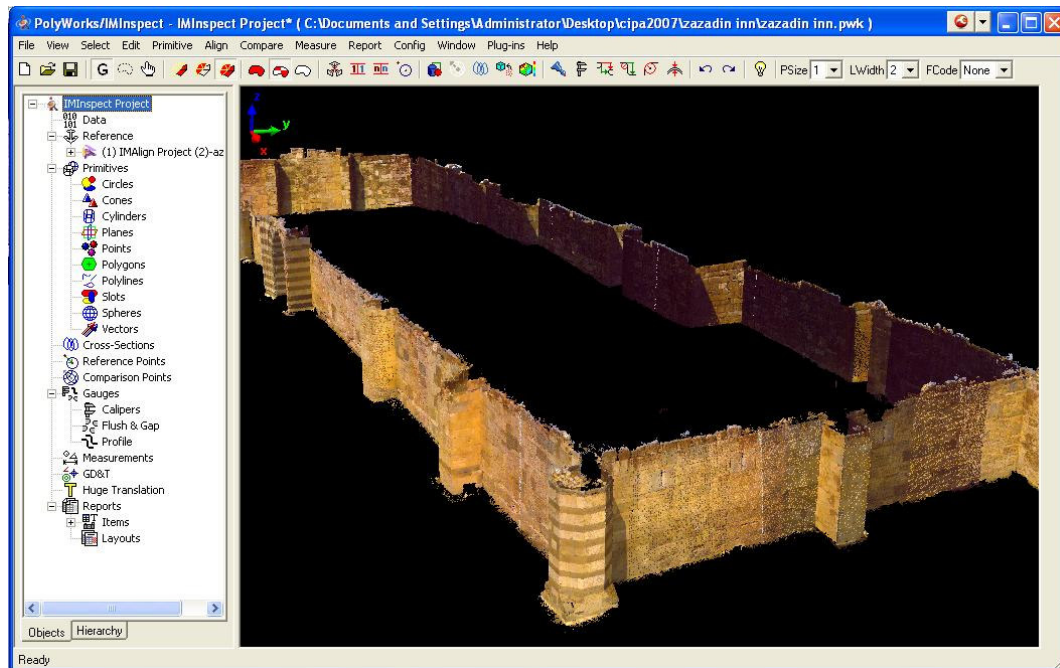Figure 4. 3D model of the Zazadin Inn obtained from laser scanner point clouds.

Figure 5. 3D model of the Zazadin Inn obtained from laser scanner point clouds.

5. CONCLUSION

The large amounts object such as the Zazadin Inn can be acquisition form 3D data in short time. Lazer scanners are facilitated documentation of historical and cultural heritage. The object can be registered global coordinate system by GCPs. Thus, obtained model can be used effective in geographic information systems and, entegrate with the other data.

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