Chapter 8

Use of Laser Scanner for Digital Surveying of the Sarnicli Inn and the Byzantine Cistern Underneath

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ABSTRACT

Measurement methods including traditional measurement methods, topographic and photogrammetric measurement methods, measurements via laser scanning devices and aerial photogrammetric measurement methods obtained using model airplane or model helicopters are used in documentation of the cultural heritage and protected areas in our country. Although data obtained by Aerial Lidar technology accepted as advanced technology over the past decade, enables faster data comparing to others as data obtained by terrestrial laser scanners provide millimetre level accuracy close-range scanning methods are preferred in architectural facades scanning during the process of surveying of a single building.

Inclusion process of a Byzantine cistern in Istanbul, Turkey, which was undiscovered for centuries, in our cultural heritage as well as surveying stages of the cistern along with the inn structure built over, using 3D scanning technology shall be described within this study.

INTRODUCTION

In recent years, 3D laser scanning systems in surveying of historical buildings have been preferred also in Turkey due to fast, accurate and dense data capture with the effect of changing technological and scientific developments in the world. Laser scanning method which is the latest technology of the century has been used in surveying of the Byzantine cistern located underneath the Sarnicli Inn and its

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The inn means “having a cistern” in Turkish). Digital surveying processes, reasons to prefer laser scanning in surveying, problems encountered and vector drawing process of two historical buildings shall be studied within the scope of this article.

BACKGROUND

Following the discovery and diffusion of photography technique around the world, trials related to photogrammetry technique to be used in the architecture, which were conducted in 1858 by Albrecht Meydenbauer, a German engineer, could be considered as the beginning of a new period in this field (Albertz, 2001). It is seen that Meydenbauer is the person who also used the photogrammetry term for first time and established the first institute in this field (Royal Prussian Photogrammetric Institute) (Burtch, 2006).

The introduction of photogrammetry with computer technologies occurred in the middle of the 20th century. Howard Aiken, an American physicist and a pioneer in computing, developed the first functional computer in collaboration with IBM in the early 1940s, and in the following years Photogrammetry, Plane Table Photogrammetry, Analogue Photogrammetry and Analytical Photogrammetry stages have occurred (Burtch, 2006). Idea of converting the photographic data algorithmically through computers came up for the first time during this period (Burtch, 2006). This conversion is used to transfer the coordinate images to the map quantitatively. However, usage of computers as a tool of the photogrammetry within this period was not for visual context, but rather for calculations.

In conjunction with these developments, it is possible to talk about the digital photogrammetry by using the photogrammetric techniques along with computer technology. Convert to digital from analog in many areas speeded up with the development of personal computers in the mid of 1980s.

Efficient usage and implementation of different medias and environments have been required in documenta-
tion of cultural heritage due to changing paradigm with the introduction of computer technologies in architecture for the last 20 years. Specific historical areas in where the documentation methods such as laser scanning are used or building surveys specialised in terms of architecture are featured prominently in the studies conducted in this area in literature.

In particular, being in different sizes and dimensions along with various architectural features of the historical buildings or cultural and natural heritage zones to be protected that involved in the architectural discipline and need of various scales and details for the work to be carried out require the use of advanced documentation techniques and technologies.

Use of laser scanning technologies in documentation of protected areas, which were initially very expensive, but getting cheaper with widespread usage has gained tremendous speed for the last 10 years in our country. Especially providing highly precise and 3D data acquisition through terrestrial laser scanning technologies made it possible to achieve integrated digital documentation either in the protected areas or single buildings with cultural heritage characteristics (Abmayr et al., 2005).

Providing fast and accurate survey of a specific architectural structure has led to increase the interest in the terrestrial laser scanning devices of architects and restorers working in the field. Quick analyses of the details related to historical building affect quick-evaluation and decision-making processes positively. Acceleration of decision-making process on repair and restoration of historical building makes a contribution to bring the building into the life quickly as well as re-use and revitalization of the building.