

3D MODELING FOR THE LARGEST STONE IN THE WORLD USING LASER SCANNING TECHNIQUE

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In the past few years, the demand for 3D scanning and documentation has increased at a high rate by various communities. The purposes and objectives behind this increase are numerous due to the interest of different researchers in obtaining 3D data. Some of these data aim to serve purely scientific and research goals in the field of geodesy for example, others are interested in the fields of industry, architecture, virtual tourism, mining, monitoring, BIM as well as the field of documenting archaeological and historical sites. 3D laser scanning and modeling has multiple advantages, the most important of which is the possibility of documenting features and structures that are difficult or impossible to reach. This technique provides high accuracy and resolution, as well as the possibility of conducting many analyzes and interpretations using various computer software and techniques.

Historic buildings constitute a valuable cultural heritage of every nation and they are covered by legal protection. The inevitable passage of time results in the deterioration of technical condition of the historic buildings. [1]. For archaeological research, it is important to appropriately record, document, and survey artifacts and sites because an accurate and complete digital documentation is a prerequisite for further analysis and interpretation of artifacts and archaeological are-as. [2]. The creation of 3D models of heritage and archaeological objects and sites in their current state requires a powerful methodology able to capture and digitally model the fine geometric and appearance details of such sites. "Baalback" is one of the most ancient cities on Earth, the ruins of which are at the foot of the eastern Lebanese mountains 85 kilometers away from Beirut in the Lebanese Republic. This city contains the largest carved stones ever, weighing more than 1000 tons, left unfinished by the workers in the quarry. The technical abilities of the builders of Baalbek platform are equally matched by their engineering confidence. The German Archeological Institute reports that the block was probably intended for use in a nearby temple

for the god Jupiter. Even though the block was likely a major disappointment to its creators, they unwittingly set world records. The newly discovered block, the Institute writes, is "the biggest boulder known from antiquity." [3]

The purpose of this study is to conduct a 3D laser scanning & documentation for the "Pregnant Woman Stone" located in "Baalback" city in the Lebanese republic using a stationary 3D laser scanner allowing scanning and imaging processes. The field work consists of establish a control network in the site using GNSS technique operating in RTK mode; then applying 3D laser scanning and imaging for the entire site using a 3D laser scanner instruments setup and oriented according to the control network, and finally data extraction. In the office, the data were imported to the computer for processing and analysis using several software. Finally, a 3D model is generated and using this model the weight of the stone is estimated based on the volume of this model and the density of the rocks.

Based on the results of the study, we can conclude that laser scanning techniques can improve finding the characteristics of large and huge monuments, not only dimensions, but also others like the weight; in addition, for some restricted areas like the archeological sites, the laser scanning technique could be the safest method to build full scale models without direct contact and probable harm to the object under study. Also, building a model can help in evaluating the weight of the megalith accurately.

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