

THREE-DIMENSIONAL MODELLING FROM SPHERICAL CAMERA
USING STRUCTURE-FROM-MOTION (SfM) PHOTOGRAMMETRY
FOR ROCK ART.

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SCHOOL OF GEOMATICS SCIENCE AND NATURAL RESOURCES
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**Thesis submitted to the Universiti Teknologi MARA Malaysia
in partial fulfilment for the award of the degree of the
Bachelor of Surveying Science and Geomatics (Honours)**

JULY 2024

DECLARATION

I declare that the work on this project/dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA (UiTM). This project/dissertation is original, and it is the result of my work, unless otherwise indicated or acknowledged as referenced work.

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ABSTRACT

A three-dimensional (3D) model can be generated through the utilization of terrestrial laser scanning (TLS) and photogrammetry techniques. Photogrammetry, involving the reconstruction of three-dimensional representations of real objects or scenes through the overlap of photographs, has been in existence for over a century. However, recent advancements in digital camera technology and the availability of processing software have led to its widespread adoption in fields such as and rock art research. While the terrestrial laser scanning (TLS) technique is cost prohibitive, photogrammetry necessitates enough overlapping photographs for successful implementation. Rock art refers to human-made markings on natural rock surfaces. These markings can include paintings, engravings, and carvings, often created by ancient civilizations or indigenous peoples. Rock art is a valuable archaeological and cultural resource, offering insights into the beliefs, lifestyles, and artistic expressions of the societies that created them. Rock art documentation is vital for preserving cultural heritage, advancing archaeological knowledge, protecting these fragile artworks, and promoting public. The goal of this study is to evaluate the accuracy of a 3D model created with a spherical camera at a rock art panel above ground. The primary objective of this study is to create three-dimensional models using spherical cameras and the Structure-from-Motion (SfM) approach. The use of spherical cameras and photogrammetry presents a cost-effective alternative for the rapid visualization of rock art, all the while maintaining high quality and accurate results suitable for both metric and visual analyses of the art. This methodology represents a significant advancement in 3D modelling for archaeological purposes, specifically in the context of rock art. The accuracy and quality of the resulting 3D models have been rigorously verified, making them effective tools for in-depth analysis and the tracing of rock art details. The RMS analysis using the M3C2 method shows an average value of 0.269 m, with a range from 0.071 m to 0.417 m.

Keywords: Structure-from-Motion, Spherical Camera, 360 Camera, Rock Art, Agisoft Metashape, Culture Heritage, Archaeological

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