Rock art preservation

Maptek™ I-Site™ Studio software has been used for 3D reproduction of historical Aboriginal rock art at Kakadu National Park in Australia's Northern Territory.

Aboriginal rock art is part of a tradition of painting and engraving that stretches back thousands of years. The escarpment, gorges, and rock outliers of Kakadu hold one of the world's greatest concentrations of rock art sites: approximately 5000 sites have been recorded and a further 10,000 sites are thought to exist.

The rock art sites of Kakadu are recognised internationally for their cultural value and are one of the reasons that Kakadu is inscribed on the United Nations list of World Heritage properties. The purpose of this project was for the preservation of Australian cultural and heritage listed artefacts in a reproducible and accurate 3D format.

Laser scanning provides a means of non-intrusive measurement of millions of points along a wall for accurate modelling.

The Zoller and Frohlich (Z+F) 5010 series engineering laser scanner was used to obtain high precision results at the very short range required to scan these small paintings in confined spaces.

Using the photo registration tools introduced in Maptek™ I-Site™ Studio 4.0, photographs from digital cameras and other sources can be projected in any orientation onto a surface.

This also makes it possible to texture the surface using different photographs, for example from the past, present and future, to analyse in 3D any fading of the artwork over time.

An Olympus E-PM2 four thirds system camera (CSC) with a 14-42mm MSC lens was used for capturing photos of the artwork to be used in the 3D texturing process. The Z+F M-Cam was mounted above the camera to provide photographic colouring of the point clouds.

Z+F scanner at the Abangbang Gallery at Nourlangie. The orange coloured area represents a sample of 3D points taken from the scanner.

Four scans were taken along this wall, with approximately 74 million points collected. Each setup was approximately 12 metres apart.

Careful processing of the data was needed to produce accurate perspective models.

Laser intensity data from the infrared signals was used to match points in photos with points in the 3D scene. After deriving enough points, a projection error is determined and if within a certain tolerance the photo can be placed accurately with a 3D context. The position of the camera when the photo was taken can also be determined.

In some locations where artwork spanned two sides of a rock, it was not possible to cover the entire piece of art accurately with a single photo. This led to complications with texturing due to the photo being from one perspective which did not cover extreme angles around the rock. Two photos from different perspectives needed to be matched.

In addition, vegetation often obscured part of the drawings, so it was necessary to crop certain data from each textured model and combine them to allow for multi-perspective imagery on the 3D model.

The excellent results obtained proved that this method was suitable for recording and reconstruction of rock art.

Thanks to the Department of Sustainability, Environment, Water, Population and Communities as well as the traditional owners of the land for their assistance and permission in capturing the data presented in this report.