

# Highly Detailed 3D Modelling of Mayan Cultural Heritage Using an UAV

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## SUMMARY

Highly detailed and highly accurate 3D models are indispensable tools for the management of cultural heritage, as well as for archaeological and anthropological research. These digital 3D models should be combined with high resolution texture maps to facilitate the understanding of the heritage sites or parts of the heritage. The construction of these models requires the deliberate selection of a data acquisition platform and spatial measurement instruments. Different considerations on these issues are discussed in this paper, based on a case study at the site of Edzná, Mexico. This project focuses on the virtual 3D reconstruction of the different structures and artefacts on the site. The project is a collaboration between Ghent University (Belgium), INAH Mexico and UNESCO. On Mayan sites, Unmanned Aerial Vehicles (UAV) are exceptionally useful tools for data gathering. These devices allow image acquisition with high resolution and various incidence angles. Moreover, the platform is compact and light weight, so it allows a flexible deployment. In this sense, flexibility means both the ability to make the platform easily transportable, and the possibility to manoeuvre in both high elevations and narrow spaces. High elevations are required to position the modelled structure in a wider spatial context. The ability to manoeuvre in narrow spaces is needed to operate in forested areas and to avoid self-occlusion in the model. Images taken with the UAV are combined with terrestrial images of the site, resulting in a full coverage with significant overlaps between consecutive images. The entire data set is processed in an image based virtual reconstruction process, resulting in digital elevation models, orthophotos, textured 3D models and other derivatives. Absolute referencing is performed based on a series of GNSS measurements, densified with total station measurements. The data is processed with various levels of details (LoD). Working with different LoDs allows the smooth implementation of the models in a 3D geographic information system (GIS). Semantic data can be assigned to different geometric features within the project. The models can be used for online consultation and visualisation systems.