



3D Reconstruction of the ancient church Santiago the Apostle, Morelos, Mexico as a follow up to the damage caused by the 2017 earthquake

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On September 19, 2017, Mexico was rocked by a 7.1 earthquake, causing an immense amount of damage in the states near the epicenter. This earthquake caused hundreds of damages in historical heritage, mainly in the states of Puebla, Oaxaca and Morelos. The patrimonial damages occurred were so extensive that they are prolonged till this day. Nepopualco Morelos was one of the towns that suffered great destruction by this shaking event. Their historical and main church, "Santiago the Apostle", was shattered in the shake, and the cleanup is still ongoing. The objective of this project was to create a 3D model of the Santiago the Apostle Church to view the process of restoration done by the National Institute of Anthropology and History (INAH). The 3D model obtained was the result of 478 images, which were captured by three different drone flights and a set of images shot on terrestrial. These flights were done by an Anafi Parrot drone, two circular flights and a double grid flight (180 and 256 images, respectively). For the purpose of obtaining a georeferenced accurate model, twelve ground control points were acquired in the field using a Emlid Reach RS+. The 3D model presented in this project is a high-resolution model that allows the spatial analysis of the cabinet structure and represents a low-cost methodology. This model presents a centimeter resolution, while the error corresponds to 1.56%. The main contribution of this work is the obtainment of a 3D model of Nepopualco's historical church in which the final product shows the present stage of reconstruction done on the structural damages caused by the earthquake. The 3D reconstruction model will be delivered to the corresponding authorities of the National Institute of Anthropology and History. There is a possible consideration in creating other models that may help the INAH in the recovery process of cultural heritage affected by natural phenomena, as well as its structural mitigation. This project is the first effort on creating a digital catalog of these types of structures that make up Morelos' historical heritage.

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