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Escuela Académico Profesional de Arquitectura

Tesis

Use of BIM Technology for Augmented Reality in Building

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***Abstract*— The study was conducted in the city of Huancayo, Junín, Peru. Between 2022 and 2023. It is based on the use of BIM technology (Building Information Modeling, referring to the modelling of buildings with parametric information), the model developed was made on a 200m2 plot, on three floors, modelled with Revit software, including the specialities of architecture, structures, sanitary and electrical installations. The model is relatively small in order to experiment its characteristics with Augmented Reality (AR) technology and to serve for learning and teaching. Subsequently, in the process of quality control of the model, the AUGIN software was used, which is a program that allows to reflect virtual reality (VR) in a physical space with augmented reality (AR) at 1:1 scale. Before the advent of VR and AR, plans and projects are still presented in 2D, with software such as AutoCAD and printed plans on paper. The research used the immersive, participatory and collaborative method to develop BIM modelling. The experimental project was validated through the tool "Focus Group" with people involved in the construction sector, which were selected randomly, on the other hand, the work was complemented with the use of software; ArcGIS for the location and location of the land and obtain a simulation fairly close to reality that has allowed to obtain relevant results and conclusions, which are shared in the document.**

Keywords— Augmented reality, AUGIN, Revit, Reinforced, Incompatibility of plans.

INTRODUCTION

The research process arose from the data collected from the National Institute of Statistics and Informatics (INEI) in the 2017 National Housing Census, where it was obtained that the constructions in Peru are based on mud, stone, wood, cement, brick, of which 42.8% of the dwellings have reinforced concrete roofs as the predominant material [1]. Of this percentage, only 30% of the executed constructions are formal and presented incompatibilities in the execution stage in the specialities of structures and sanitary installations, due to several factors such as sanitary pipes that cross the beams with structural function [2], these data incompatibilities have brought potential challenges for project evaluation and delivery of results [3], This is due to the fact that before the arrival of augmented reality (AR) technology, the plans were made in AutoCAD, Archicad presenting only 2D models, in which the verifications were carried out using the printed plans, consequently, not having three-dimensional models as it required a skill in handling the 3D CAD software, the process of verification of incompatibilities consumed several hours of work [4]. Currently, 3D models are required to make use of augmented reality (AR) and verify the plans before execution; with other quality control software. However, the use of digital machinery is expensive and sophisticated. [5].

This was validated by the researchers in our work centres, where we constantly carry out architectural project designs and execution of works, in which we experience the most frequent problems such as the elaboration of costly physical models, modifications of the plans during the execution of the work, stoppages due to failures in the construction process, delays in the work schedule and unnecessary waste of materials.

Another aspect that influenced the research topic was the emergence of technology in Building Information Modelling (BIM), for the present study refers to parametric building models; which currently serves to manage construction projects throughout the life of the building by centralising the digital information created by its designers, on the other hand, augmented reality using the software "AUGIN" in whose practice we have found solutions to the problems described as it allows the user to bring the digital design to a real world space that allows physical interaction with each modelled component being its main feature to simulate the building on a real scale including all its specialties and that can be appreciated by anyone involved in the process, from owners and investors to the executors. Virtual reality, on the other hand, allows the user to interact with artificial spaces without the interaction of the physical world.

Another aspect that influenced the choice of the application is related to the cost, which represents between a third and a fifth of the average value of other similar applications, as shown in table 1.