Chapter 9
Augmented Reality for Evaluating Low Environmental Impact 3D Concepts in Industrial Design

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ABSTRACT

This work uses augmented reality (AR) as a supplementary tool in teacher’s evaluation of low environmental impact 3D concepts in industrial design, which are part of contents in subjects taken by fifth semester undergraduate students of Industrial Design at the Autonomous University of the State of Mexico (UAEM), specifically in the Tool Design Workshop. Design criteria are presented and they will be used to evaluate 3D concepts through the use of AR. The project is developed in three stages: 1) presenting the 3D concept through AR scenarios in order to be evaluated, 2) visual evaluation with established technical criteria, and 3) evaluation feedback so as to improve the 3D concept. The aim is to reduce evaluation subjectivity in order to reduce production costs, waste generation, and energy use in producing mockups and models.

DOI: 10.4018/978-1-5225-5243-7.ch009

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INTRODUCTION

Nowadays, technology development has enabled exploring and making use of different strategies in order to have a favorable impact on education. Augmented Reality (AR) in teaching abstract concepts and morphologic evaluation of objects is an important technological tool for Higher Education Institutions (HEI). Likewise, it is an opportunity to innovate in the teaching-learning process. As pointed out byBillinghurst (2002) interactions with tangible objects and efficient transition between reality and virtuality may generate new educational experiences. Therefore, this technology along with its three main characteristics: a) combining real with virtual, b) real time interactions and, c) three-dimensional records (3D), allow to make a combination among objects, people and contexts that are part of real environments and virtual objects, making them seem as if they coexist in the same space as in the real world (Azuma, 2001).

Nowadays, teacher’s perception on aspects of structure, use, function and morphological analysis applied to objects is a permanent action and, evaluating 3D concepts that could subsequently be built leans towards a professor’s experience and tendencies to conceptualize. Further, evaluation and approval of a 3D concept in Industrial Design is usually defined by design requirements, which are proposed by students as variables that must fulfill a quantitative and qualitative solution due to regulations the project must follow, whether it is a use, function, structural, ergonomic, esthetic formal and/or productive technical requirement, among others (Rodríguez, 1988). Precision criteria change very little from one concept to another; function, use, morphology and esthetic structure are applied in most cases. Meanwhile if requirement for the designed project is governed by a low environmental impact, it is possible to categorize and prioritize how they will be solved from complementary subjects such as: life cycle, required energy use, raw material extraction or production processes.

Due to the above and the different variables an evaluation may have, it is possible to include some didactic resources and determined processes to evaluate 3D concepts through AR; also when adding conventional instruments such as evaluation documents, signatures or evidence folders, as well as software that is easy to access and use by the teacher. Within these activities, both Industrial Designer and evaluator aim to decrease evaluation subjectivity, representation and improvements of three-dimensional models (3D). Therefore, it is viable to add or eliminate objects from the real environment and to use graphic coverings to hide or remove environmental parts if the evaluation requires it according to complexity level.
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