

Overview of Research Contexts about XR Technologies in Architectural Practice

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Abstract : The transformation of architectural design practices has been underway for almost forty years due to the development and democratization of computer technology. New and more efficient tools are constantly being proposed to architects, amplifying a technological wave that sometimes stimulates them, sometimes overwhelms them, depending essentially on their digital culture and the context (socio-economic, structural, organizational) in which they work on a daily basis. Our focus is on VR, AR, and MR technologies dedicated to architecture. The commercialization of affordable headsets like the Oculus Rift, the HTC Vive or more low-tech like the Google CardBoard, makes it more accessible to benefit from these technologies. In that regard, researchers report the growing interest of these tools for architects, given the new perspectives they open up in terms of workflow, representation, collaboration, and client's involvement. However, studies rarely mention the consequences of the sample studied on results. Our research provides an overview of VR, AR, and MR researches among a corpus of papers selected from conferences and journals. A closer look at the sample of these research projects highlights the necessity to take into consideration the context of studies in order to develop tools truly dedicated to the real practices of specific architect profiles. This literature review formalizes milestones for future challenges to address. The methodology applied is based on a systematic review of two sources of publications. The first one is the Cumincad database, which regroups publications from conferences exclusively about digital in architecture. Additionally, the second part of the corpus is based on journal publications. Journals have been selected considering their ranking on Scimago. Among the journals in the predefined category 'architecture' and in Quartile 1 for 2018 (last update when consulted), we have retained the ones related to the architectural design process: Design Studies, CoDesign, Architectural Science Review, Frontiers of Architectural Research and Archnet-IJAR. Beside those journals, IJAC, not classified in the 'architecture' category, is selected by the author for its adequacy with architecture and computing. For all requests, the search terms were 'virtual reality', 'augmented reality', and 'mixed reality' in title and/or keywords for papers published between 2015 and 2019 (included). This frame time is defined considering the fast evolution of these technologies in the past few years. Accordingly, the systematic review covers 202 publications. The literature review on studies about XR technologies establishes the state of the art of the current situation. It highlights that studies are mostly based on experimental contexts with controlled conditions (pedagogical, e.g.) or on practices established in large architectural offices of international renown. However, few studies focus on the strategies and practices developed by offices of smaller size, which represent the largest part of the market. Indeed, a European survey studying the architectural profession in Europe in 2018 reveals that 99% of offices are composed of less than ten people, and 71% of only one person. The study also showed that the number of medium-sized offices is continuously decreasing in favour of smaller structures. In doing so, a frontier seems to remain between the worlds of research and practice, especially for the majority of small architectural practices having a modest use of technology. This paper constitutes a reference for the next step of the research and for further worldwide researches by facilitating their contextualization.

Keywords : architectural design, literature review, SME, XR technologies

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