World CAAD PhD Workshop 2020 - Abstract

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Augmented reality as a tool to aid briefing development

Building design conception starts in the architectural program, also known as briefing. Although part of the same process and deeply related, as described by Dogan and Zimring (2002), program and design have different natures. A large body of literature including Goldschmidt (2014) e Van Der Voordt; Van Wegen (2013), has investigated the importance of early phase of designing. At this point, designers careful analyze context, needs, and goals. However, while it has previously been observed the development of new architectural programs detached from the above-mentioned characteristics, efforts in the program still concentrate on developing ideas to establish priorities, rules, functions, and relationships shaping the design. By combining all these aspects, architects must transform briefings into spaces that are more than areas or a vague and dry wish list (KOUTAMANIS, 2017). Documentation including briefing information contains valuable data that otherwise would not be present in other phases. As briefing varies considerably according to architectural typologies, we specified school parameters analysis, named School Design Patterns (DP) (NAIR; FIELDING; LACKNEY, 2013) and based on Alexander; Ishikawa; Silverstein (1977) pattern language. Architectural information is structured graphically and may be classified considering medium, purpose, and mode of representation. From orthogonal projections to immersive virtual environments, or from first sketches to model rendering, there is a considerable set of representational systems (HEWITT, 1985). Undoubtedly, digital tools have been playing a major role in advances in this area once computational approaches increase our capacity to manage architectural complexities (PANTAZIS; GERBER, 2018). Computer-aided architectural design (CAAD) advances have shown to be changing our design process from relying on a plurality and disconnection of tools, previously manually driven, into a coordinated activity. Yet, early design stages of architecture such as briefing are often neglected in most computational analyses. In initiative stages, graphic representations include only generic and abstract shapes contrasting with design phases where geometry study and definition become the center of interests. An attempt to bring architectural information closer to designers is applying immersive technologies such as Virtual and Augmented realities (VAR) during design stages. VR takes the user into a completely computer-created digital environment, and in contrast, AR allows the coexistence of virtual and real-world interactions. Although traditional methods of representation using technics like hand-drawn sketches and diagrams play a major role amongst architect's skills to depict concepts, the introduction of computational technologies from the early stages of design is an exciting opportunity to explore applications not yet considered. Specifically, despite AR utilization mainly in later phases of design, as most of the digital tools, this study sits within an understanding that there is the potential for broadening its application. The main research approach is to couple traditional methods of representing briefing information and digital design benefits to address complex data in a methodological, more systematic and integrated way. Along with this understanding, our goal is to characterize the graphic representation of the architectural program and verify its inclusion in AR. The benefit of this approach is that it allows us to tackle architectural program contents differently. Including a third dimension adds up another layer of information, which changes considerably the stimulus, experience and even

the designer reality of work (AKIN, 1986; TUFTE, 1990; KRAWCZYK, 2016), and this is the mains challenge faced by this research. The Design Science Research (DSR) methodology directs the work with AR exploration in the early stages of architectural design and attempts to address three research questions: (1) How the addition of a 3rd dimension for DPs representation affects its interpretation and meaning? (2) DPs into an AR platform along with professional interaction with the tool properly assists and enables the program development?; (3) AR in the first stages of architectural design stimulates recognition and application of DPs? This way, the framework evolves around visual language studies to deepen the comprehension of translating two-dimensional diagrams into 3D graphic solutions, and AR tools integration in the briefing to be tested with architectural designers. In its turn, AR technology is being tested to match its graphic affordances with DP representation requirements, also considering tool properties regarding tool-user interaction. Nair, Fielding, and Lackney (2013) provided the description and general composition of each DP, this way a detailed reflection on this content allowed us to identify the inner characteristics of each pattern. At first, a random system of rules for naming and representing originated 47 so-named basic elements (BE), which were put together in different manners to form the 29 DPs diagrams. Taking into account representational studies for communicating visual information we were able to undertake a deep and careful analysis of such diagrams defining criteria for using shapes, color, dimension, position, association, and other features. In contrast with the primary criteria system mentioned, this second one is better structured, which facilitates overall understanding. We plan further detailing of element combination to guarantee application principles are well comprehended and that hierarchies among the elements are properly set. This qualitative approach already allowed us to reduce the number of elements considered from 47 to 27 with standardized names and graphic aspects. The focus is not on elements restriction but rather on making them coherent, yet dealing with fewer variables aids both digital and manually built diagrams. As the next steps of the research towards designing the AR tool, we will translate the 2D patterns, and related BEs, into 3D ones. The relationship between both types of representation is based on a semantic analysis that allows the correspondence of both representational means. To build the AR app we are studying Unity Engine associated with Vuforia Software Development Kit (SDK). For envisioning information we are examining the possibility of using smartphones or tablets, which are more affordable devices, or smart-glasses, which would allow hands-free interaction. In any case, we will incorporate the above-mentioned DPs' content within the app. With the incorporation of all elements, we would make it easier for the tool-user to visualize all the variables he or she would need to consider when developing the briefing. In addition, user-interface (UI) interaction is being considered as an attempt towards the flexibility of use and to encourage designer engagement. Resuming our research questions and goals, expected results from app tests relate to qualitative analysis of DPs insertion in AR, identifying graphic representation characteristics within this platform. Furthermore, application operation by professionals will be assessed in terms of their understanding and interaction with DPs concepts inside this environment, verifying the assistance provided by the tool. We point that, in general, the inclusion of essential information on the briefing, as the example of schools design patterns, depends upon the designer's previous knowledge and his or her recognition of these elements. In this research, we work towards preparing data to assist and enable architects in developing a well-supplied architectural program. Comprising such data in AR platforms highlights the importance of updating our approach to the architectural program, developing new kinds of abstractions in a digital context, and contributes in the search of a more user-friendly manner to approach this phase of the building design.

Keywords: architectural program; graphic representation; augmented reality; school architecture; design patterns

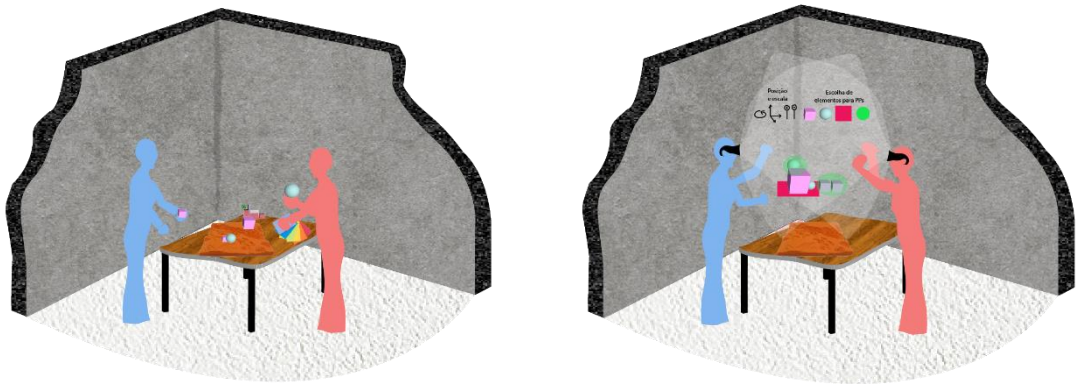

Image – Traditional methods and augmented reality for architectural programs

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