Mediating cognitive transformation with VR 3D sketching during conceptual architectural design process

ABSTRACT

Communications for information synchronization during the conceptual design phase require designers to employ more intuitive digital design tools. This paper presents findings of a feasibility study for using VR 3D sketching interface in order to replace current non-intuitive CAD tools. We used a sequential mixed method research methodology including a qualitative case study and a cognitive-based quantitative protocol analysis experiment. Foremost, the case study research was conducted in order to understand how novice designers make intuitive decisions. The case study documented the failure of conventional sketching methods in articulating complicated design ideas and shortcomings of current CAD tools in intuitive ideation. The case studyôs findings then became the theoretical foundations for testing the feasibility of using VR 3D sketching interface during design. The latter phase of study evaluated the designersô spatial cognition and collaboration at six different levels: "physical-actions", "perceptualactions", "functional-actions", "conceptual-actions", "cognitive synchronizations", and "gestures". The results and confirmed hypotheses showed that the utilized tangible 3D sketching interface improved novice designersô cognitive and collaborative design activities. In summary this paper presents the influences of current external representation tools on designersô cognition and collaboration as well as providing the necessary theoretical foundations for implementing VR 3D sketching interface. It contributes towards transforming conceptual architectural design phase from analogue to digital by proposing a new VR design interface. The paper proposes this transformation to fill in the existing gap between analogue conceptual architectural design process and remaining digital engineering parts of building design process hence expediting digital design process.

Keyword: Conceptual architectural design; External representation; VR 3D sketching; Design collaboration; Design cognition