

ABSTRACT

Shin, Do Hyoung Ph.D., Purdue University, August 2007, Strategic Development of AR Systems for Industrial Construction. Major Professor: Phillip S. Dunston.

The overall goal of this research was to provide a basis for facilitating the adoption of Augmented Reality (AR) in the Architecture, Engineering and Construction (AEC) industry, particularly in the construction phase. To meet this goal, this research achieved its three particular research objectives. First, this research produced a comprehensive map for identifying the more appropriate AR application areas in industrial construction. Research studies in the application of AR in AEC have suggested its feasibility. However, realization of the use of AR in AEC requires not only demonstration of feasibility but also validation of its suitability. This requirement indicates the necessity for the comprehensive identification of AR application areas based on the suitability of AR technologies. The first step to develop the comprehensive map was to classify work tasks in industrial construction and assess them from the viewpoint of human factors regarding visual information. The assessment of work tasks revealed needs in terms of visual information requirements which occur in the work tasks, thus providing the rationale for the utilization of AR. Mapping work tasks to AR systems provided the motivations for targeted development of AR systems for achieving better task performance. Finally, activities in industrial construction were classified and mapped to work tasks. Through mapping activities to work tasks in addition to mapping work tasks to AR systems, the comprehensive map was established. For its second objective, this research produced the ARCam, an AR prototype that enables users to inspect location and position of critical elements. Inspection is one of the AR application areas identified through the comprehensive map. The adoption of AR in AEC will be

facilitated by demonstrating benefits of AR in tasks with AR prototypes. For its third objective, the research required experimental evaluation of the benefits of AR. In particular, steel column inspection with the ARCam was compared to the total station (conventional method). The results of the experiment indicate that even though there are still technical and human factor issues regarding accuracy to be addressed and advanced, the ARCam is a promising inspection tool especially for inspection of column orientation (plumbness).