

Working with Drones: Design and Development of a Virtual Reality Safety Training Environment for Construction Workers

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ABSTRACT

The use of drones in construction grew exponentially over the last few years, making the construction industry one of the fastest commercial adopters of this technology. Drones are widely used in the construction industry for a wide variety of applications (e.g., site surveying/mapping, earthwork volumetrics, safety inspection, progress monitoring). Nevertheless, the integration of drones in construction raises novel occupational safety and health issues for onsite construction workers. This study presents the technical design and development of DroneSim, a Virtual Reality (VR) safety training environment for human-drone interaction on construction jobsites. Specifically, DroneSim aims at training construction workers on how to safely collaborate and work with drones on jobsites. The paper discusses the complete workflow involved in designing and developing the VR environment, which consisted of: (1) identifying current and future drone-mediated construction applications; (2) identifying the technical and functional requirements pertaining to each of the applications; (3) proposing different drone types based on the identified applications; and (4) developing the VR-based environment, which included the incorporation of static objects, sound effects, animations, text-to-speech, as well as audio, lip-sync, and gesture synchronization.