Head Tracking for Mixed Simulators: which system to use?

Alexandre Millette

CAE

Montreal, Canada

ABSTRACT

Recent improvements in Head-Mounted Display (HMD) devices have made Augmented Reality (AR) and Virtual Reality (VR) more accessible than ever to the gaming industry. These new technologies can be adapted for simulator visual systems, which may profit from having portable and low-cost alternatives to traditional display solutions. One notable feature of these HMDs is they must be tracked in 3D, most often with 6 degrees of freedom. It is not enough to replace a traditional display with a HMD; you must also integrate a tracking system with the simulator. But with all the available technologies to do just that, one may ask which tracking system is the most suited for a simulator? We used publicly available documentation and papers on the different technologies to produce a list of the currently available tracking systems and, for each, their pros and cons. We then studied the opportunities for suitable types of aircraft simulators currently produced by CAE to propose potential combinations and investigate issues with those. This paper presents a matrix with different types of aircraft simulator on one axis, each with their own requirements and limitations, and the types of tracking technologies we have identified as potential solutions on the other axis. In each cell is the usability of the tracking system for that aircraft type, along with risks and drawbacks. By presenting these results, we hope to move the industry toward certain types of technologies, to make them a better fit for simulation purposes.

BIO
Primary Author

Alexandre Millette studied Software Engineering before doing his Master on Human-Machine Interfaces (HMI) and Augmented Reality (AR) at École de Technologie Supérieure (ETS) in Montreal, Canada. He published and presented a paper on input devices in an augmented reality system at ISMAR 2016, and started working at CAE, an aircraft simulator manufacturer, the same year. There he was involved with the simulation of navigation systems, including Inertial Referential Systems, for the civil aviation. Later he joined the Immersive Environment department as an AR specialist for research and development of new mixed reality training simulators for the military aviation. Previous jobs include GPU development at Matrox, and game development at Behaviour Inc. Alexandre was also employed during his Master as a graduate teaching assistant for classes on HMI, Software Project Management, and Software Analysis Requirements, at ETS. Along with his experience with HMI and AR, he has notable experience with Computer Graphics, systems integration, and Machine Learning. Finally, he has interests in aviation, PC building, and many personal programming projects.