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Bridging the Gap Between Real and Artificial Worlds: The Next Generation Classroom

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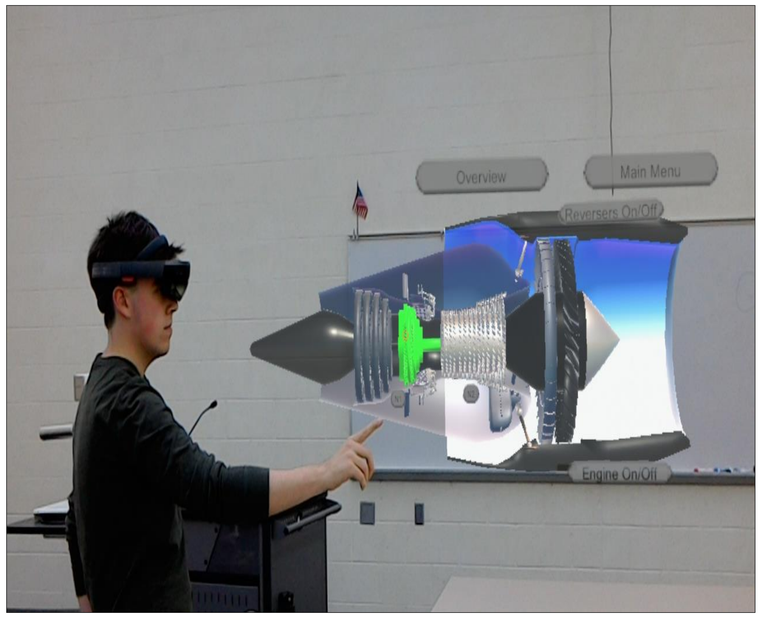
Background

Students today represent a new generation of learner which requires us to look beyond our tradition training methods. Augmented Reality (AR) has already shown great promise of transforming the way interact with students in any technically driven education such as aviation.

The operation and maintenance of modern aircraft requires an understanding of several interrelated human and machine components requiring practice and immersion. The immersive experience can be enhanced with augmented reality (AR) and virtual reality (VR). Relevant to the task at hand, they both have the ability to alter our perception of the world, give real-time feedback, improve the efficiency of skills transfer and increased knowledge retention. Where they differ, is the perception of our presence.



WMU Student Exploring Augmented Reality engine in the Classroom.

Virtual reality (VR) is able to transpose the user through closed visors or goggles, which block out real world surroundings. VR is useful for singular operations such as reviewing a special qualification airport to allow the pilot to experience the terrain and surroundings before actually flying the approach, learning a procedure or checklist, and practicing maintenance or other operational functions.

On the other hand, Augmented Reality (AR) blends virtual reality content with the real world. As a result, users can interact with virtual contents while continuing to be in touch with the real life around them. Operations tasks such as aircraft maintenance can be augmented with procedures, checklists and manual information to create a hands free environment. This experience is achieved by the wearing of AR or mixed reality (MR) headsets such as the Microsoft HoloLens. MR adds computer-superimposed holographic enhancements to a user's real-world environment. The ability for remote instruction for crews and maintenance technicians could be a game changer for the entire industry.

Countermeasures

AR Technologies are currently widely used in the medical and automotive community and have recently been adapted by aerospace industry companies such as Lockheed Martin, Pratt & Whitney, Bell Helicopter, Air New Zealand, TAE Aerospace, Air France, Japan Airlines, Boeing and Airbus.

However, the use of virtual reality VR and AR in the training of pilots is a recent innovation and little research has been published on its efficacy compared to conventional training methods. To evaluate possible benefits for NGAP training, Western Michigan University (WMU), College of Aviation (USA) has integrated an application created by WMU researchers called JetXplore with the Microsoft HoloLens.

The application was developed for operation and procedures training for the CRJ-200 regional jet, B787, A380 and SR20 aircraft which will be compared to traditional training to bridge the gap between the classroom and flight simulation. The interactive JetXplore HoloLens application includes customized scenarios, turbofan engines and 360 degree interactive cockpits to teach aircraft systems, procedures, flows, checklists and malfunctions. Beyond customizing the JetXplore application for the virtual environment a significant goal of this project is to explore subjective presence as it affects task performance to reduce the gap between expensive simulators and the classroom.

The pedagogical material development has been extended to outreach activities and integrate AR micro-simulations in the classroom as interactive 3D knowledge objects. Using Bloom's Taxonomy in the cognitive domain, 3D learning objectives can be refined to create more meaningful student outcomes and mapped to reflect expected assessment and student proficiency in technology driven training environments.

WMU augmented reality Jet viewed in augmented reality.

It can be suggested that AR offers the potential for faster and deeper knowledge retention in aviation training, while actively engaging NGAP. another area where MR can impact maintenance engineers is in the field itself, especially from a maintenance perspective where knowing equipment and using publications is an essential component of the job.

New Technologies

Companies that rely on engineers and technicians in their workforce stand to benefit greatly from the immersive potential of Augmented Reality and HoloLens. As this potential becomes more and more realized, engineers both operationally and from a training perspective will see their entire industries transformed by Mixed Reality.

Where the traditional learning model leans heavily on memorization and discipline to create uniform, self-reliant students, the educational system must shift the focus from what students learn to how well students can apply knowledge to break barriers, chart their own paths and ignite their own career passions and interests. As we redefine the education environment through technology and innovative learning styles, we can prepare students to meet changing workplace expectations by teaching them how to learn, think and lead.

Microsoft HoloLens displaying augmented reality engine compressor.

AR can safely simulate: dangerous or difficult to replicate scenarios; Requires the trainee to actively participate in the exercise; evaluate based on performance or relevant tasks and this data can be transmitted to a company's training department or instructor; virtually create new equipment without expense or space-accommodating additions, maintenance or space considerations and allow training anywhere any time.

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Unlike other advanced technologies, HoloLens is intuitive and offers a natural means of interaction. There's no mouse, wire or touch-screen. All you need are simple gestures to create and alter holograms, your voice to communicate with apps, and your eyes to navigate and analyze. In other words, it's an invaluable tool that will improve the way you operate without requiring extra time.
HoloLens is bringing forth a new medium, a new paradigm of augmented reality, where for the first time in our history, we have the ability to take the analog world and superimpose in it digital artifacts and create this mixed reality. You can be anywhere, from anywhere to bridge the gap between our real and digital world.