

XR-based Education in the Southwestern Region of Ohio

Virtual and Cyber-Physical Systems have become a centerpiece of current advancements in technology. The advent of low-cost virtual reality tools, such as head-mounted display systems, e.g., Oculus Rift, HTC Vive, or Microsoft's HoloLens, have reinvigorated the area of Virtual Reality with myriad applications in healthcare, training, and engineering due to their ability to increase retention and safety, and reduce costs. Utilizing this technology for workforce development and for more advanced training in several application disciplines is critical to Ohio's economy. Furthermore, investing in building the region's workforce will increase local industries' success in competing for investment dollars allocated for virtual and cyber-physical initiatives. Training the workforce of tomorrow has become even more important today than it has ever been in the past. According to a Harvard University study, in 2018, 90% of jobs require some form of technical skills or even a bachelor's degree or greater compared to only 40% in 1960. Out of those 90%, 33% of jobs would require a bachelor's degree or higher. However, in Ohio, only 26.6% have at least a bachelor degree according to the 2014 census data. This huge jump in jobs requiring specific technical skills requires a significant investment in workforce development to overcome that skills gap. The job market in XR-related fields is forecasted to increase exponentially as well yet dedicated training in that area is limited.

In order to fill that skills gap, more investment in better-suited training options to educate the workforce of tomorrow as quickly as possible is needed. There is evidence in the literature that using augmented and virtual reality (AR/VR) for training provides several significant benefits, including more motivated trainees, eased transition to real-life experience, and shortened total length of training needed for learning a specific skill as outlined in the following sections. The institutions participating in this project will form the Center of Virtual and Cyber-Physical Systems to leverage the advantages that AR/VR bring to training and to close the loop by incorporating physical components into the training environment. The advantage here is that the trainee learns in a much safer training environment and acquires skills before handling dangerous equipment.

The Center for Virtual and Cyber-Physical System successfully obtained close to one million dollars in funding through the State of Ohio's Department of Higher Education for different types of virtual reality equipment, such as a new four-walled CAVE-type display environment and head-mounted augmented reality displays. This will augment the existing systems of 3D-capable display systems combined with optical tracking and head-mounted displays, such as different types of stereoscopic display systems [3] and a three-walled tiled display configuration [4]. Utilizing these VR- and AR-capable systems will provide exciting opportunities for utilizing these capabilities beyond Computer Science education to improve learning and retention rates and open up areas to a broader range within the population.

We have already started using XR techniques for educational purposes. Specifically, nursing students at Wright State University are currently learning using AR devices, such as the Magic Leap One, that allows the student to see organs inside the manikins traditionally used for training [5]. Dedicated facilities for training students in Computer Science and Engineering have been set up to allow students to receive further education in this important field. This presentation will provide further details on these efforts.

References:

- [1] <https://gjmltd.com/workforce-shortage>
- [2] https://www.cleveland.com/datacentral/index.ssf/2015/09/ohio_ranks_36th_for_college_de.html
- [3] Thomas Wischgoll: *Display Systems for Visualization and Simulation in Virtual Environments*, Visualization and Data Analysis, 2017, pp. 78-88.
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