University of Oklahoma is Developing Innovative Smart Learning Algorithms for Multi-person Virtual Reality

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Dr. Ziho Kang, Director of the Human Factors & Simulation Laboratory at the University of Oklahoma (OU), is currently developing immersive smart learning algorithms in multi-person virtual reality (M-VR) by leveraging neuroimaging, eye tracking, and haptic interactions. These research efforts are part of Dr. Kang's ongoing work, supported by his National Science Foundation CAREER Award.

The goal of the research is to revolutionize educational environments by integrating advanced biometric measures to enhance learning experiences in fully immersive M-VR settings. Algorithms are being developed to facilitate smart learning tailored to individual needs. Eye tracking and haptic interactions are directly obtained through the VR devices, while brain waves (i.e., hemodynamic activities) are captured by syncing an fNIRs device with the VR system (see **Figure 1**).

Figure 1. **Dr. Ziho Kang and his students at the University of Oklahoma are implementing and validating near real-time smart learning algorithms within a multi-person virtual reality (M-VR) environment.**

The research focuses on the near real-time analysis of biometric measures, such as eye movement characteristics, haptic feedback, and brain activities, which are used, in part and in whole, to understand and improve learning outcomes. For example, the M-VR environment creates an interactive space where users learn to create semantic networks, a visualization of how concepts and objects are stored as a network in our memory. The multi-person environment promotes active and collaborative interactions among students within the virtual reality space. In the figure below (see **Figure 2**), two users create connections among various objects, such as body parts and food items, to determine which food items might be healthy for certain body organs. In additional, M-VR apps are being developed that are directly associated with middle and high school courses, such as chemistry and math (see **Figure 3**).

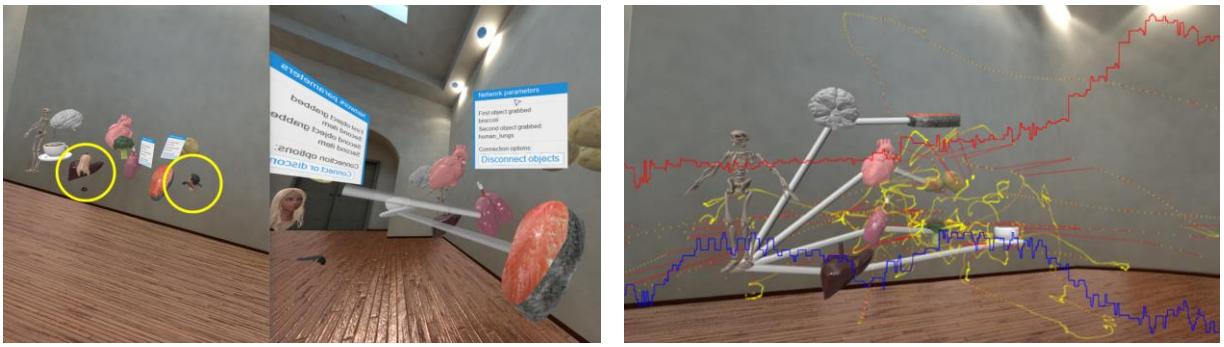

Figure 2. Two or more students can work together to create a semantic network (see left image). The biometric data (e.g., eye movement data and brain waves) of each student can later be visualized by overlaying the data onto the recorded video for further analysis.

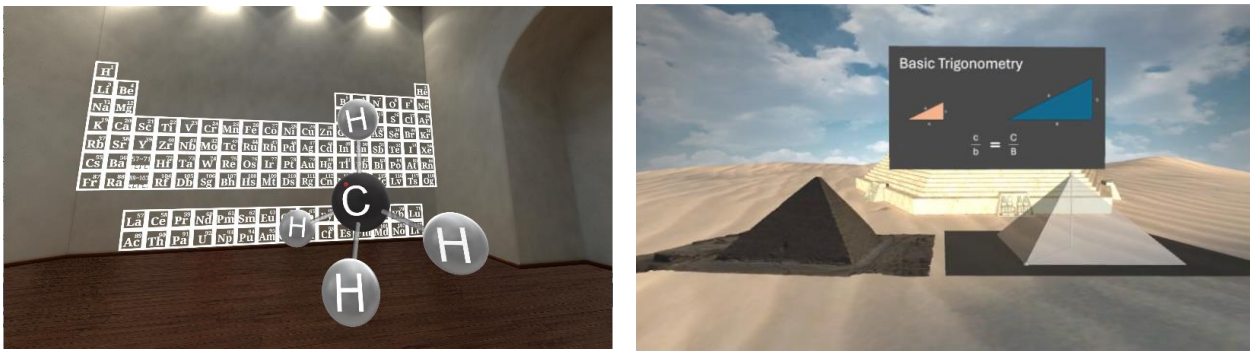

Figure 3. Different types of M-VR apps, such as a chemistry learning app and a math learning app, are under development.

Dr. Ziho Kang and his researchers at the Human Factors and Simulation Laboratory at OU are currently improving real-time data visualization, developing new biometric data analysis algorithms, and adapting machine learning algorithms to address and predict diverse learning needs. Dr. Kang's lab is collaborating with local communities and educational organizations to further develop and distribute M-VR technology for broader educational impacts. Dr. Kang welcomes collaboration opportunities with various research interest groups, educators, and stakeholders.

Dr. Kang's lab website is https://humanfactors.oucreate.com/home.html, and he can be directly reached at zihokang@ou.edu.