As flames rapidly engulf a burning building, the heat becomes overpowering. Thick, choking smoke rises quickly. Firefighters drop to the ground and crawl beneath the haze. They are looking for victims but can barely see the hands in front of their faces.

Now imagine if they could wear specialized glasses that could “see through” the smoke – illuminating each room’s floor plan, identifying victims’ locations, and pointing out where fellow first responders are in the building.

“See through” is augmented reality, or AR. Dr. Regis Kopper believes AR will transform many aspects of public safety within the next 10 to 28 years.

While this and similar next generation tools are not fully developed yet, the assistant professor and his computer science students are working with police, firefighters, and EMTs right now to design the interfaces that these technologies will require.

Funded by the National Institute of Standards and Technology, the projects use virtual reality – VR – to simulate future AR technologies, with a goal of determining what types of interfaces will work best for the end users.

With tech like this, EMTs of the future could glance at a license plate through AR glasses – or even contact lenses – and immediately access a patient’s real-time vital signs pop up on a virtual computer screen that appears almost in thin air. By simply pointing at the virtual screen, the EMT could toggle from a patient’s vital signs to other relevant information such as medical history, prescription information, and allergies.

Kopper and his Interactive Realities Lab team gather information through interviews and ride-alongs to develop the simulations. This allows first responders to provide critical input in the design of future systems. “It’s always important to have the end user be a part of the design, and in public safety, not doing so could be particularly dangerous,” Kopper says. “There is risk involved in public safety operations, and we want users to be able to operate and trust these systems.”

When it comes to law enforcement, VR will be used both to simulate upcoming technologies and to improve current training protocols. Kopper and his team are currently launching a project with the Hillborough Police Department to test their tech – while also helping officers learn to handle or avoid potential escalations in routine traffic stops. Instructors will be able to tweak each scenario to include different types of cars, circumstances, and driver demographics such as race and gender.

“One of the great benefits of VR is that you can repeat a scenario as many times as you need and control very precisely what you want in the simulation,” Kopper says. “It will offer the ability to debrief, discuss, and even replay the scenario.”

“Bar goal for this project specifically is not to make profit, but to make impact,” Kopper says.
As the saying goes: You only have one chance to make a first impression.

Kopper’s lab members keep that in mind as they work toward streamlining users’ experience with virtual reality.

“VR technology has the potential for so many important and useful applications, but if you have a bad experience with it the first time, you will become a skeptic,” says Kopper. “It’s difficult to go back and want to give it another try.”

Feelings of nausea or motion sickness can arise when a user’s eyes tell the brain they are in motion, but signals from the rest of the body disagree.

To combat this, Kopper and his Duke University PhD student Zekun Cao theorize that adding small static elements will lessen viewer discomfort. For instance, if viewers sense they are inside a stationary cockpit while “flying” in VR, that might help with feelings of stability. Or perhaps even less obtrusive elements could help, such as tiny dots that don’t move in the user’s peripheral vision.

“We are running studies on this right now,” Kopper says, “and we are getting some promising results.”

The lab is also interested in how well virtual reality training translates to real life learning. Think of it this way: When you bowl a bowling ball. It makes for a fun and entertaining game, but without the weight of the ball, you won’t learn accurate techniques for how to bowl in real life.

The work was conducted in partnership with Dr. Asha Kutty and UNCG’s Interior Architecture Department, and the immersive experience is based on the designs of undergraduate Hannah Tripp and UNCG’s Interior Architecture Department, and the immersive experience is based on the designs of undergraduate Hannah Tripp.

“I had always been interested in virtual reality,” Tripp says. “I’ve never had the chance to work with it before.”

That is also one of the goals of a two-year project funded through the National Archives and the National Endowment for the Arts. The work is conducted in partnership with Dr. Asha Kutty and UNCG’s Interior Architecture Department, and the immersive experience is based on the designs of undergraduate Hannah Tripp.

Last year, undergraduate Kadir Lofca created a virtual walk-through of Greensboro’s Magnolia House. The former “Green Book” hotel provided lodging known to be safe for African American travelers during the Jim Crow era.

The project team includes principal investigators from Johnson C. Smith University and researchers from UNC Charlotte. Kopper’s lab members keep that in mind as they work toward streamlining users’ experience with virtual reality.

“It gives people a unique experience and can help users understand aspects of history, to understand the impact of history on the present day,” says Kopper. “Virtual reality can help us experience history from a first-person perspective.”

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