

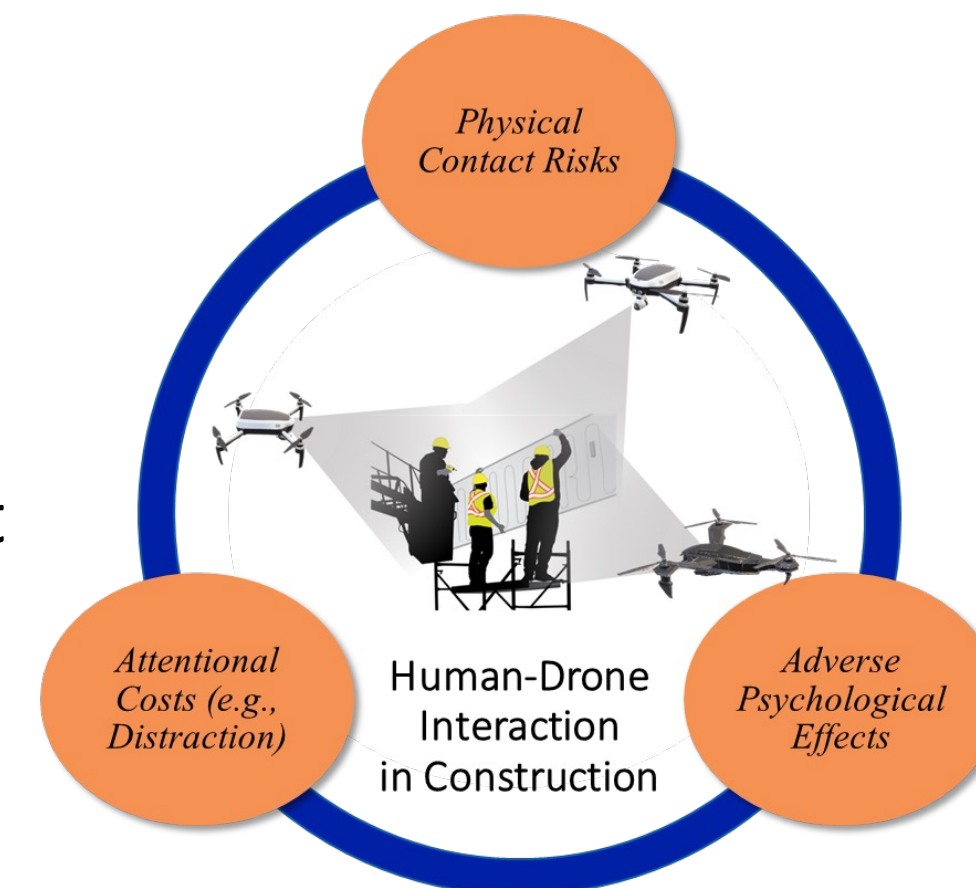
NRI: FND: Investigating the Safety Challenges of Co-Drones in Future Construction Workplaces

Masoud Gheisari (University of Florida), Idris Jeelani (University of Florida), and Boyi Hu (University of Florida)

<https://sites.google.com/view/safe-hdl>

Challenge

- There is an unprecedented usage of drones in construction.
- Drone presence on jobsites has been associated with physiological risks, attentional costs, and physical or contact risks.
- These risks along with their associated safety implications have not been studied yet.
- Novel interaction modalities need to be explored to ensure safer human-drone interaction (HRI).



Scientific Impact

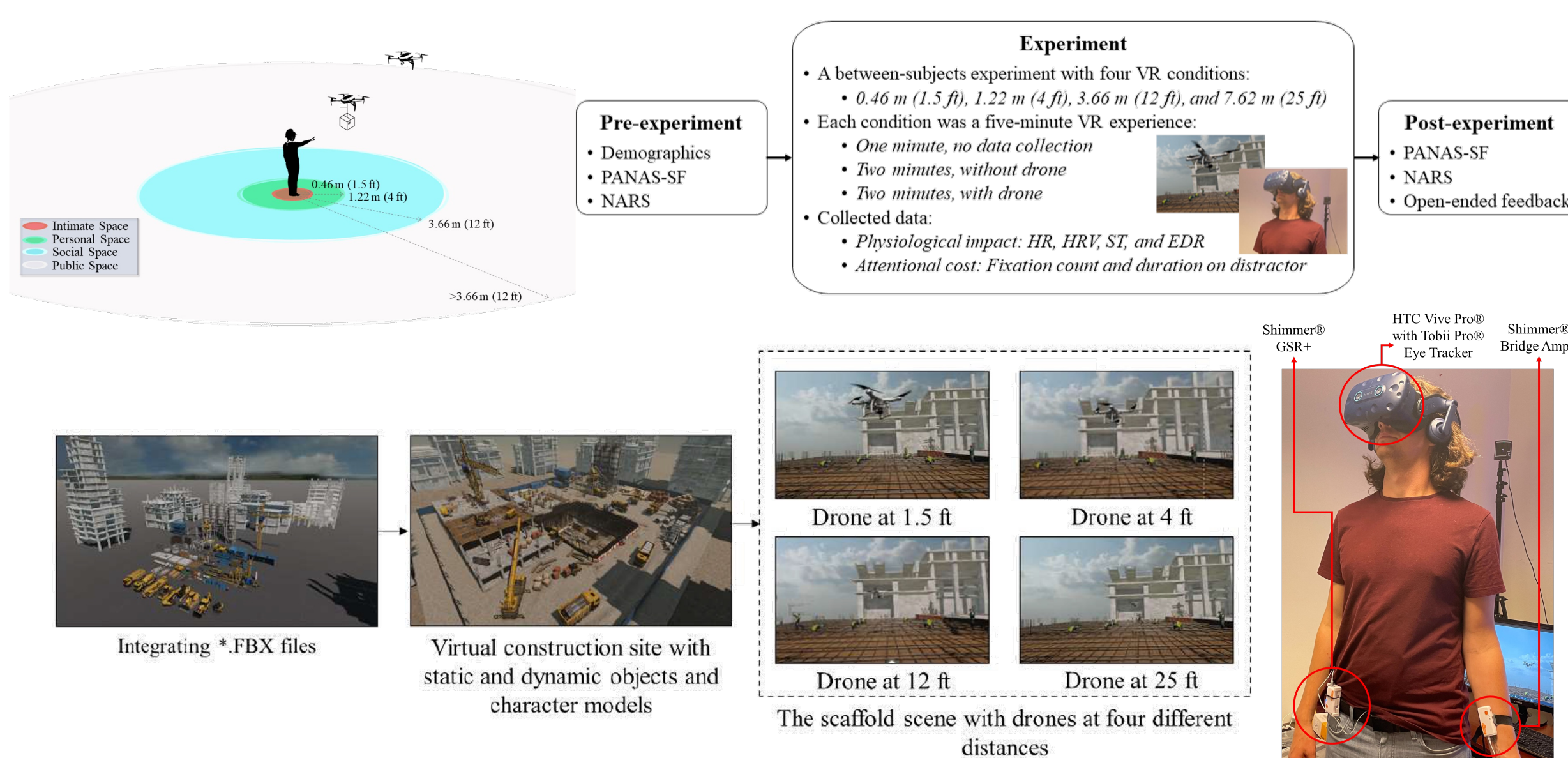
- This project is the first effort to study the safety risks and challenges of human workers, working with or around co-drones on the construction sites.
- The project expands and extends the knowledge of societal impacts – specifically the safety challenges of collaborative drones at the human-robot frontier – using construction domain as one of the most dangerous industries that is experiencing a tremendous increase in the deployment of drones.
- The proposed work will advance knowledge about human and co-drone team interactions by revealing different means through which drones can affect individuals' safety through a specific focus physical risks, attentional costs, and psychological impacts.

Solutions:

Studying Physiological, Emotional, and Attentional Impacts of Working with Drones on Construction Sites

Study I:

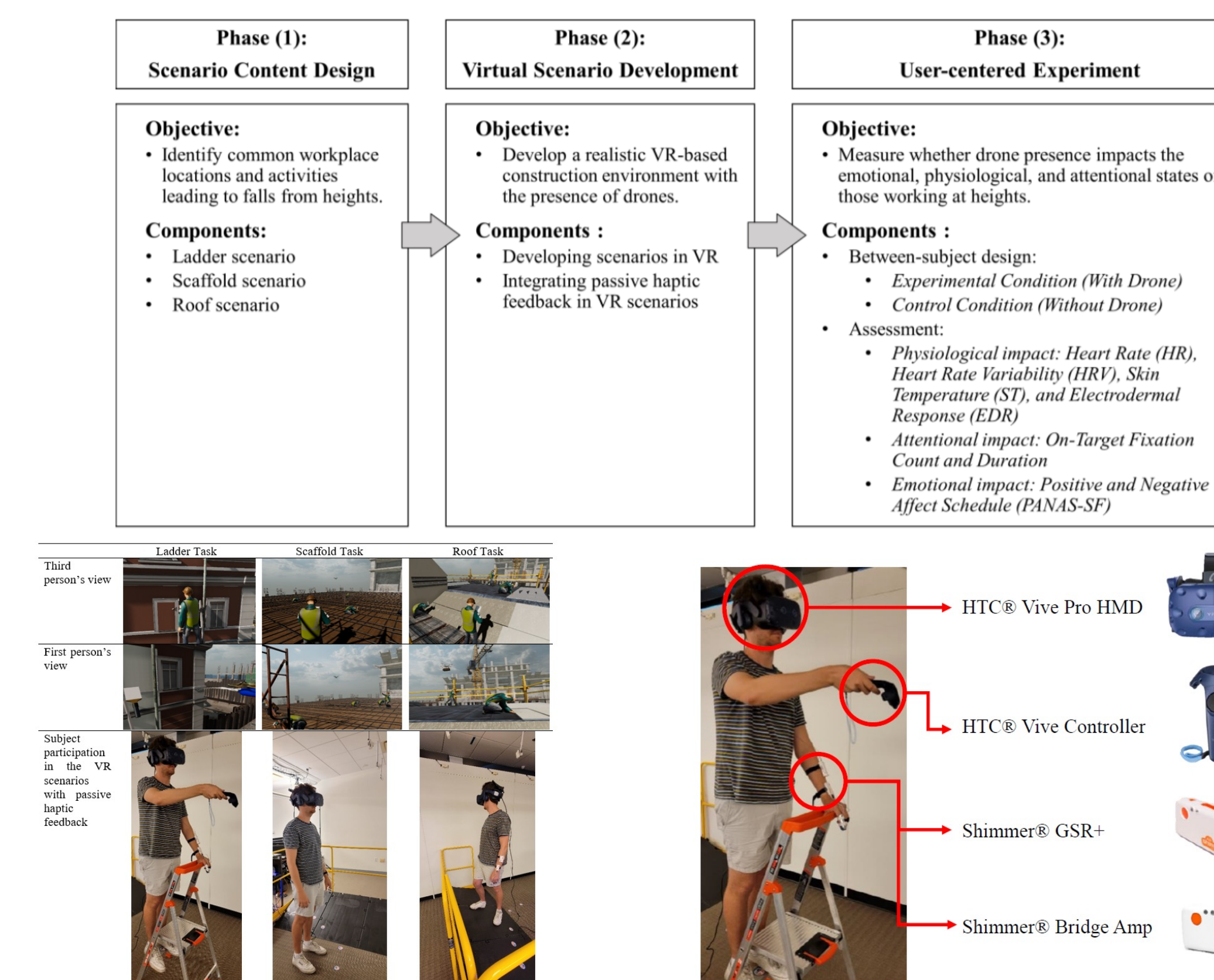
Working with Drones at Different Distances



- Drone presence has some physiological impacts, causes distraction, and reduces construction individuals' attention on the tasks at hand.
- Drones operating at some distance cause more distraction to professionals than drones operating in close proximity.
- Drones were not found to cause significant psychological or emotional distress or affect individuals' attitude towards them.

Study II:

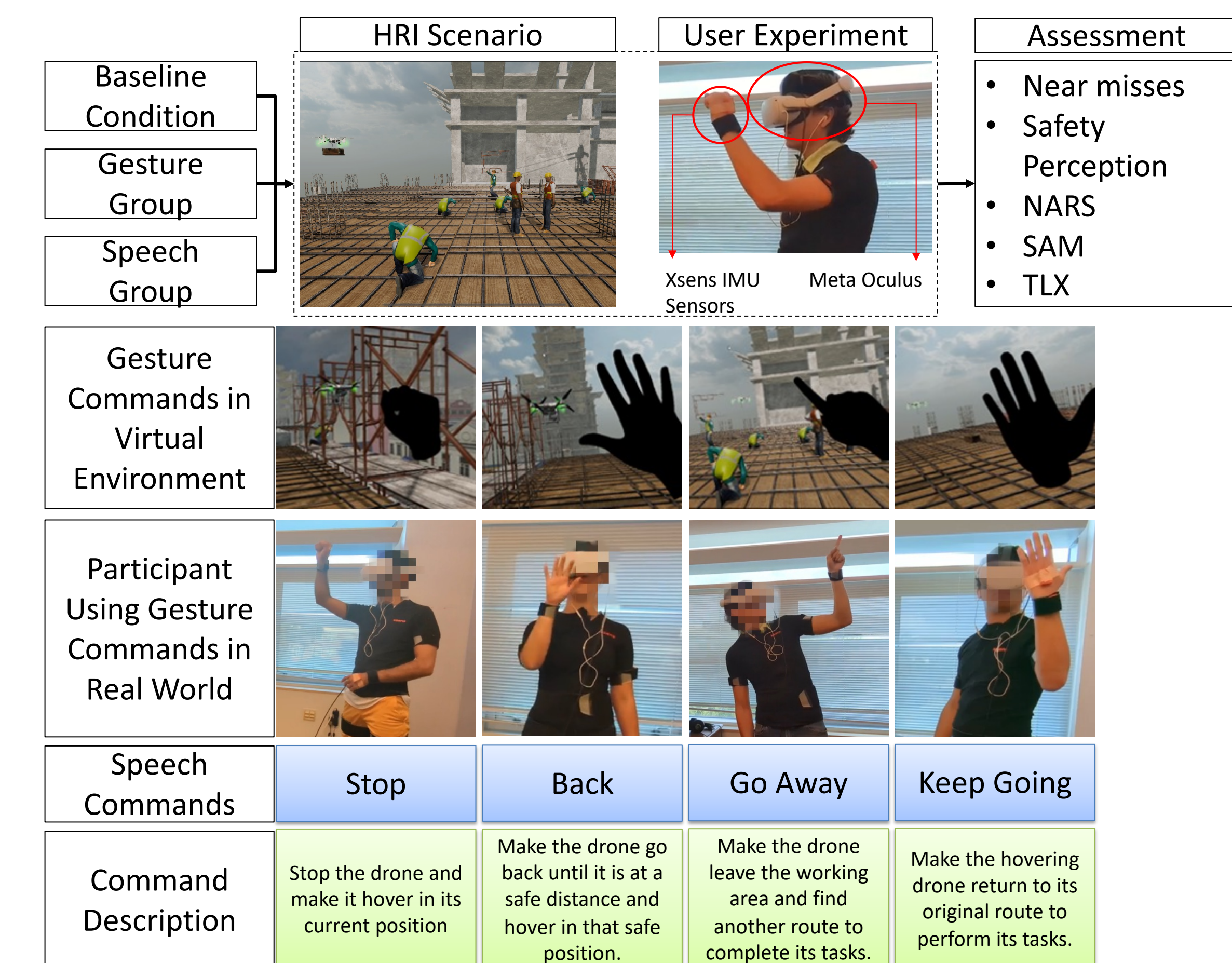
Working with Drones at Heights



- Drone presence was not associated with changes in individuals' physiological and emotional states.
- Individuals diverted some of their attention from the assigned task towards the drone.

Study III:

Communicating with Drones using Gesture and Speech Modalities



- Further data analysis based on the physiological and emotional data is still undergoing.

Broader Impact (Society)

- With the intent of understanding health and safety implications of construction crew collaboratively working with co-drones on the construction jobsites, this project elicits fundamental knowledge in terms of human natural behavior that could be applicable to any drone-populated work context.
- The effectiveness of using various communication modalities to interact with drones was explored to promote safe human-drone interaction in construction. This exploration can also inform future technical developments aimed at addressing the safety challenges posed by co-drones in construction workplaces.

Broader Impact (Education and Outreach)

- Educational and outreach efforts are envisioned to be integrated into several courses, workshops, webinars, and outreach activities, conducted by the PIs.
- This project will also provide the opportunity of project-based learning for undergraduate and graduate students as a part of worker safety and co-drone course modules.