Hyper-Reality Helmet for Mapping and Visualizing Public Safety Data

Yang Cai • Carnegie Mellon University • ycai@cmu.edu

Problem Statement

- Mapping and visualizing the physical environment of an emergent event is a compelling need for first responders.
- Where are the responder locations? Where are the people in need? Where are the locations of assets? What hazards and resources are present in the area? How to navigate inside the building? How do we update the map on-demand?
- It is challenging to work inside a building, in a tunnel, or in a cave where GPS, cellular, and infrastructural WiFi signals are not available.

Specific Objectives

1. Rapid prototyping the see-through head-mounted display and data processing helmet
2. Landmark recognition and tracking and tagging landmarks on the map
3. Visual simultaneous location and mapping (SLAM) and smart phone ad-hoc network (SPAN)
4. Gesture and speech recognition for navigating and information retrieval
5. Superimposing live thermal images to the helmet
6. Human-robot interaction interface development for 3D mapping of the infrastructure and the First-Person-View (FPV) from drone's cameras.

Unique Approach

- *Affordable* holographic smart helmet
- *Hyper-reality* technology for superimposing on-demand information to objects in the view.
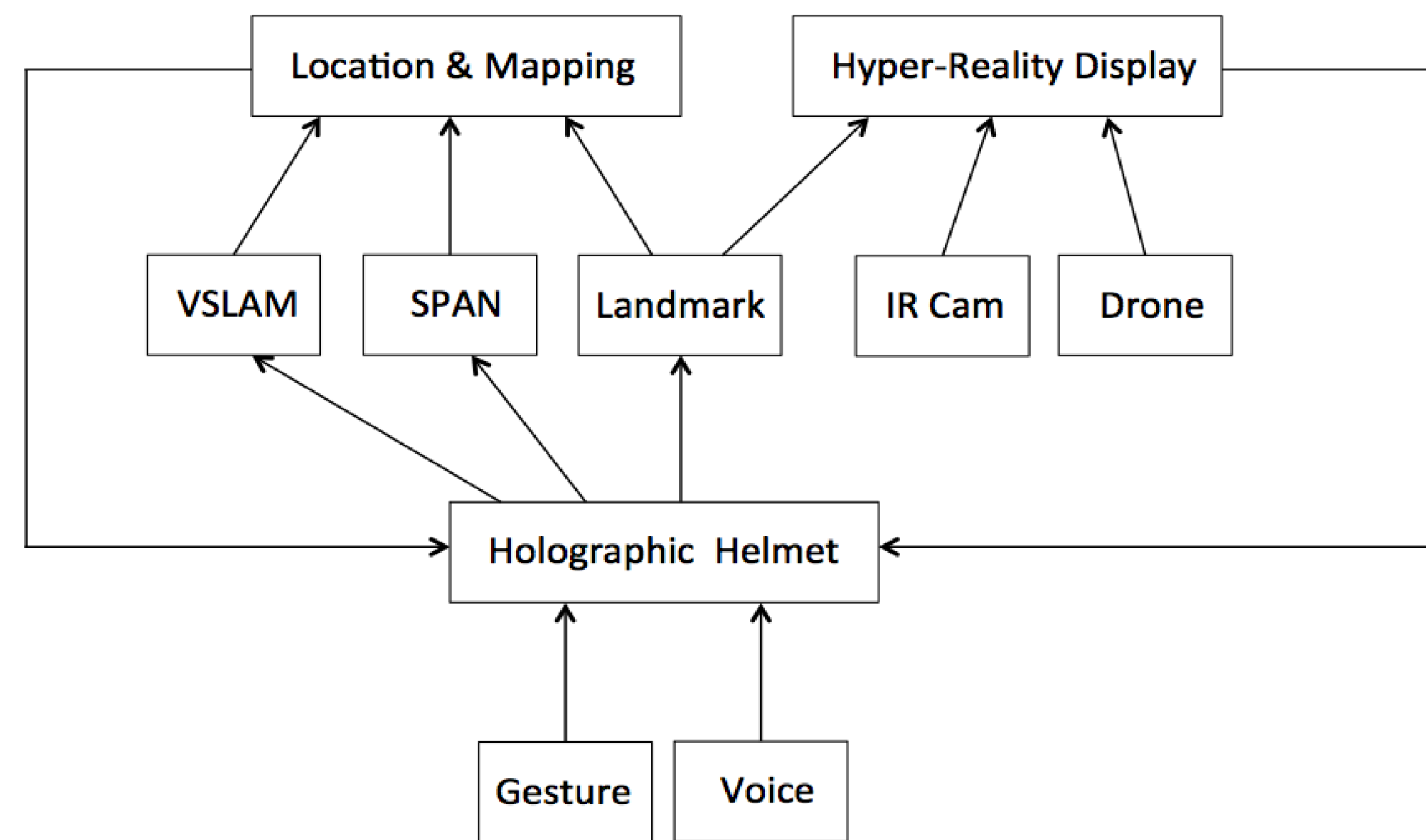

Architecture of the Hyper-Reality Helmet System

The prototype of the smart helmet (left) and the projected navigation information about where is the electrical room (right)

Expected Impact

The technology is expected to assist first responders in emergency environments of fire, flood, shooting, cyber attack, and medical distress, where GPS, cellular and regular WiFi signals are not available.
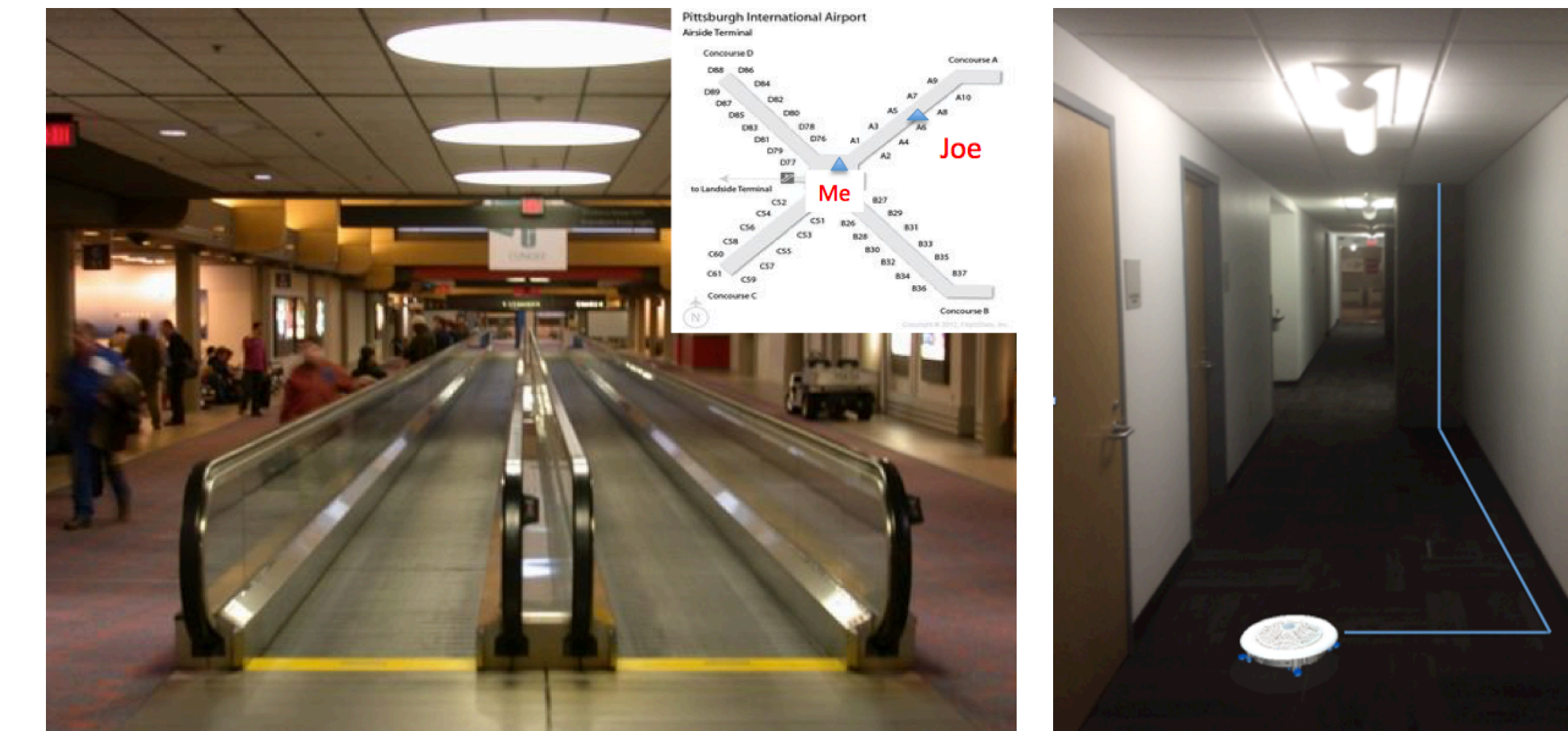
Localization and mapping for first responders in the airport (left) and the superimpose the locations of the Internet of Things (IoT) devices under the floor (right)
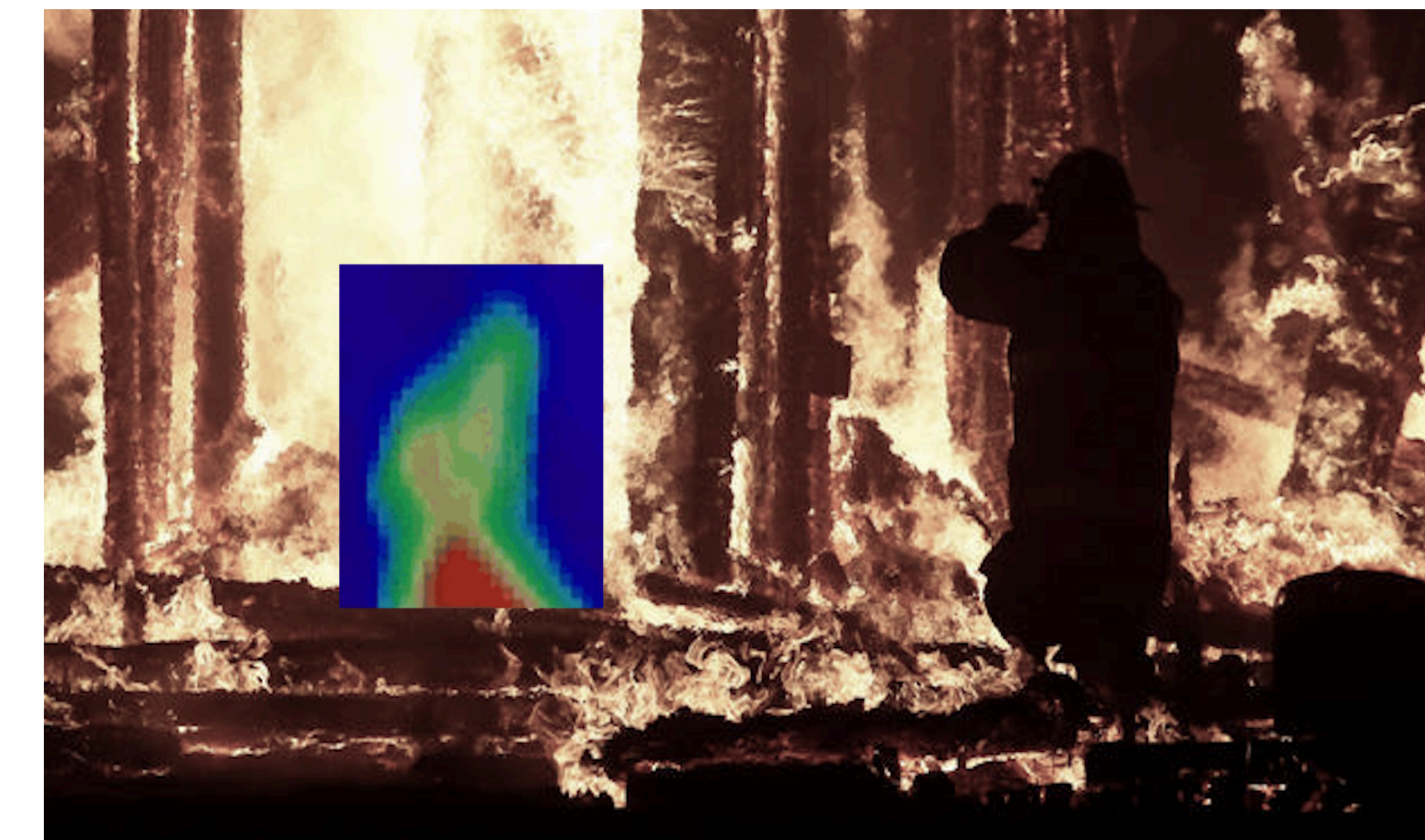
The thermal image is superimposed to the helmet