

Real time human detection and counting in a closed room without setting up the sensors or going inside

Application Number: 202411000619

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ABSTRACT

Embodiments disclose a method and a system for real time human detection and counting in a closed room environment, the system comprising: (i) a multi-sensor component whose inputs are the real-world coordinates of the disaster site, and the output is a set of sensor data; (ii) a federated learning component whose inputs are the sensor data, extracting the features from it. In one-time activity, a model is pre-trained from features obtained from ground truth data collection by enacting real-world scenarios with the help of volunteers; and later, during the search task, when a drone has real-world data, this component outputs key information in the form of 3D points of the trapped humans, which is referred to as 'local perception'; (iii) a data fusion component employing: a point cloud method, a surface fitting method, a surface superimposition method, and a smoothing-clipping method, wherein the data fusion component fuses local perceptions received from individual drones over the network, and the output is a 3D model of the site showing the position and the estimated number of trapped people; and (iv) a transfer learning component aiming to improve human detection accuracy and response time as drones face new real-world situations.

KEY APPLICATION AREAS

1. Disaster Management & Emergency Response.
2. Search and Rescue Operations.
3. Public Safety & Homeland Security.
4. Defense & Military Operations.
5. Healthcare & Epidemic Monitoring.
6. Smart Buildings & Industrial Safety.

POTENTIAL USES

1. Detect and count trapped people during fires, earthquakes, gas leaks, and building collapses without entering the structure.
2. Assist firefighters and rescue teams by providing the location and number of survivors in real time.
3. Support hostage rescue and tactical military operations by estimating the number and positions of people inside buildings from outside.
4. Monitor occupancy limits and social distancing during infectious disease outbreaks (e.g., COVID-19).
5. Enable non-invasive occupancy detection in restricted or hazardous environments such as factories, warehouses, and hazardous industrial zones.
6. Improve emergency evacuation planning by rapidly estimating indoor human presence before responders enter.
7. Enhance building safety inspections where entering the premises is unsafe or impractical.