First Responder Assisting Sensor Payload

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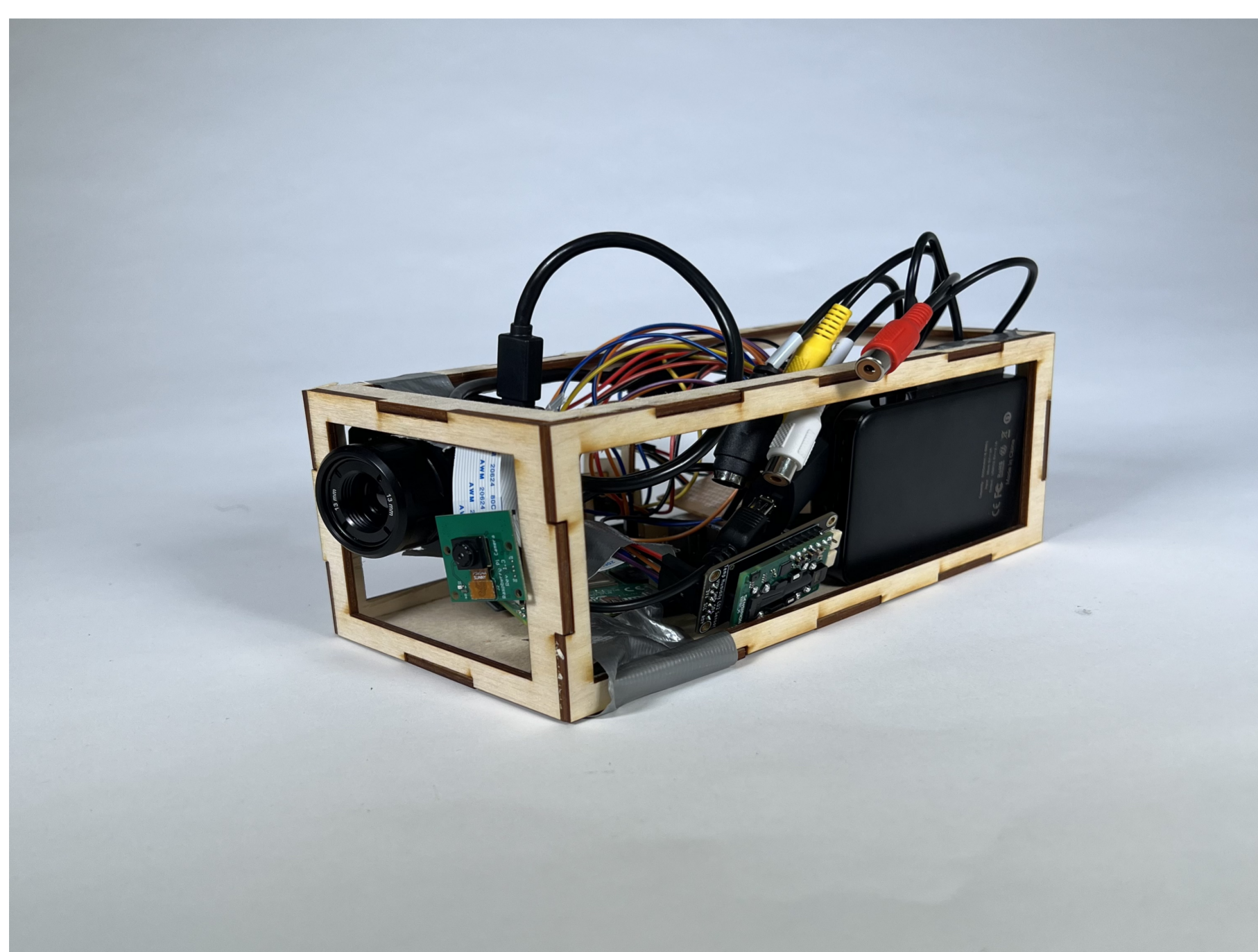
Unmellow Yellow

Problem Definition

- Building collapse is the most lethal aspect of urban earthquakes.
- Uninjured adult victims can survive 72hrs with fresh air supply.
- 80% of survivors are rescued before 48 hours, but after 72 hours the survival rate drops exponentially.
- The rubble and terrain are highly dangerous for first responders and canine teams to navigate.

Sensor Payload. 540g, 21.5cm x 10.5cm x 8cm

Unmellow Yellow's Solution Concept

- Create a method to remotely detect signs of life to help rescue efforts, better distribute rescue resources and limit the amount of time responders have to spend in danger.
- The method implemented by the group to detect signs of life is a system of sensors that work simultaneously to measure different variables inferring the presence of humans in a surrounding area.

Accomplishments

- Both camera feeds were able to be streamed wirelessly over the internet with minimal latency.
- The infrared camera was able to detect exposed and covered human features on the other side of an obstruction regardless of ambient lighting.
- The CO_2 sensor was able to perform in varying environments. It has detected humans despite significant airflow and detected a human trapped inside a box when the payload was positioned near an opening of the box.
- The two microphones were sensitive enough to record conversation level human vocals in stereo within a 5m radius. The audio samples were then processed through a machine learning model in order to determine whether human noises (both language and guttural sounds) were present.

Next Steps

- Incorporate LiDAR.
- Scale up number of microphones and implement audio source localisation features.
- Improve the human noise detection algorithm success rate and implement multi-channel audio files.
- Test the sensor payload in more realistic disaster scenarios and on a mobile chassis.