Tracking Indoor Room Occupancy with mmW Radar

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Aims

Uptime

Stable for at least 8 hours without experiencing a critical fault

mmW Radar Sensor

Data points accurate to a resolution of 20cm in a 5mx5m area

Communication System

Latency should be less than or equal to 5 seconds between sensing and online dashboard update.

Machine Learning

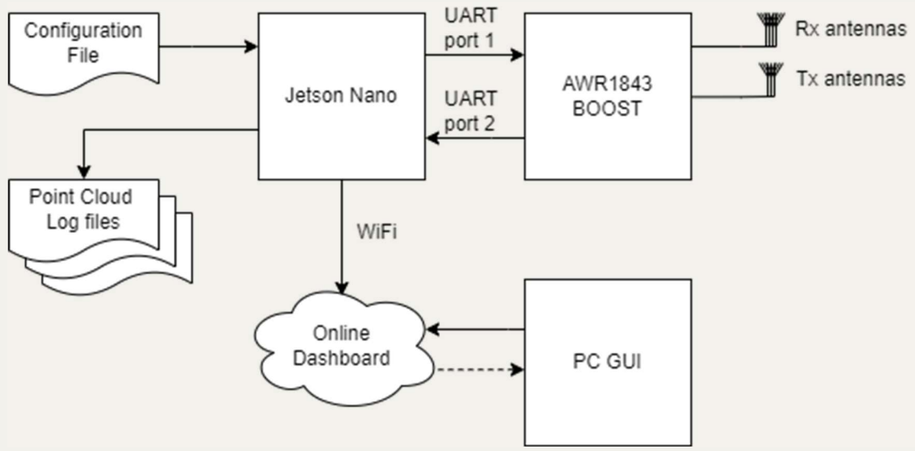
Successfully identify 3 objects separate from noise

Data Visualization

View both current room occupancy and the history of room occupancy.

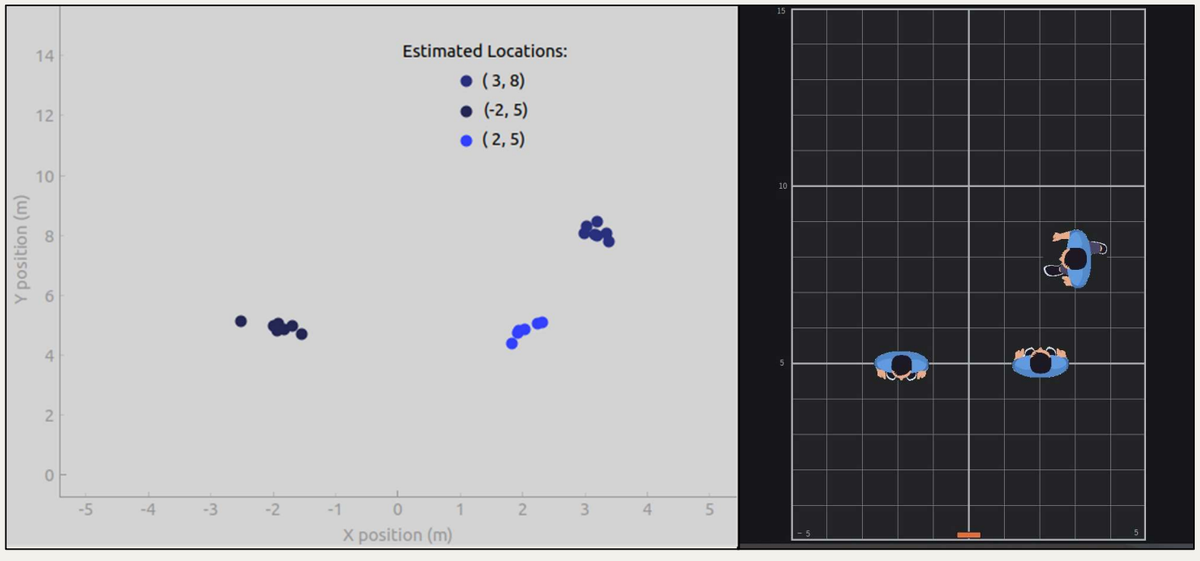
The history should be viewable for the same length as the embedded system uptime.

System Overview



Results

On the left is the graphical representation of the raw mmW data processing through the DBSCAN algorithm running on the Jetson Nano. On the right is an example of the dashboard, showing object position.



Conclusions

Uptime

The system was tested running on the Jetson Nano for >4hrs with no failures.

mmW Radar Sensor

Individual cloud data points were accurate to 3-5cm up to 8 m in the given cone and declined after that.

Communication System

Latency between the radar and Python GUI was <0.2s running at 10Hz. The upload delay to the dashboard was capped at ~1s. The graphical update was capped at 5s.

Machine Learning

The clustering algorithm can successfully identify 3+ objects while ignoring noise.

Data Visualization

Current room occupancy, object position and object velocity are viewable from an online dashboard.