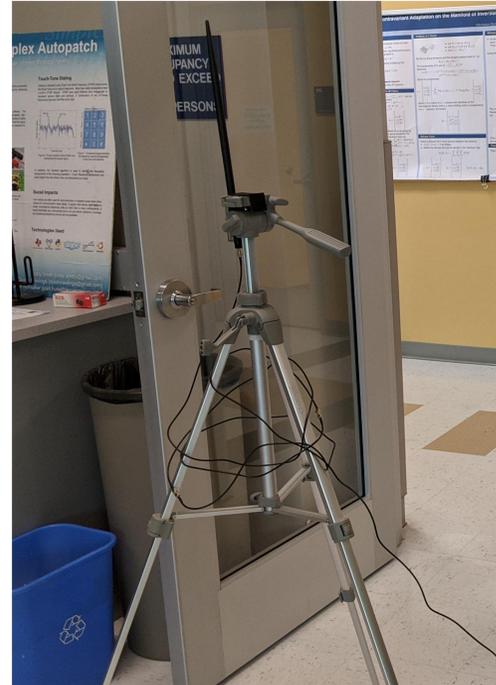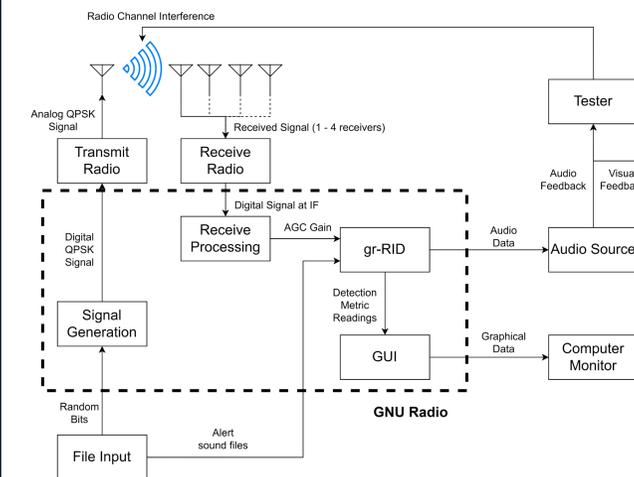# Real-time Intrusion Detection: gr-RID

Project

- Uses basic radio communication techniques to detect intruders in **real-time situations**
- Relies on Linux-based **GNU Radio** software and Ettus Research Universal Software Radio Peripheral (**USRP**) devices
- Intruder detection metrics all available through a **single processing block**
- **Multi-antenna** data collection to improve detection rate and increase detectable area
- Baseline for further research on target detection and tracking using Wi-Fi signals
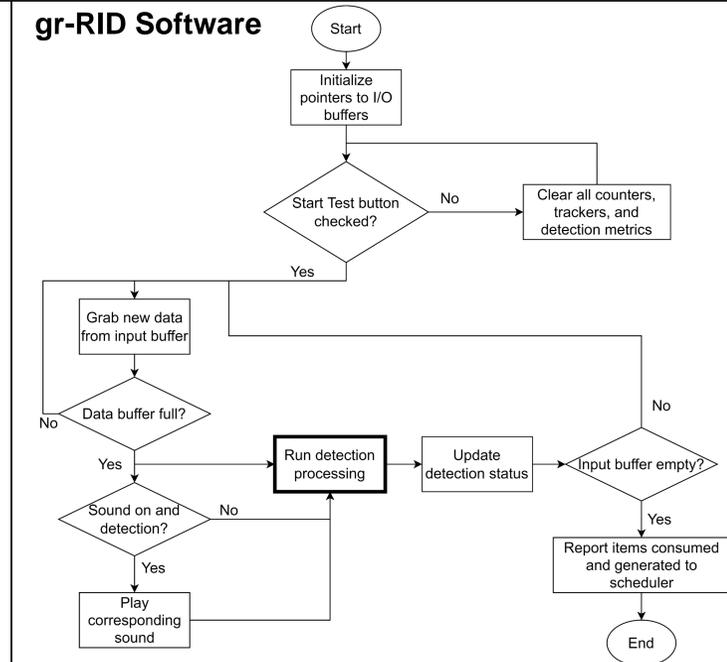

System

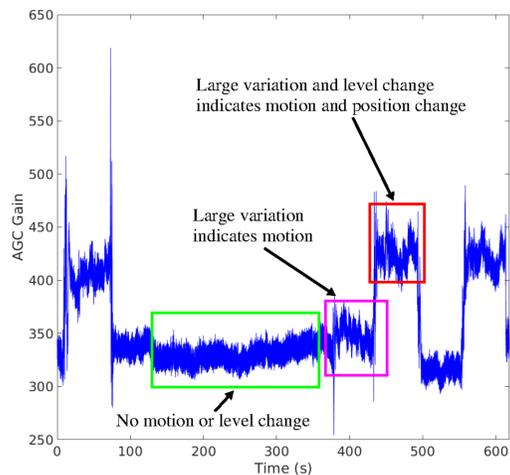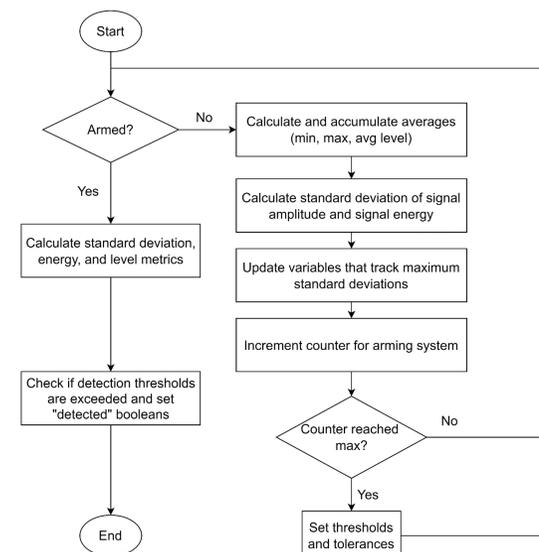### Overview

GNU Radio

gr-RID Software

Methods

Decision Metrics

- Large variation and level change indicates motion and position change
- Large variation indicates motion
- No motion or level change

- Amplitude standard deviation (purple and red boxes vs. green)
- Energy of standard deviation (purple and red boxes vs. green)
- Level thresholding (significant in red vs. green)

Detection Processing

- Collect data for duration set by user
- Set thresholds and arm system
- Check if thresholds exceeded

Conclusions

- Consistent detection (as mapped below) for baseline testing and experimentation
- **Low sample rate requirements** allow gr-RID to be implemented on lower-cost and lower-capability radio communication hardware.
- Data collection indicates that it is possible not only to detect intruder motion and presence, but **general location** as well. This is critical for tracking.
- gr-RID is a valid method of detection in research that has developed since the conclusion of this project.

Detection Heat Map
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