COLLEGE OF ENGINEERING
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

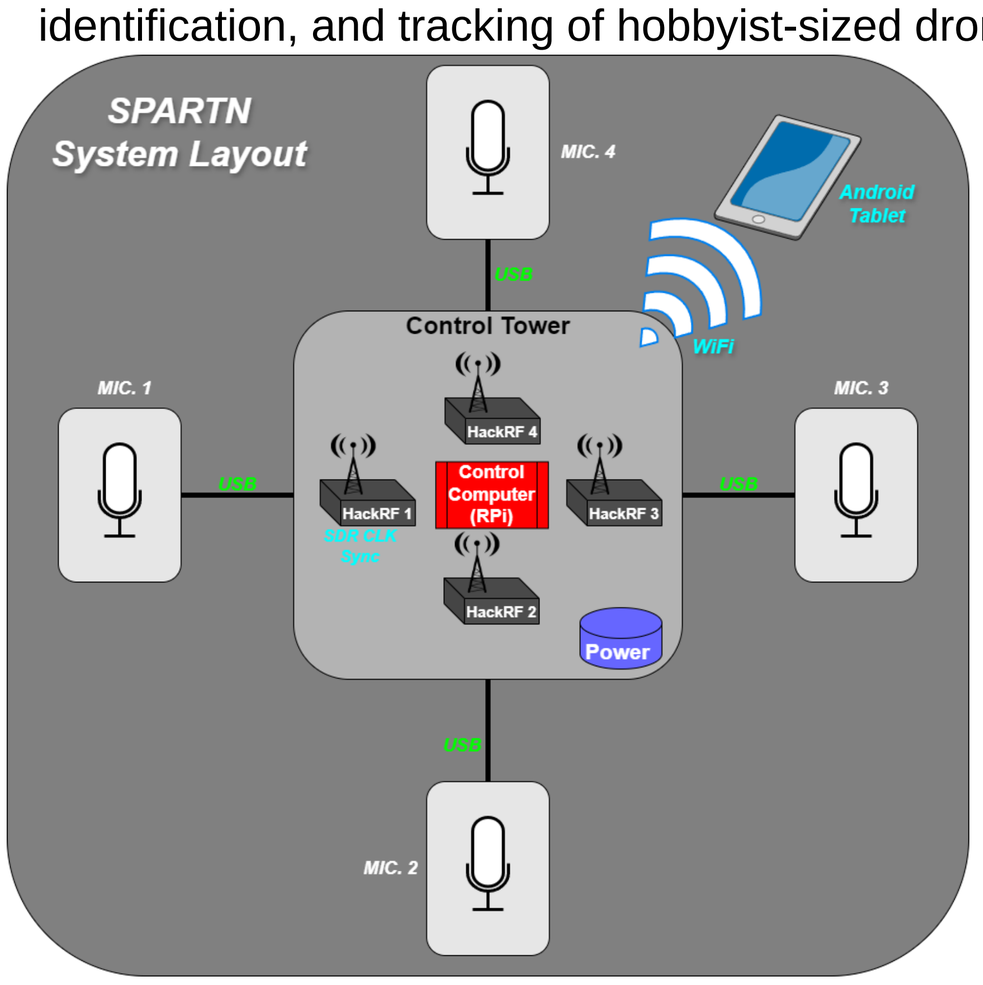
E-Week Engineering Showcase 2025
CPE496/498 Capstone Design Course

SPARTN Drone Detection Network [Sensor Platform for Acoustic and Radio Tracking Network]

Tyler Briggs, Nicholas Brownfield, Dawson Hampton, Jeff Ikeda, Kentrell Martin, Mikhail Ramirez, Dr. David Coe,
Department of Electrical and Computer Engineering

Overview

- Rapid drone technology advancement and ineffective geofencing create new challenges.
- There is a need for a simple, rapid deployment system with real-time detection, identification, and tracking of hobbyist-sized drones.
- Our project addresses this with real time detection, identification, and tracking of hobbyist-sized drones.



System Design

The SPARTN drone detection network is comprised of four microphones, four HackRF SDRs, a central control tower, and a tablet.

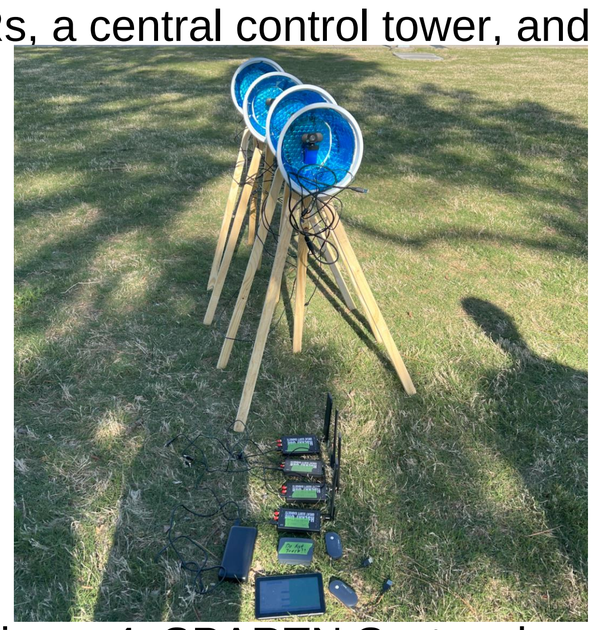


Figure 4. SPARTN System hardware
Mic stands, HackRFs, battery, usb splitters, tablet

Requirements

- The system should reliably detect small, hobbyist-sized drones, anything under 250 grams.
- The system should detect drones using sound and radio-frequency signatures.
- The system should use localization and report the exact position of drones in real-time.
- The system should be able to characterize the type of drone detected.

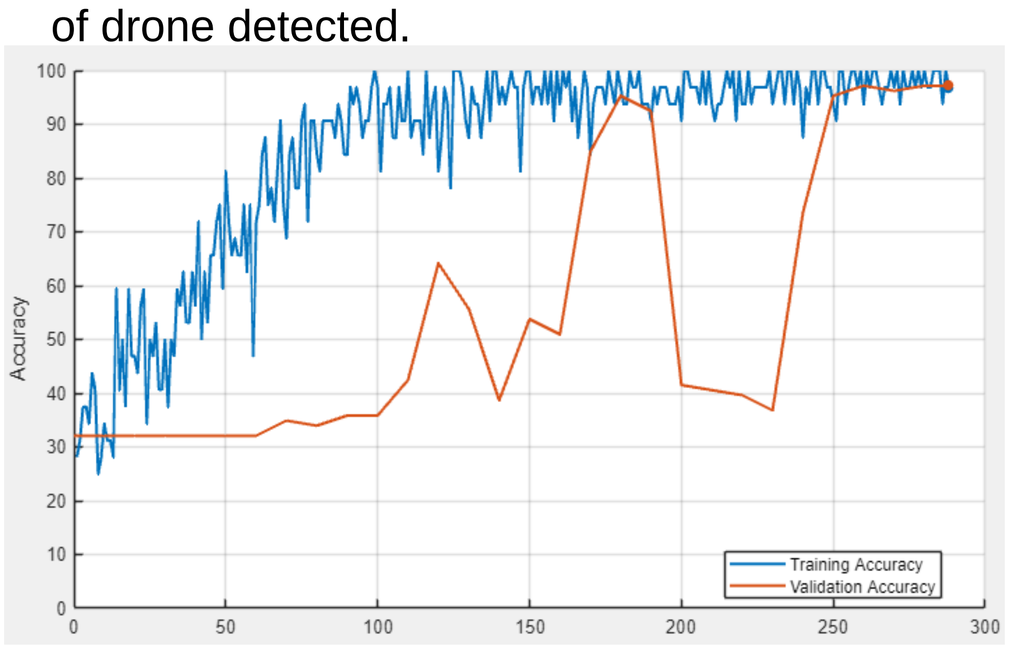
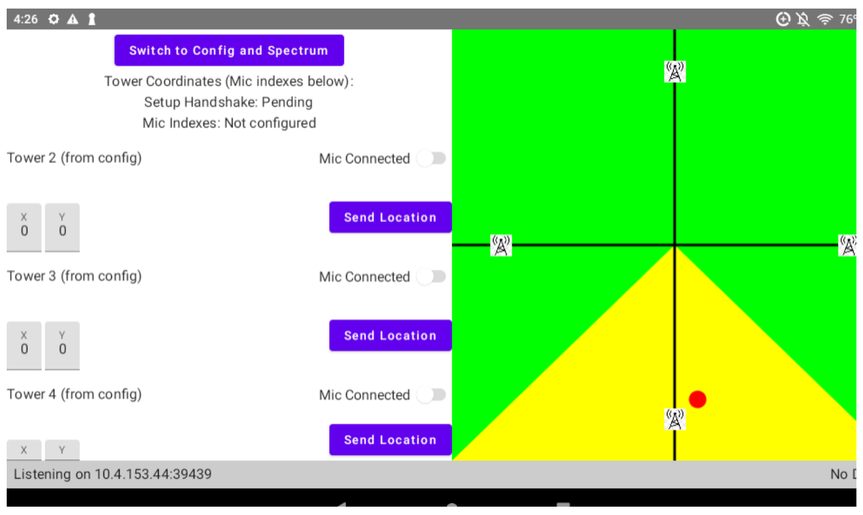


Figure 2. Training the drone classification AI

Figure 3. Mobile app for visualization of location and identification of drone



Results/Conclusion

- The most important results for our project are drone locating and identification through real time captured audio data.
- The amplitude shifting localization method estimates position within a 16x16 foot area.
- The AI model is operating at up to 90% accuracy for drone classification.
- Future work would consist of greater integration of RF systems, better hardware for TDOA, expanded range and more robust encryption.

References

1. Shi, Z., Chang, X., Yang, C., Wu, Z., & Wu, J. (2020). An acoustic-based surveillance system for amateur drones detection and localization. IEEE Transactions on Vehicular Technology, 69(3), 2731–2739. https://doi.org/10.1109/TVT.2020.2964110
2. Wang, L., & Cavallaro, A. (2022). Deep-learning-assisted sound source localization from a flying drone. IEEE Sensors Journal, 22(21), 20828–20838. https://doi.org/10.1109/JSEN.2022.3207660

Acknowledgements

This project was supported by The University of Alabama in Huntsville Electrical & Computer Engineering Department. With special thanks to Dr. Buren E. Wells, Dr. David Coe and Dr. Emil Jovanov for mentoring and guiding all of us.