DRONE DETECT

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Goal: Implement a bistatic, forward scatter radar system capable of detecting and gathering information on low flying drones.

Introduction to Drone Detect

A type of bistatic (separate transmitter and receiver) radar, that uses the shadow a target casts of the RF signal rather than the refraction of the signal. This makes stealth aircraft detection and doppler signal extraction possible.

Above: Basic FSR setup/function. An object passes the baseline between the TX and RX antenna and the object's "shadow" is detected.

Success Criteria

- Send and receive sinusoid signal that complies with FCC regulations
- Detect objects passing through the baseline
  - Targets of cross-sectional area > 1 ft²
  - Angle of approach 90°
- Extract Doppler information from moving target (velocity)
- Create a GUI to show relevant frequency and system data in real time

Methodology

Drone Detect consists of the Antenna Array and Signal Processing Graphical User Interface (GUI).

Above: Antenna Array, both sides consisting of an Antenna and HackRF SDR, and the SDRs connected by an SMA Coaxial Cable

Above: Signal Processing GUI on-screen display

Future Work, References, and Acknowledgments

- Improve speed of real-time GUI
- Optimize sensors to allow for more accurate readings
- Implement more complex signal processing to allow:
  - Identifying target angle in relation to baseline
  - Adjust resulting velocity calculation based on the angle

Faculty: John Reece
Teaching Assistant: Tim Amish
Industry Mentor: Luke Firsching, Mike VanDooren


Above: (Left) TX antenna, 916-CW-RCL-SMA Monopole Antenna with Ground Plane and (Right) RX antenna, RFSPACE TSA400 Antenna with Ground Plane.

Left: Antenna array during outdoor testing