Developments in climate science and geopolitical conflict have increased the demand for coastal reconnaissance. Modern applications call for robotics to improve safety and efficiency. We present a radar-navigating unmanned surface vessel (USV) as a platform to perform intelligence gathering missions.

**Capabilities**

Signal jamming and sparse cellular coverage in remote areas mandate robotic self-reliance. Equipped with a mesh radio, the USV can be teleoperated from a control station. With more than 5 hours of battery life, it can map surroundings with radar and stream live video of operations, while navigating at 10 mph.

**Software**

USV control software utilizes a system of nodes defined under Robot Operating System (ROS) to control peripheral, process data, and communicate with the control station. ROS nodes communicate by publishing and subscribing to user defined topics. Nodes written with Python and C++.

**Hardware**

- **Quantum Q24C Radar**
  Gathers 360 degree point cloud (250 spokes) of the environment ranging from 1/16 to 24 NM

- **Raspberry Pi 4B**
  USV’s onboard computer that runs ROS nodes for hardware drivers, socket communication, navigation, and signal processing

- **mini Mesh Rider Radio**
  Streams video, telemetry, and radar data to the control station from 2+ km

- **Blue Robotics T200**
  Two powerful thrusters propel the USV at 10 mph and enable zero radius turning

- **NEOM8 GPS and Adafruit IMU**
  Sensor fusion of acceleration data and GPS position provides localization of the USV for map-making

**Mapping**

Radar point clouds are collected from different positions and composed to form larger maps.

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