

SeaShield

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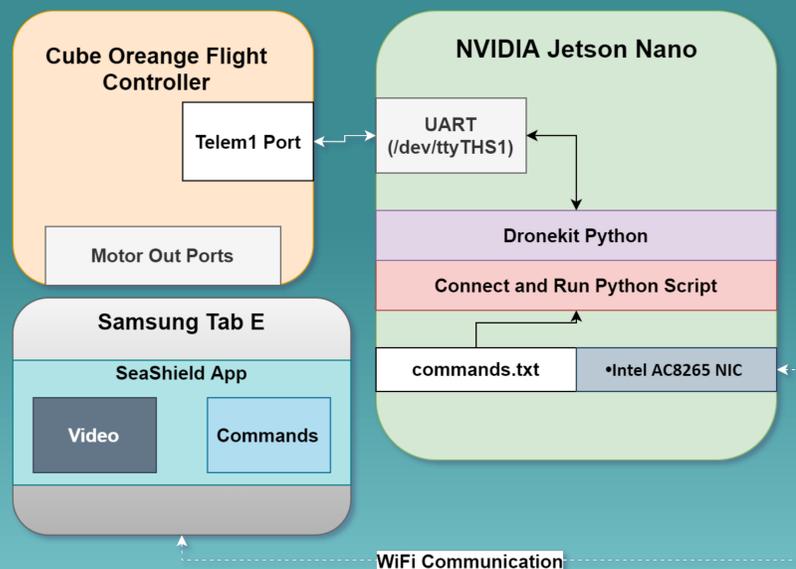
Background

The electrolytic properties of the oceans' salt water dramatically increase the rate of corrosion on naval vessels. Rust and corrosion cost the United States Navy nearly twenty billion dollars to repair. SeaShield is a drone system aimed at reducing the cost, time, and manpower required to repair corrosion. SeaShield remotely applies an inhibiting liquid that will slow down or stop the rate of corrosion until the naval ship can be repaired.

Overview

The drone is designed to be able to carry a significant payload of rust inhibiting liquid. A HEX Cube Orange Flight Controller handles the flight and adjustments aboard the drone. The drone is equipped with a Jetson Nano computer, which offloads various processing needs, such as the Rust Detection Algorithm and flight command interpretation. The Nano also enables remote communication through a network interface card configured as a WiFi access point.

Control Flow



SeaShield Drone



- 4 Liter payload.
- 22000mAh LiPo Battery.
- 30 minute flight time.
- 18.5 inch propellers.
- ~34 inch diameter.
- 100 psi spray system.

Key Components



HEX Cube Orange Flight Controller

Tripple redundant, temperature controlled Inertial Management Units (IMU), two of which are mechanically vibration isolated. 400MHz STM32H743 Cortex®-M7 processor.



NVIDIA Jetson Nano

Companion computer used to establish a wireless access point, handle image processing, video streaming, and flight command interface between Android Application and flight controller.



Dronekit-Python

Python module providing an Application Programming Interface that sends and receives MAVLink-2 commands and messages to and from the drone.

Android App Control



- Live video feed.
- Spray control.
- Full flight command palette.

Rust Object Detection



- Custom trained YOLOv3 model.
- Identifies rust coloring using pattern recognition.
- Training dataset annotated using LabelImg.

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