

Crawler Drone For Ship Inspection

Senior Design Class
Sponsored by Lockheed Martin
Mentored by Professor Lerner
Senior Design II 801C 1212

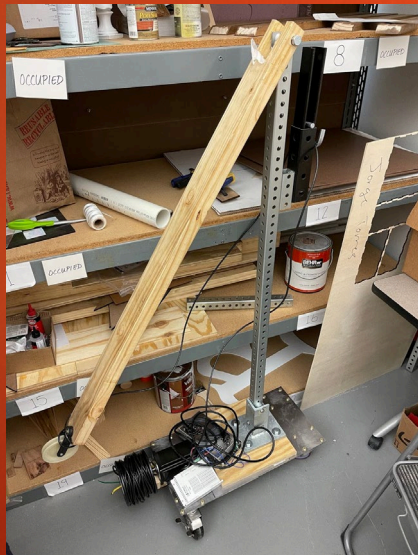
- ▶ Drone deployment on side of ship for inspection of damages
- ▶ 4 Main Components
 - ▶ Shell for the drone
 - ▶ Crane to deploy the cable as the drone moves on the side of the ship
 - ▶ Locating system of the drone
 - ▶ Control system for cable management

- ▶ STEPHEN CHENG
- ▶ CIERRA STAFFORD
- ▶ ANURAAG THAKUR
- ▶ PEYTON TURNER
- ▶ COLE WILBOURNE



Outer Shell and Crane Design

- ▶ Crane designed to be minimalistic in order to increase transportability of the unit.
 - ▶ Crane is easily assembled and disassembled by a single person.
- ▶ Crane can support up to 150lbf.
 - ▶ This is x3 the expected force of the drone falling.
- ▶ Shell was thickened to 0.1" in order to give more structural rigidity to the drone.
 - ▶ The shell was a major weak point in the given drone.
- ▶ A hook was added as close to the CG as possible
 - ▶ This decreases the moment forces on an individual wheel and allows the drone to stay on the ship under larger loads.



Locating & Coordinate System Control Mechanism

- ▶ Sensors attached to the crane and drone send and receive ultrawide band radio waves. The distance between sensors is calculated in board through a two-way ranging, time of flight approach
- ▶ Distances are converted to cartesian coordinates through a locating algorithm that uses principles from trilateration as well as constraints from the drone-ship interface.
- ▶ Initial Set-Up Instructions of drone will be provided to properly calibrate the system.
- ▶ We take the current position of the drone and its next position.
- ▶ When the displacement exceeds a set threshold, the drone moves up and down, we release cable.
- ▶ If there is right/left displacement that exceeds a set threshold, we rotate the crane to preserve initial setup.