Autonomous Base Station for Drone Storage and Battery Swapping

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The use of UAVs has increased rapidly in the last decade. They are now implemented in various research operations and inspections. The main limitation of drones is their short flight time of 20-30 minutes, which causes the need for frequent battery replacement by a human. The purpose of this project is to eliminate drone ground maintenance by developing a ground station that autonomously swaps the drone’s battery. The ground station consists of four main mechanisms: the mechanism for aligning the drone, the compartment for charging up to six batteries, the robotic arm that handles the battery swapping, and the mechanism for elevating the landing platform. The entire system is monitored by 14 sensors that ensure accurate operation. A mobile app was developed to view the state of each mechanism and send commands to the ground station via WiFi or LTE. Thanks to this mechanical assembly the station can change the drone’s battery in just 12 seconds, which combined with the aircraft's flight time of 17 minutes allows the drone to stay in the air 98.8% of the time. The system can be used for 24/7 aerial surveillance or continuous inspections which would not have been possible with other similar commercial charging stations that can keep the drone flying for only 61.5% of the time. The obtained system was tested in daytime and nighttime for continuous 5-hour periods with a total of 300 battery swaps and proved to be a sustainable and robust solution.

Awards Won:
Third Award of $1,000
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