

Autonomous Battery Replacement System for Surveillance Drones

J.B.S. Thyriar and W.A. Rasika Nandana

*Department of Mechanical Engineering, The Open University of Sri Lanka, Colombo,
Sri Lanka*

Surveillance and monitoring are being widely used in areas such as home automation, road surveillance, monitoring cattle, identifying wildfire and ubiquitous sensing. Even though there are various other surveillance methods currently available in the market, computer-controlled unmanned aerial vehicles (UAV) found to be one of the successful ways since the motion of it is unrestricted within a surveillance boundary without being bind by ground interference. One of the disadvantages of UAV is the duration of flight since a typical UAV can only fly about 10 minutes using Li-Po batteries, which is a major drawback for tasks like aerial surveillance which requires longer flying duration. So that this research is based on autonomous battery replacement along with charging of the battery. In this process, the surveillance drone is assumed to be landed by image processing technique within 20cm radius of the exact location. After the landing, it is positioned autonomously. Then a gripper grabs the discharged battery from the drone and places it into the empty charging bay. Thereafter, the rotary manipulator grabs the charged battery pack and replaces the drone battery slot by the charged battery. Finally, the drone takes off with the fully charged battery. Initial experiments are conducted using the developed system and successfully estimated the outcome of continuous surveillance. The base station is used to landing, removing & replacing the battery and charging. It is a mechatronic system, which was designed and implemented successfully. According to the results, the objectives of the project such as centering the drone to the secondary dock and battery replacing are achieved successfully. Therefore, the system could be suggested for surveillance and package delivery drones which come across the problem of insufficient battery life.

Keywords: Unmanned aerial vehicles, Battery replacement, Surveillance drones, Drone battery