ABSTRACT

The main problem of the conventional air quality measurement system is it sometime gives inaccurate result due to the pollution nearby the sensor. To solve this problem, this research builds a prototype of Unmanned Aerial Vehicle (UAV) as part of Swarm-IoT (Internet of Things) to measure the air quality over the ground of specific area. To establish the stability, we use UAV with 4 propellers or a quad-copter. Since a Swarm-IoT is a distributed autonomous IoT devices, we have to make sure that the UAV has the ability to identify the take-off position to know where it should return autonomously without the help of remote control. Thus, the purpose of this research is to create an Automatic Take Off and Landing (ATOL) functionality on the air quality measurement UAV. By adding an ATOL functionality, the UAV can simply take-off and landing without any control or help from human. This is beneficial, since if the Swarm-IoT UAV is operated by remote control, it would be inefficient because it needs many people to remotely control each UAV.

For air quality measurement purposes, as an additional of the ATOL functionality, we program the UAV to operate autonomously from take-off, hover at the altitude of 3 and 5 m for measuring the air quality, and finally landing on the same position from take-off without any human intervention. In general, the components used to do the ATOL functionality for the UAV are Pixhawk as the autopilot system, Mission Planner as the software, Global Positioning System (GPS) as the receiver, Telemetry as a two-way data stream, and a computer as the control unit.

The results obtained after creating the system are the UAV can successfully take-off and land automatically to the take-off place with the precision of average distance from the takeoff and landing position is 45 cm. The average data error for take off coordinate is 2.95 m with deviation of 0.86 and the average data error for landing coordinate is 2.95 m with deviation of 0.95. The precision of the altitude at 3 m is 9.5 cm with deviation of 5.14 and at 5 m is 6.9 cm with deviation of 3.17.
Keywords: UAV, Swarm-IoT, ATOL,GPS.