“Real-Time Low Cost Air Quality Monitoring with Solar Powered UAV”

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Drone technology has emerged as a very important platform to do sensing of physical phenomena around us with fine-granularity and offers enormous potential and capability for industrial pollution monitoring and dense areas like urban cities. Air Quality is a local phenomena, that is, it changes in a significant manner from point to point, thus making Air Quality mapping from scarce static Air Quality sensors, practically insignificant. Thus, Air Quality monitoring using mobile sources holds enormous potential as it gives us the ability to perform geospatial-temporal pollution mapping of a geographically wide region using just a few hundred sensors. In this study, we have designed a fixed-wing solar-powered UAV, with potential to perform perpetual flight using solar power and generate Air Quality data in real time. This system was successfully field tested at a low altitude and on ground, collecting, storing and transmitting data through a data fusion module consisting of low cost OPC R1 sensor, Raspberry Pi and Pixhawk Flight controller. We do geospatial-temporal analysis of the generated PM 2.5 data from the system, which could be very useful to identify pollution hotspots in urban areas, industrial region and glaciers. Our UAV design, makes it more efficient than previous studies on Air Quality monitoring using quadcopters, due to less propeller wash on sensor readings and more flight time. We also take a look at using state of the art thermal camera on UAV for Infrared signatures of harmful CH4 emissions in oil & gas industry and remote sensing of Air Quality using satellite data.

Keyword- Air Quality Monitoring, Solar Power, UAV, Satellite Sensing