Development of a Real-Time Solar UAV With a Smart System for Measuring of Air Pollution Levels in Industrial Areas, Oman

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Industrial areas have emerged as a pressing global concern due to their substantial impact on air quality and public health. In Oman, the rapid economic growth has resulted in the development of various industrial parks, which pose considerable challenges to maintaining air quality. This study seeks to develop a robust real-time air quality monitoring system (AQMS) leveraging the 4th industrial revolution technologies to enhance health and environmental protection. The research employs an eco-friendly unmanned aerial vehicle system (UAV), with a frame constructed through 3D printing techniques using biodegradable algae-based filament. The drone is designed to collect air quality data and transmit it to a cloud-based platform. The drone will be deployed at the Bahla Industrial area in Al Dakhiliyah Governorate, to measure the concentrations of five key air pollutants: carbon monoxide (CO), carbon dioxide (CO2), nitrogen dioxide (NO2), sulfur dioxide (SO2), and volatile organic compounds (VOCs), along with ambient temperature (T) and relative humidity (RH). Equipped with embedded smart sensors, the drone will acquire and transmit real-time air quality information, enabling continuous monitoring and evaluation. This data will be relayed to a cloud-based platform, where it will be visualized instantaneously on a dashboard. Based on the findings from the pilot study, the drone will possess the ability to assess pollution levels and identify pollution hotspots. This solar-powered UAV system presents a promising approach to air quality assessment and can aid in making informed strategic decisions for managing air pollution.

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