ASEC 2024 Conference
The 5th International Electronic Conference on Applied Sciences
04–06 December 2024 | Online
MDPI

Development of Autonomous Unmanned Aerial Vehicle for Environmental Protection using YOLO V3

Vijayaraja Loganathan[a], Dhanasekar Ravikumar[b], Manibha M P[c], Rupa Kesavan[d],Gokul Raj K[e] and Sarath S[f]

[a,b,e,f]Department of Electrical and Electronics Engineering, Sri Sairam Institute of Technology, India

[c]Department of Electrical and Electronics Engineering, Sri Sairam Engineering College, India

[d]Department of Computer Science Engineering, Sri Venkateswara College of Engineering, India

INTRODUCTION & AIM

Unmanned aerial vehicle also termed as unarmed aerial vehicles are used for various purposes in and around the environment, such as delivering things, spying the opponents, identification of the aerial images, extinguishing of fire, spraying the agricultural fields etc. As there are multi-functions in a single UAV model, it can be used for various purposes as per the user requirement. The UAV's are used for because of faster communication of information identified, entry through the critical atmospheres and no harm to humans before entering a collapsed path. In concern with the above discussion an UAV system is designed to classify and transmit information about the atmospheric conditions of the environment to a central controller. The UAV is equipped with advanced sensors that are capable in detecting air pollutants such as: carbon monoxide (CO), carbon dioxide (CO_2), methane (CH_4), ammonia (NH_3), hydrogen sulphide (H_2S), etc,. These sensors present in the UAV model monitor the quality of air time to time, as the UAV navigates through different areas and transmits real-time data regarding the air quality to a central unit; this data includes detailed in-formation on the concentrations of different pollutants. The central unit analyzes the data that are captured by the sensor and checks whether the quality of air meets the atmospheric standards. If the sensed le, such as identifying industrial activities, traffic congestion, or natural sources like wildfires. vels of pollutants exceed the thresholds, then the system present in the UAV triggers a warning alert, this alert is communicated to local authorities and the public to take necessary precautions. The developed UAV is furnished with cameras which are used to capture real-time images of the environment and it is processed using the YOLO V3 algorithm. Here YOLO V3 algorithm is defined to identify the context and source of pollution.

METHOD

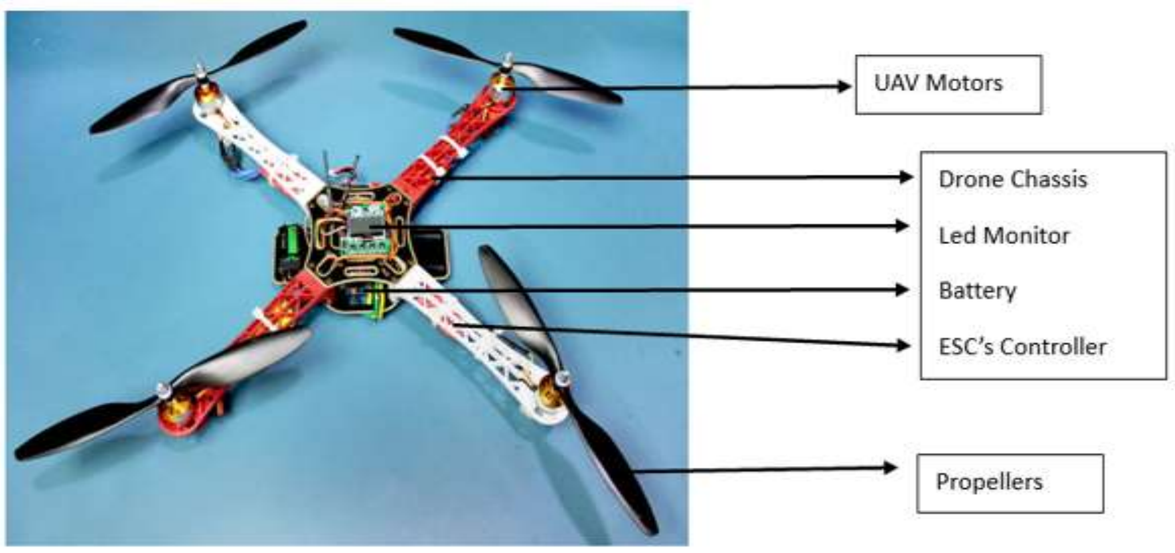

Fig. 1. AI-powered Autonomous UAV

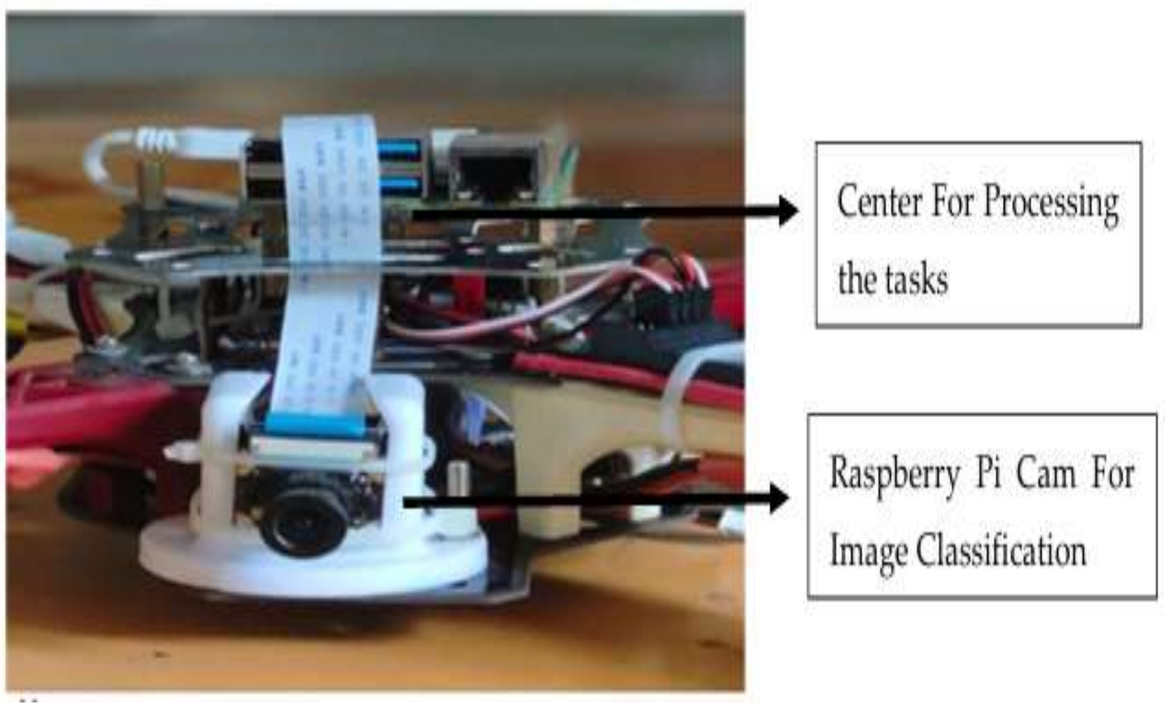

Fig. 2. UAV with Image Classification

RESULTS & DISCUSSION

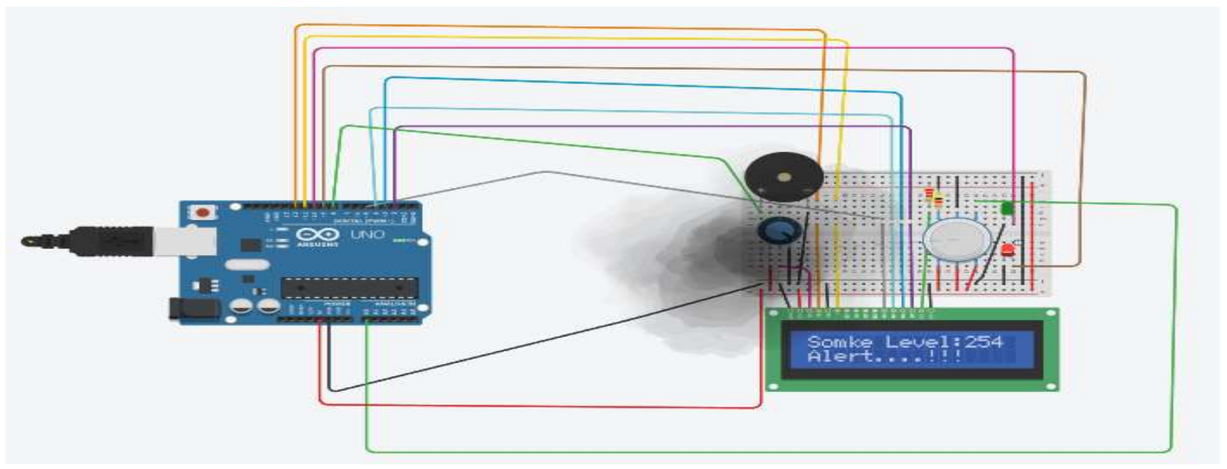

Fig. 3. Simulation of air monitoring system

Fig. 4. Yolo V3 Image Classification by UAV system

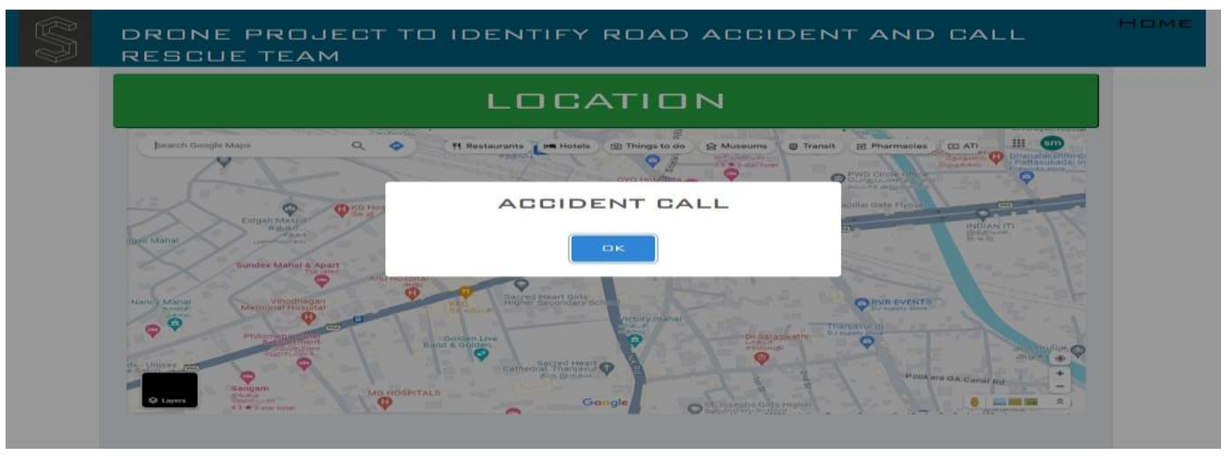

Fig. 5. Navigation of UAV

CONCLUSION

This research discusses the development of a UAV (Unmanned Aerial Vehicle) that classifies real-time data using the YOLO V3 algorithm. The UAV provides alerts to the relevant departments to facilitate faster rescue operations and help reduce pollution and mortality rates. The analysis conducted indicates that the proposed UAV model achieves an accuracy of 91%. These improvements lead to quicker object classification, enabling the air monitoring system to utilize a Raspberry Pi camera for image classification more effectively. This, in turn, enhances communication speed for the drone.

FUTURE WORK / REFERENCES

Enabling the system to forecast outcomes based on analyzed data from specific locations can help in devising effective strategies to reduce pollution in those areas, ultimately protecting the environment in a sustainable manner. Creation of a website to archive forecasting data for future reference, allowing us to identify the most polluted areas and implement necessary measures to mitigate pollution.