

**Project Topic Submission Form**

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| **CLASS** |  | S6 CS(AI) |  | | |

1. **Title of Proposed Project:**

Smart Motion and Zone-Based Fan Control System Using YOLO

1. **Project Abstract:**

This project presents a **Smart Motion and Zone-Based Fan Control System** that leverages YOLO (You Only Look Once) object detection to provide intelligent and efficient fan control in real-time. The system is designed to detect human motion and presence in predefined zones of a room and according to that turn ON/OFF the fan . It also incorporates a web-based interface for monitoring and manual control, making the solution both practical and user-friendly.

The YOLO model is used to process live video feeds and accurately detect individuals in the room, mapping their locations to specific zones. A microcontroller (e.g., Arduino, ESP32, or Raspberry Pi) bridges the gap between the detection system and the fan hardware.

The web interface provides users with a live video stream of the room, displays active zones, and offers manual override options to control the fan. The platform supports deployment on both local servers and cloud environments, ensuring accessibility and scalability.

This innovative system aims to enhance energy efficiency and user comfort by combining computer vision, IoT, and web technologies. It provides a cost-effective solution to modernize traditional fan control mechanisms while optimizing resource usage.

Index Terms—YOLO Object Detection, Smart Fan Control, Zone-Based Automation, IoT, Web Interface.

1. **Project requisites:**

Core Components

* 1. Object Detection: YOLO (You Only Look Once) model for detecting people in realtime video feeds.
  2. Hardware Components:
     + Microcontroller: ESP32, Arduino, or Raspberry Pi to process YOLO outputs and control the fan.
     + Fan: With adjustable speed and direction capabilities.
     + Camera: For live video feed input.
  3. Web Interface:
     + Frontend: HTML, CSS, and JavaScript for an interactive user interface. - Backend: Flask/Django for processing YOLO outputs and communicating with the microcontroller.

1. Hosting: Firebase, Google Cloud, or AWS for storing and processing data.
2. Energy Efficiency: Timer-based fan control for motionless zones to reduce energy consumption.

**3. Novelty of the project:**

1. Real-Time Zone-Based Control:
   * Utilizes YOLO for detecting individuals and zones, enabling accurate fan control.

1. Energy Efficiency:
   * Optimizes energy consumption by automatically turning off the fan in motionless zones.

1. Customizable Features:
   * Users can manually override the smart system through a web interface.

1. Cross-Platform Accessibility:
   * Deployable on mobile and web platforms, ensuring widespread usability.

1. Integration of AI and IoT:
   * Combines advanced object detection with IoT-enabled hardware for a seamless experience.

**4. References (in IEEE reference format):**

* J. Redmon and A. Farhadi, "YOLOv3: An Incremental Improvement," arXiv preprint arXiv:1804.02767, 2018.
* Z. Cao, T. Simon, S.-E. Wei, and Y. Sheikh, "Realtime Multi-Person 2D Pose Estimation Using Part Affinity Fields," in Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2017, pp. 7291–7299.
* OpenCV Library. Available: https://opencv.org/.
* Raspberry Pi Foundation, "Raspberry Pi 4 Model B Technical Documentation," [Online]. Available: https://www.raspberrypi.org/documentation/.
* A. Graves et al., "Connectionist Temporal Classification: Labelling Unsegmented

Sequence Data with Recurrent Neural Networks," in Proceedings of the 23rd International Conference on Machine Learning (ICML), 2006, pp. 369–376.

* Flask Web Framework. Available: https://flask.palletsprojects.com/.

