An AI Approach To Human Non-Movement Analysis

Mr. R. Rama Rajesh[1], Ananya K.S[2], Bhavani G[3], Himaniya D[4]
[1, 2, 3, 4] Dept of Information Technology
[1, 2, 3, 4] Anjalai Ammal Mahalingam Engineering College, Kovilvenni, India

Abstract- *This paper presents an AI-based Human Non-Movement Detection System designed for real-time monitoring and safety applications. Traditional systems mainly focus on motion detection and fail to identify prolonged inactivity, which may indicate critical situations. The proposed system uses YOLO for human detection and OpenCV for frame processing. It continuously analyzes movement and detects inactivity based on predefined time thresholds. When abnormal stillness is detected, the system generates alerts through sound and Telegram notifications. The system is efficient, automated, and suitable for healthcare, surveillance, and workplace safety applications.*

Keywords: Computer Vision, Deep Learning, Human Detection, Inactivity Detection, YOLO

I. INTRODUCTION

In recent years, intelligent monitoring systems have become increasingly important in ensuring safety across environments such as hospitals, elderly care centers, workplaces, and surveillance areas. Traditional monitoring systems mainly focus on detecting motion; however, they fail to identify prolonged inactivity, which may indicate critical situations such as medical emergencies, unconsciousness, or accidents. Continuous manual monitoring is also inefficient and prone to human error, making it difficult to ensure 24/7 observation.

To overcome these limitations, this paper proposes an AI-based Human Non-Movement Detection System. The system uses computer vision and deep learning techniques to detect human presence, monitor movement, and identify abnormal inactivity in real time. When prolonged stillness is detected, the system generates alerts to ensure quick response and improved safety. The proposed system aims to provide an efficient, automated, and reliable solution for real-time monitoring applications.

II. IDENTIFY,RESEARCH AND COLLECT IDEA

The first step in this research work involves identifying the problem and understanding the limitations of existing monitoring systems. Traditional surveillance systems mainly focus on motion detection and are unable to detect prolonged inactivity, which may indicate critical situations such as medical emergencies or accidents on the topic of your research work

To analyzes this problem, various research papers, journals, and online resources related to human detection and activity monitoring were studied. This study helped in understanding the existing techniques such as motion detection, computer vision, and deep learning approaches. Based on this analysis, it was observed that there is a need for an intelligent system that can monitor both movement and inactivity effectively.

Therefore, the idea of developing an AI-based Human Non-Movement Detection System was proposed. The system aims to detect human presence,analyzes movement patterns, and identify abnormal inactivity in real time, thereby improving safety and reducing the need for continuous manual monitoring.

III. WRITEDOWNYOURSTUDIESAND FINDINGS

After identifying the problem and collecting relevant information, the next step is to analyze and organize the findings related to human activity monitoring systems. Various existing techniques such as motion detection, frame differencing, and background subtraction were studied, and their limitations in detecting prolonged inactivity were observed. It was found that these methods are not efficient in analyzing human behavior and often fail to detect abnormal stillness in real-time scenarios.

Based on these observations, the use of computer vision and deep learning techniques was considered for improving system performance. The YOLO (You Only Look Once) algorithm was identified as an effective method for real-time human detection due to its high accuracy and speed. OpenCV was selected for processing video frames and analyzing movement patterns. By combining these technologies, a more reliable and efficient system design was developed.

The findings from this study helped in building the proposed AI-based Human Non-Movement Detection System, which focuses on detecting human presence, monitoring

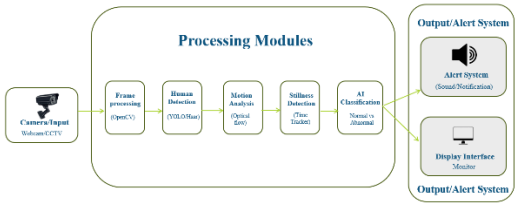
movement, and identifying inactivity. This approach improves accuracy, reduces false detection, and ensures timely alert generation in critical situations.

IV. PROPOSED SYSTEM

The proposed system is designed to detect human inactivity in real time using computer vision and deep learning techniques. It captures live video input through a webcam and processes frames using OpenCV. Human detection is performed using the YOLO algorithm.

The system tracks movement across frames and analyzes activity patterns. If no movement is detected for a predefined duration, the system classifies the state as inactivity. Once inactivity is detected, the system generates alerts through sound notifications and Telegram messages to ensure immediate response.

V. SYSTEM ARCHITECTURE



The system architecture shows the workflow of the proposed system. It starts with video input from a webcam, followed by frame processing using OpenCV. The YOLO model detects human presence in each frame. The motion analysis module tracks movement, and the stillness detection module identifies inactivity based on a time threshold. Finally, the alert system generates notifications and displays the output in real time.

VI. MODULES

1. Video Capture Module
2. Human Detection Module
3. Motion Analysis Module
4. Stillness Tracking Module
5. Stillness Time Threshold Module
6. AI Classification Module
7. Alert Generation Module

VIDEO CAPTURE MODULE

This module is responsible for capturing live video input from the system webcam. It uses OpenCV's Video Capture function to Initialize and access the camera. The module continuously reads frames from the video stream and sends them for further processing. It ensures smooth and real-time frame acquisition without delays.

HUMAN DETECTION MODULE

The human detection modules uses the YOLOv3 deep learning module to identify humans in each video frame. It processes frames and detects object by generating bounding boxes and confidence scores. Only the "person" class is filtered for further analysis.

MOTION ANALYSIS MODULE

This module analyzes the movement of detection humans across consecutive frame. If theres is a signification changes in coordinates, the system the system starts tracking stillness duration.The module helps in distinguishing between motion and non-motion states

STILLNESS TRACKING MODULE

The stillness tracking module monitors whether a person remains stationary over time. It continuously check movement values and determines if the person is inactive. If the movement remains below a certain threshold, the system starts tracking stillness duration.

STILLNESS TIME THRESHOLD LOGIC

This logic defines the time duration required to classify a person as inactive. The system uses a predefined threshold (e.g., 10 seconds) to evaluate stillness. If no signification movement is detected without this period, the system changes the state to "Idle".

AI CLASSIFICATION MODULE

This module classifies human activity into two categories: "Moving" and "Idle". It uses the output from the motion analysis and stillness tracking modules. Based on movement thresholds and time duration, it assigns the appropriate state.

ALERT GENERATION MODULE

The alert generation module is responsible for notifying users when inactivity is detected. It triggers a local audio alarm using the winsound library. It also captures the current frame and sends it to the user via Telegram API.

VII. IMPLEMENTATION

VIDEO CAPTURE MODULE

This module is responsible for capturing live video input from the system webcam. It uses OpenCV's Video Capture function to Initialize and access the camera.Each frame is extracted sequentially and prepared. The model detects objects and generates bounding. The module continuously reads frames from the video stream and sends them for further processing. It ensures smooth and real-time frame acquisition without delays.

HUMAN DETECTION MODULE

The human detection modules uses the YOLOv3 deep learning module to identify humans in each video frame. It processes frames and detects object by generating bounding boxes and confidence scores. Only the "person" class is filtered for further analysis. This process ensures accurate and fast detection of human in real time, forming the foundations for movement and inactivity analysis

MOTION ANALYSIS MODULE

This module analyzes the movement of detection humans across consecutive frame. If theres is a signification changes in coordinates, the system the system starts tracking stillness duration. The module helps in distinguishing between motion and non-motion states. If the change is minimal, the system treats the person as stationary. This process helps in identifying whether a person is actively moving or not.

STILLNESS TRACKING PROCESS

The stillness tracking module monitors whether a person remains stationary over time. Once the system detects minimal movement, it starts tracking the time for which the person remains inactive. It continuously check movement values and determines if the person is inactive. If the movement remains below a certain threshold, the system starts tracking stillness duration. This process ensures that tempory pauses are not misinterpreted as critical inactivity. It provide accurate detection of prolonged stillness in real-time scenarios.

STILLNESS TIME THRESHOLD PROCESS

This logic defines the time duration required to classify a person as inactive. The system uses a predefined threshold (e.g., 10 seconds) to evaluate stillness. If no signification movement is detected without this period, the system changes the state to "Idle". This classification helps in making accurate decision for triggering alerts. This process acts as the decision-making component of the system.

AL CLASSIFICATION PROCESS

The alert generation module is responsible for notifying users when inactivity is detected. It triggers a local audio alarm using the winsound library. It also captures the current frame and sends it to the user via Telegram API. This process ensures immediate response and enhances safety is critical situation

VIII. RESULTS AND DISCUSSION

The system was tested using real-time video input and showed accurate human detection and inactivity monitoring. The YOLO model effectively detects humans in different conditions. The system successfully identifies inactivity and generates alerts without delay. It also handles scenarios where no person is present. The results demonstrate that the system is reliable, efficient, and suitable for real-time applications.

IX. CONCLUSION

The proposed system provides an effective solution for detecting human inactivity using AI and computer vision techniques. It improves safety by generating real-time alerts and reduces the need for manual monitoring. The system can be used in healthcare, surveillance, and security applications. Future improvements can include multi-person detection and enhanced accuracy.

REFERENCES

[1] G. Bradski, "The OpenCV Library," 2000.
[2] Bochkovskiy et al., "YOLOv4: Optimal Speed and Accuracy of Object Detection," 2020.
[3] N. Dalal and B. Triggs, "Histograms of Oriented Gradients for Human Detection," 2005
[4] J. Gubbi et al., "Internet of Things (IOT):A Vision, Architectural Elements, and Future Directions," 2013.
[5] M. Hasan et al., "Learning Temporal Regularity in Video Sequences," 2026.
[6] G. Jocher et al., "YOLOv5 by Ultralytics," 2020.
[7] Rougier et al., "Fall Detection from Human Shape and Motion History," 2011.
[8] TensorFlow Team, "Real-Time Object Detection using TensorFlow," 2021.
[9] Ultralytics, "YOLOv8: Real-Time Object Detection," 2023.