# Intelligent System for Monitoring Line Of Safety In Railway Platforms

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**ABSTRACT**

*In today's world, population growth is increasing rapidly. The sequential growth in the population has resulted in many passengers using the railways. This population growth has resulted in the development of more strict safety requirements for railway signaling, control, and infrastructure. Accompanying that trend, machine learning techniques have also advanced rapidly in recent years. People Count Monitoring systems point at naturally evaluating the number of individuals in indoor and open-air places. They can be utilised in retail environments, determining conversion ratios, advertising, and video surveillance. This project presents a model for estimating the number of people in railway platform scenarios based on YOLO's deep neural network algorithm. YOLO has high accuracy in object detection. We have developed a system capable of automating the lighting on railway platforms based on the passenger count on those platforms and alerting us if a person is in an unsafe zone at the time of train arrival.*

**Keyword:***Raspberry Pi, Open CV, YOLO, Day Night Sensor*

## 1.INTRODUCTION

There's a developing trend,especially in rising economies like India, for common people to use private transport instead of public transport. People feel that public transport is not secure, but many governments are working on many ways to improve safety, security, and the quality of service provided on public transport. An important part of those efforts is to provide a transport infrastructure that provides safety for users and reduces power consumption. Railways have the advantage over buses and other transport because they have essential tracks where they can accelerate at the highest speed to reach the destination faster.

In today's world, many public transport systems have invested more in CCTV camera systems to improve security and safety. More recently, there have been major developments in OpenCV and sensors that use deep-learning algorithms. On InRailway platforms, crowd density is high nowadays, and because of that, power consumption has also increased. In this paper, we have used object detection algorithms such as YOLO. YOLO algorithms will be implemented in our prototype. This paper explores whether such methods can improve the safety measures for people and reduce energy consumption in those areas effectively.

## 1. LITERATURE SURVEY

Passenger safety is a primary concern of the railway system, but it has been an urgent issue that dozens of people are killed every year when they fall from train platforms. We propose a real-time object detection-based monitoring system for railway station platforms. The system immediately perceives the danger factors of passengers on the platform by using image processing technology. CCTV cameras are used to monitor nearly the entire length of the track line in the platform. Each camera conducts surveillance in its own preset monitoring area, whether a human or dangerous object has fallen in the area.

### 2.1 Novel YOLO-based Real-time people counting Approach.

Peiming Ren, Wei Fang, and Soufiene Djahel "Novel YOLO-based Real-time People Counting Approach". In this work, we modify the pioneering object detection system YOLO by proposing the YOLO-PC. YOLO-PC improves on the original YOLO system by employing a deep learning approach for more accurate people counting. The YOLO-PC outperforms YOLO as it re-trains the YOLO network, which enables it to detect more boxes and achieve a higher average confidence value. The boundary selection in YOLO-PC makes the counting more targeted and its results more accurate and fast.

### 2.2 Comparison of YOLO v3, Faster R-CNN, and SSD for Real-Time Pill Identification.

Lu Tan,Tianran Huangfu, and Wenying Chen introduce the basic principles of three object detection models for Faster R-CNN, SSD, and YOLO. It trained each algorithm on a pill image dataset and analysed the performance of the three models to determine the best pill recognition model. The mean average precision (MAP) of Faster R-CNN reached 87.69%, but YOLO v3 had a significant advantage in detection speed where the frames per second (FPS) was more than eight times that of Faster R-CNN. This means that YOLO v3 can operate in real time with a MAP of 80.17%. The YOLO v3 algorithm also performed better in the comparison of difficult sample detection results.

### 2.3 Object detection system based on SSD algorithm.

To accelerate network training, Qianjun Shuai, Xingwen, and Liyao Wu (2020) proposed that the SSD network structure modified and the Batch Norm operation be added before the feature fusion layer. The target counting function is added to the object detection. Finally, the usable object detection system was built using the Flask framework and the Layui framework. This paper presents the SSD model, which is modified by adding the BN algorithm. The modified SSD model was trained and tested on the Pascal VOC dataset and obtained a high mAP.

## 3. PROPOSED METHODOLOGY

This project highlights the methodology in the field of the crowd counting system in railway stations, which is a robust system and can handle the following scenarios with a single framework: heavy occlusion, massive crowds, both static and dynamic crowd counting, all kinds of environments, less computational cost, and time. The YOLO v3 algorithm can meet the conditions of operation in environments where low power platforms and high recognition speeds are required and are worthwhile for a wide range of development prospects and practical applications. This system also addresses the safety of people and reduces power consumption in public places by using automated systems. These efficient people count extractions are useful in many ways and can be altered to be used in many ways. One such example is resource allocation for public events and so on.

### 3.1 Object Detection Phase.

In the Object Detection Phase, we compare YOLO with one algorithm based on classification and one algorithm based on regression. Mask-RCNN is an algorithm based on classification, and Single Shot Detector (SSD) is an algorithm based on regression. Parameters such as accuracy, execution time, and false-negative value are calculated for YOLO, SSD, and Mask-RCNN. Many images were given as input and tested for the YOLO, SSD, and Mask-RCNN algorithms using Spyder on the Anaconda Platform with a pre-trained dataset, and the YOLO algorithm was recognised as the algorithm with the best accuracy for image recognition of people.

### 3.2 Person Detection Module.

In the In-Person Detection Module, the video is processed and the person crossing the Yellow Safety Line and persons on the platform are detected by using the YOLO algorithm. The person inside the Yellow Safety Line is marked by a red grid and an alarm is activated during the arrival of the train. The green grids represent the total number of people on one side of the platform and the intensity of light is adjusted automatically according to the headcount of the person. This safety system activates once the train reaches the first IR sensor and deactivates after the train reaches the second IR sensor. People can only move onto the train when the train is stopped. Otherwise, an alarm system will warn the passengers to not cross the line of safety.

### 3.3 You Only Look Once Algorithm (YOLO Algorithm).

YOLO (You Only Look Once) is an Object Detection Algorithm that uses Classification methods and Bounding box regression heads.YOLO detects 45 frames per second and 2000 bounding boxes per second. YOLO works by dividing the image into N grids, each grid having an equal dimensional region of S x S. One of the interesting points about YOLO is that it looks into the complete image during the test time, and YOLO makes predictions with a single network. This makes YOLO extremely fast, over 1000x faster than Mask R-CNN. In our system, we use YOLO to detect the number of people on the platform, and with that count, we process the safety and automation process. The advantage of using YOLO is that it is extremely fast and it visualises the entire image during training and testing time.

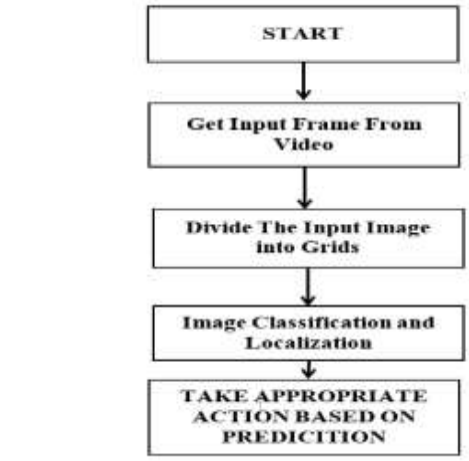


Figure 1. Flow Diagram

## 4. DEVELOPED METHODOLOGY

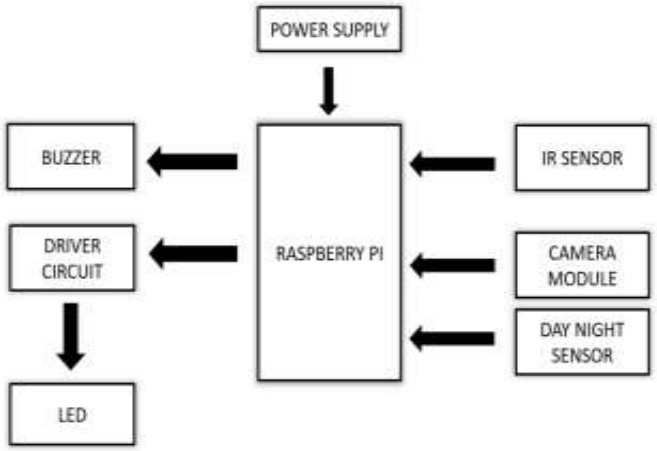


Figure 2. block diagram

The Fig-2 Explaination : The Railway Platforms will have a camera placed on two sides of each terminal, and at the time of train arrival to the platform, the IR sensor, which is placed in the front of the platform, detects the train and the system turns ON when the first IR sensor detects the train arrival. Once the system turns ON the YOLO algorithm, the camera determines the count of people and if any passengers cross the Yellow Safety Line during the arrival of the train, an alarm will be raised in the

terminal. This system turns off if the train reaches the other IR sensor. Using the YOLO algorithm, this system also monitors the platform lightning and lighting will be provided by the number of passengers counted in the terminal to reduce the usage of power on platforms. The Day/Night Sensor indicates when the lightning system must be activated, so it reduces power consumption in the daytime and when there is excess light.

## 5. RESULTS AND DISCUSSIONS

### 5.1 overall setup

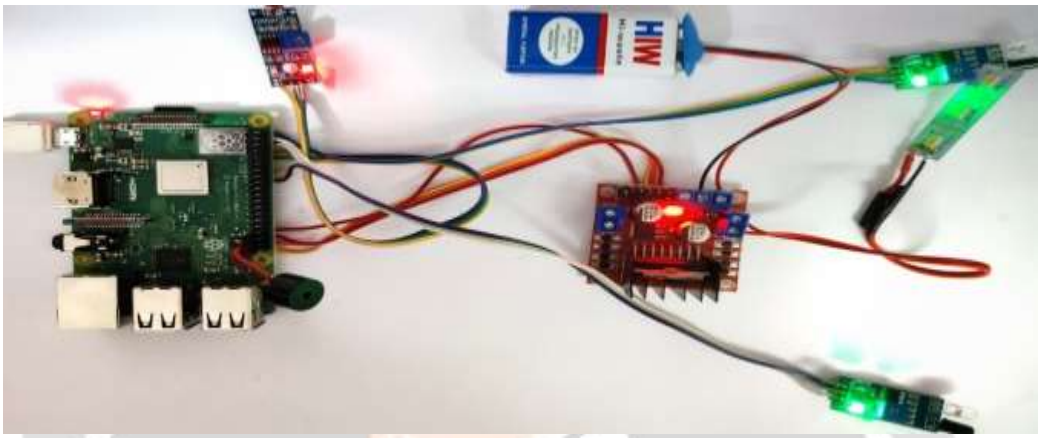

Figure 3. Overall Prototype

Figure 3 represents the hardware setup of an intelligent system for monitoring line safety in railway platforms. It shows the interfacing of various sensors such as an infrared sensor, a day and night sensor, a buzzer, a driver circuit, and a LED with a Raspberry PI 3B+.

### 5.2 Person Count Monitoring

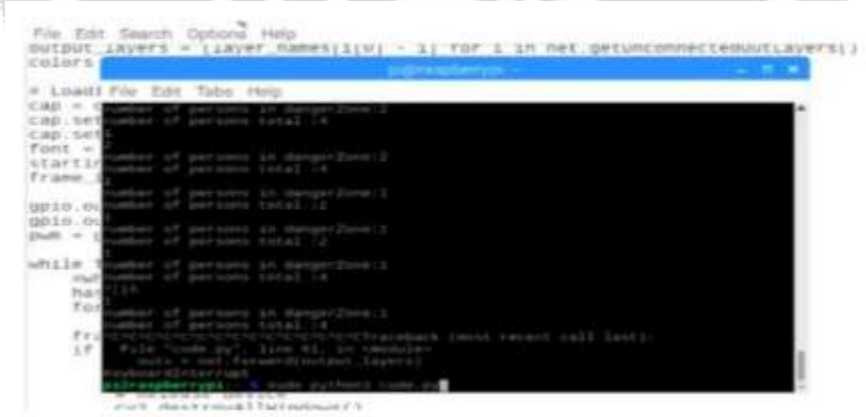

Figure 4. Person Count Monitoring

The figure 4 represents the count of people crossing the yellow safety line by the YOLO Algorithm.

### 5.3 Detection of Person in Safety Line

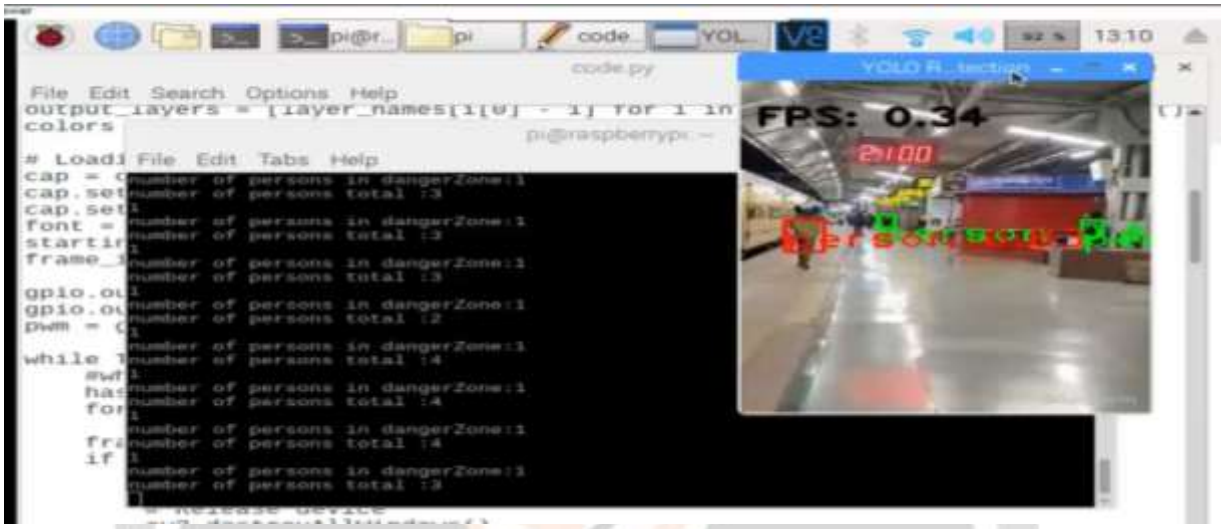


Figure 5. Output of person detection in safety line

The figutre 4 represents that , the person crossing the Yellow Safety Line and Persons in the Platform is detected by using the YOLO algorithm. The person inside the Yellow Safety Line is marked by a red grid and an alarm is activated during the arrival of the Train, the Green Grids represent the Total number of persons on one side of the Platform and the Intensity of Light is adjusted automatically according to the headcount of the person.

### 5.4 LED Light Intensity Variation

Figure 6. Light Intensity Variation

The figure 5 represents the lights in the platform will glow according to the Total number of people on the Platform.

**Intensity of Light**:

- People Count > 50 = 100 percent
- People Count > 25 && < =50 = 75 Percent
- People Count < =25 = 50 percent

## 6. CONCLUSION

This project highlights the methodology in the field of the crowd counting system in the railway stations which is a robust system and can be used in the scenarios like the massive crowd, heavy occlusion, and both static and dynamic crowd counting. The YOLO v3 algorithm meets the conditions of operation in environments where low power platforms and high recognition speeds are required and are worth a wide range of development prospects and practical applications. This System also addresses the safety of people and reduces Power consumption in public places by using automated systems. These people counting systems are useful in many ways for maintaining security and safety in public places. This system can also be used in areas like Pedestrian crossings

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