

IOT Based Missing Person Detection System

¹Ms.G.Susmitha, ²G.Vennela, ³T.Tejaswini, ⁴S.Manisha

¹Assistant Professor, Department Of ECE, Vignan's Institute of Management and Technology for Women, Ghatkesar, Telangana.

^{2,3,4}B.Tech Students, Department Of ECE, Vignan's Institute of Management and Technology for Women, Ghatkesar, Telangana.

ABSTRACT

This paper presents the design and implementation of an Internet of Things (IoT)-based Missing Person Detection System aimed at improving the efficiency and accuracy of locating missing individuals in real-time. The proposed system integrates a Raspberry Pi 3B+ with a Pi camera module, GPS technology, and face recognition algorithms to continuously monitor and identify individuals in public and crowded environments. The captured images are processed using image processing techniques to detect and recognize human faces, which are then compared with a prestored database of missing persons. Upon successful identification, the system instantly generates alerts and transmits location details to concerned authorities and family members through IoT-enabled communication channels, ensuring rapid response and action. Additionally, the system incorporates geo-fencing capabilities and can be extended with mobile application integration for enhanced accessibility and user interaction. The proposed solution is cost-effective, portable, and scalable, making it suitable for deployment in various real-world scenarios such as railway stations, malls, and public gatherings. By leveraging IoT and automation, the system significantly reduces manual search efforts, increases recovery rates, and enhances public safety. Furthermore, the model can be improved with advanced artificial intelligence and deep learning techniques to achieve higher accuracy and broader surveillance coverage in future implementations.

Keywords: IoT (internet of things), raspberry pi, pi camera.

1.INTRODUCTION

The increasing number of missing person cases worldwide has become a serious social concern, demanding faster and more reliable identification and tracking solutions. Traditional search methods are often time-consuming, labor-intensive, and lack real-time responsiveness, which reduces the chances of successful recovery. To address these challenges, this paper proposes an Internet of Things (IoT)-based Missing Person Detection System that leverages modern technologies such as embedded systems, image processing, and wireless communication. The system utilizes a Raspberry Pi 3B+ integrated with a Pi camera module to continuously capture and analyze visual data in real time. Using face detection and recognition techniques, the system identifies individuals and compares them with a stored database of missing persons. Upon detecting a match, it immediately sends alerts along with location information to concerned authorities and family members through IoT connectivity. The integration of sensors, GPS modules, and cloud-based communication enhances the system's capability to monitor, track, and respond efficiently. This approach not only improves the speed and accuracy of detection but also reduces human effort and operational costs. The proposed system is designed to be portable, scalable, and suitable for deployment in public areas such as transportation hubs, markets, and crowded places, thereby contributing significantly to public safety and security.

II. LITERATURE REVIEW

Smart Surveillance System for Missing Person Identification. This system was proposed by Kumar et al. (2022), where the authors developed a camera-based surveillance model using face recognition to identify missing individuals in public areas. Their work uses OpenCV and a lightweight machine-learning model to detect and compare faces from live video feeds with a stored database.

IoT-Enabled Person Tracking and Recognition System. Proposed by Irene and team (2023), this project integrates IoT devices with deep-learning algorithms to perform person search across multiple surveillance cameras. The system functions by detecting individuals, extracting their features, and matching them across different camera locations using person re-identification techniques. This helps track the movement of a missing person across wider areas without continuous human monitoring.

GPS-Based Wearable Tracking System for Vulnerable Individuals. This solution, proposed by Thomas et al. (2021), introduces a wearable IoT device with a built-in GPS module to track the real-time location of individuals, especially elderly people or children who are at risk of going missing. The system continuously sends live coordinates to a cloud server, enabling caregivers or authorities to locate the person quickly through a mobile or web application.

RFID-Assisted Missing Person Detection System. Colleagues and Arniker, (2020) proposed an RFID-based detection model that works by assigning RFID tags to individuals and placing RFID readers at important entry and exit points. When a tagged person crosses a monitored area, the system automatically logs their presence. This method is mainly used in controlled environments like schools or care homes to prevent missing-person incidents.

Edge-Based Face Recognition System on Raspberry Pi. This system was developed by Sharma et al. (2022) and focuses on performing face recognition directly on edge devices such as the Raspberry Pi. The project reduces dependency on cloud servers by processing all images locally, improving speed and privacy. It captures images using a camera module, processes them using optimized deep-learning models, and identifies individuals stored in its database.

Mask-Resistant Facial Recognition for Public Safety Applications. Proposed by Li et al. (2024), this project addresses the challenge of recognizing faces even when individuals are wearing masks or partially covered. The authors designed a face-recognition model trained on masked datasets to improve accuracy in real-world conditions. The system is useful in public surveillance applications, including missing person detection during crowded or emergency situations.

Cloud-Integrated Face Detection System for Public Security. This project was proposed by Banerjee et al. (2021), where the authors introduced a cloud-connected face detection system designed to support public security operations. The system captures images through surveillance cameras, uploads them to a cloud server, and performs face matching using a central database of individuals. Its function is to provide fast and centralized identification, which helps authorities detect missing persons or suspicious individuals across multiple locations.

Deep Learning–Based Human Identification in Smart Cities.

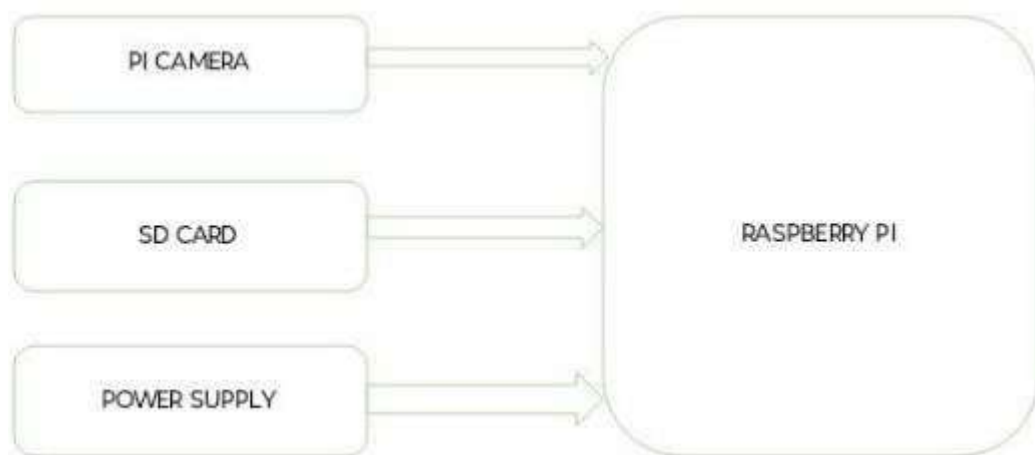
III. PROPOSED SYSTEM

The proposed system is an IoT-based Missing Person Detection System designed to automatically identify and locate missing individuals using real-time image processing and communication

technologies. It utilizes a Raspberry Pi 3B+ integrated with a Pi camera module to continuously capture images from the surrounding environment. The captured images are processed using face detection and recognition algorithms, where the detected faces are compared with a pre-existing database of missing persons. This automated approach reduces manual intervention and improves the speed and accuracy of identifying individuals in crowded or public areas.

Once a match is detected, the system immediately activates an alert mechanism that sends notifications along with the person's location details using GPS and IoT connectivity. Alerts are delivered to authorities and family members through communication platforms such as email or mobile applications, enabling quick response and action. The system also supports features like geo-fencing for area-based monitoring and is designed to be cost-effective, portable, and scalable. It can be deployed in various public environments such as railway stations, malls, and airports, making it a practical and efficient solution for enhancing public safety and improving the chances of recovering missing individuals.

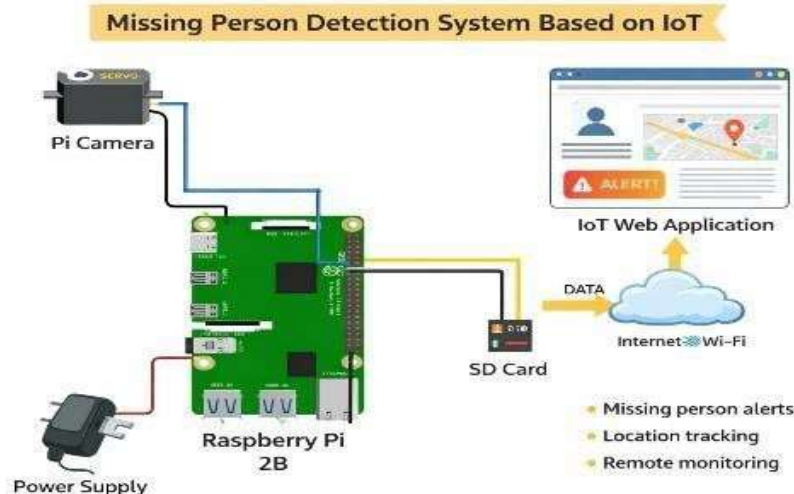
Block diagram:



IV. SYSTEM ARCHITECTURE

The IoT The architecture of the proposed IoT-based Missing Person Detection System is built around the Raspberry Pi 3 Model B, which serves as the central processing unit of the system. A Pi camera module is connected to the Raspberry Pi to continuously capture real-time images from the surrounding environment. These images are processed using face detection and recognition algorithms to identify individuals present in the monitored area. The system uses an SD card for storing the operating system, application software, and the database of missing persons. A regulated power supply ensures stable and continuous operation, enabling the system to function efficiently in real-time scenarios.

After capturing and processing the images, the Raspberry Pi 3 Model B compares the detected faces with the stored database to find potential matches. If a match is identified, the system generates an alert containing the person's details and relevant information. This data is transmitted via built-in Wi-Fi to a cloud-based IoT platform, allowing seamless communication and real-time data sharing. The use of IoT connectivity ensures that the system can operate remotely and provide instant updates.



V. WORKING PRINCIPLE

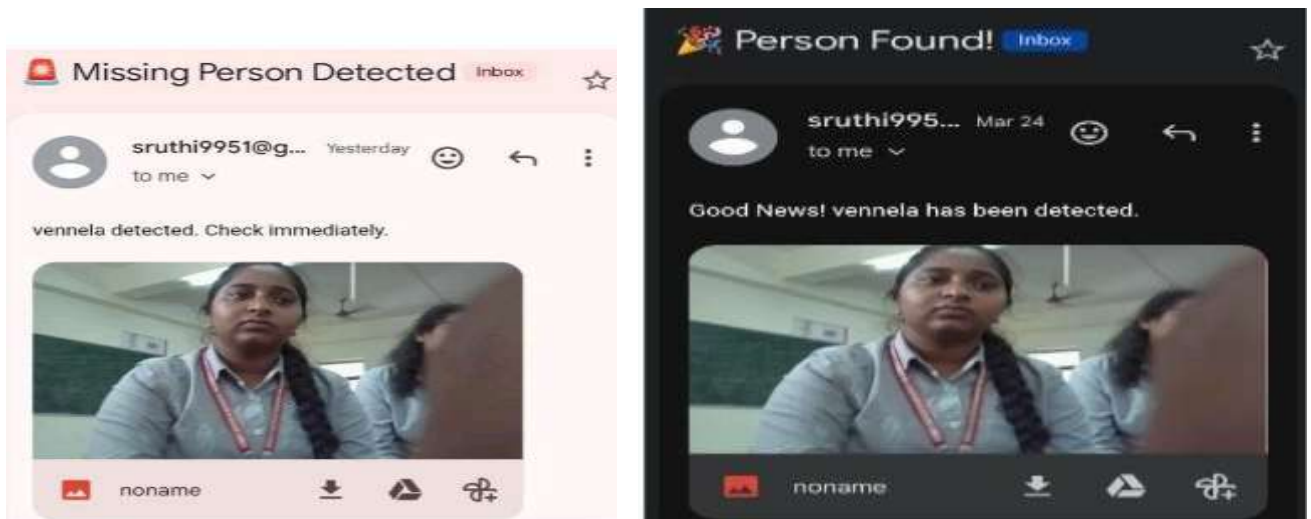
The working of the proposed IoT-based Missing Person Detection System begins with the Pi camera module continuously capturing real-time images from the surrounding environment. These images are fed into the Raspberry Pi 3 Model B, which acts as the central processing unit. The system uses image processing techniques to detect human faces in the captured frames. Once a face is detected, feature extraction and recognition algorithms are applied to identify the individual by comparing the captured image with a pre-stored database of missing persons available in the system.



If a match is found, the Raspberry Pi immediately triggers an alert mechanism. The system retrieves the relevant details of the identified person and combines them with location information (if GPS or network-based location is enabled). This information is then transmitted through the built-in Wi-Fi module to a cloud-based IoT platform. The real-time data transfer ensures that alerts are generated without delay, improving the response time of the system. The alert notifications are displayed on an IoT web application, which can be accessed by authorities and family members. The application provides details such as the identified person's

information, captured image, and location data, enabling quick verification and action. This automated process reduces manual effort, increases detection accuracy, and ensures efficient monitoring, making the system highly effective for identifying and locating missing individuals in public and crowded environments.

VI. RESULTS



The proposed IoT-based Missing Person Detection System was successfully implemented and tested in a controlled environment. The system was able to accurately detect and recognize faces using the Raspberry Pi 3 Model B and Pi camera module. When a match was found in the database, alerts were generated instantly and transmitted to the IoT web application without noticeable delay. The system demonstrated reliable performance in real-time monitoring and identification, with efficient data transmission over Wi-Fi.

Overall, the results show that the system is capable of providing a fast, cost-effective, and automated solution for missing person detection. It significantly reduces manual effort and improves response time, making it suitable for practical deployment in public areas.

VII. FUTURE ENHANCEMENTS

The proposed system can be further enhanced by integrating advanced deep learning algorithms such as Convolutional Neural Networks (CNNs) to improve the accuracy and robustness of face recognition under varying lighting conditions and occlusions. The system can also be expanded by connecting multiple cameras and centralized cloud databases to enable large-scale surveillance across different locations. Incorporating real-time video analytics and edge computing can further reduce latency and improve system performance.

Additionally, a dedicated mobile application can be developed to provide instant push notifications, live tracking, and user-friendly interaction for authorities and family members. Integration with GPS modules for precise location tracking and the use of biometric or multimodal identification techniques can further enhance reliability. Future improvements may

also include stronger data security, privacy protection mechanisms, and the use of AI-based predictive analysis to proactively assist in missing person identification and recovery.

VII.CONCLUSION

In this project, an IoT-based Missing Person Detection System was successfully designed and implemented using a Raspberry Pi 3B, Pi Camera, SD card, power supply, and a web-based application. The system successfully achieves real-time tracking, quick alert generation, and continuous monitoring of individuals. The major achievements of this project include the development of a cost-effective and reliable tracking system, accurate location identification, implementation of geofencing for safety boundaries, and the ability to store and transmit data efficiently using cloud platforms and SD cards. It also enhances user safety by reducing response time and providing timely notifications to guardians or authorities. However, the system has certain limitations, such as dependency on network connectivity for real-time updates, reduced accuracy in indoor environments where GPS signals are weak, limited battery life of wearable devices, and concerns related to data privacy and security. Despite these challenges, the project proves to be a significant step toward building smarter safety solutions, and with further advancements, it has the potential to become more efficient, secure, and widely applicable in real-world scenarios.

IX.REFERENCES

- [1]. Kumar et al, "Smart Surveillance System for Missing Person Identification", 2022.
- [2]. Irene and team, "IoT-Enabled Person Tracking and Recognition System", 2023.
- [3]. Thomas, "GPS-Based Wearable Tracking System for Vulnerable Individuals", 2021.
- [4]. Colleagues and Arniker, "RFID-Assisted Missing Person Detection System", 2020.
- [5]. Sharma, "Edge-Based Face Recognition System on Raspberry Pi", 2022.
- [6]. Sharma et al., "IoT-Based Real-Time Human Tracking and Monitoring System", 2021
- [7]. Reddy et al., "GPS and GSM Based Missing Person Detection System", 2020
- [8]. Patel et al., "Wearable IoT Device for Child and Elderly Tracking", 2019
- [9]. Singh et al., "Cloud-Integrated IoT System for Missing Person Detection", 2023
- [10]. Das et al., "Intelligent IoT Framework for Monitoring and Tracking Individuals", 2022