

Vehicle Theft Detection

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Abstract- In recent days, cars play a significant role in the lives of humans. The use of vehicles significantly helps people live lighter lives. Simultaneously, the rate of vehicle theft is increasing by the day. The significance of the car theft discovery follows. The foundation of the current security system is an anti-theft alarm. The alarm activates and sounds automatically if someone touches the car's body. Making duplicate car keys at the moment are not delicate, and utilizing keys that are identical ups the risk of theft. We have a solution for a comparable issue. The proposed goal of our project is to create a security system that may be installed inside a car in order to detect theft. The suggested system is a face recognition-based security system using a Raspberry Pi-loaded face recognition module. The Raspberry Pi module is programmed and trained in such a way that the system recognizes the owner and the frequent users of the vehicle. Only those who have been given permission to use the vehicles as users can be identified by our system's face recognition technology. If any unauthorized person tries to access the vehicle an alert message along with a picture of the person is sent to the owner's mobile. This system is also programmed with an additional feature that the owners can also lock the car when any unauthorized person tries to enter the vehicle.

Indexed Terms- IoT, Raspberry Pi, Face recognition, Alarm

I. INTRODUCTION

Automobiles are essential assets for modern life, providing convenience and mobility to millions of people worldwide. However, along with their widespread use, vehicle theft has become a prevalent and persistent issue. According to statistics, thousands of vehicles are stolen each day globally, resulting in substantial financial losses for individuals

and insurance companies, as well as significant concerns related to safety and security.

Vehicle theft is a pervasive problem that continues to affect individuals and communities worldwide. The loss of a vehicle not only entails significant financial implications for the owner but also disrupts daily routines and compromises personal safety. As a result, the development of effective vehicle theft detection systems has become a crucial focus in recent years. The advancements in technology have paved the way for innovative solutions to combat vehicle theft. These cutting-edge systems utilize a combination of hardware, software, and data analytics to enhance security measures and protect vehicles from unauthorized access or theft attempts.

This paper aims to explore the current situation regarding vehicle theft and the major problems faced by society. Additionally, it introduces the concept of vehicle theft detection systems, which leverage cutting-edge technology to mitigate these challenges and enhance the protection of vehicles.

II. EASE OF USE

A. LITERATURE REVIEW

[1] The research paper titled "Intelligent Car Anti-Theft System through Face Recognition using Raspberry Pi and Global Positioning System" by Kosalendra Eethamakula, Leema G, and Muni Vara Prasad K was published in the International Journal of Analytical and Experimental Modal Analysis in 2020. This study presents an innovative approach to vehicle theft prevention by utilizing face recognition technology with Raspberry Pi and integrating it with Global Positioning System (GPS) for real-time tracking. The following literature review examines the contributions and findings of this research paper and its significance in the context of intelligent car anti-theft systems.

[2] The research paper titled “IoT based Smart Environment Using Node-Red and MQTT” authored by B.KavyaDeepthi,Venkata RatnamKolluru,George TomVarghese,Rajendraprasad

Narne,Dr.N.Srimannarayan was published in the Journal of Adv Research in Dynamical & Control Systems, Vol. 12, No. 5, 2020. The authors likely proposed an IoT-based smart environment system using Node-RED as the development platform and MQTT as the messaging protocol. The system might include various IoT devices, such as sensors, actuators, and controllers, which communicate with each other using MQTT. Node-RED would be used to design the flow of data between these devices and to create the logic for data processing and control. Interfacing mqtt client with node red and raspberry pi. The system with Node-RED acts as MQTT client and raspberry pi acts as an MQTT broker.

III. THEORY OF PROBLEM

A. PROBLEM DEFINITION

The average number of vehicle theft incidents reported in India each year is 1 lakh, and the figure is continually rising. If the stolen vehicles are not found quickly, they are typically sold or, in rare cases, destroyed if the resale value is deemed to be too low. In this project we proposed the design and implementation of vehicle theft detection and tracking that will protect and secure vehicles.

B. AIM OF THE PROJECT

Vehicle theft is a major problem globally, causing significant financial losses to individuals and organizations. there is a need for a reliable and efficient vehicle theft detection system to prevent such incidents. This work aimed to detect unauthorized entry, ignition, and movement of the vehicle, and notify the owner in real-time. it should also be able to track the location of the vehicle and provide data for analysis to help in the recovery of the stolen vehicle.

C. HOW VEHICLE THEFT DETECTION SYSTEM WORKS

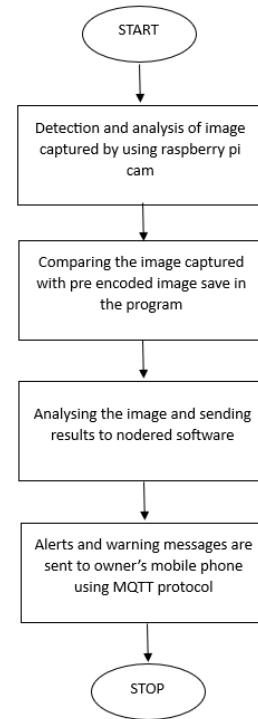


Fig 1: Method Flow

Our system captures the image of a person who tries to enter the vehicle using a raspberry pi cam and sends it to the raspberry pi microcontroller. We have imported a face recognition library in the coding part and uploaded the images of people who alone have the access and encoded their names for those images. Whenever a raspberry pi cam captures the image it will be sent to the face recognition library and the captured image is divided into small grids and each grid is compared with the image uploaded in the code. Each grid is compared and the confidence level of the image is calculated. If the captured image matches with the image uploaded the confidence level of the image will be greater than threshold else it will be lesser. In the program threshold value is set. If the confidence level is greater than the threshold it shows the vehicle is accessed by the name of the person who has given authorization in the library along with their image. If the confidence level is below the threshold it shows the vehicle is accessed by others who do not have authorization along with their image. So in a software called Node red we interface our raspberry pi controller and MQTT

protocol using RabbitMQ broker to send alert messages and warnings to the user or owner of the vehicle. We connect the owner's mobile phone number with Node red and send alert messages to his number and also we can Whatsapp him. We can also track the location of the vehicle and send the location to the owner's mobile as a text message in case of any situation like the thief has broken the car window and tried to access it. And also we connect a solenoid lock and a relay with raspberry pi microcontroller which will be placed inside the vehicle and whenever we get un-access message from the raspberry pi we will switch on the relay by giving power and can lock the solenoid lock to avoid unwanted access from others from outside. By doing so, thus our system reduces vehicle theft which is a concerning crime and global issue and helps owners to protect their vehicles and can also recover the vehicle quickly by tracking the vehicle efficiently and sending it to a nearby police station

MQTT - Message Queueing Telemetry Transport
 OPENCV - Open Source Computer Vision Library
 GPS - Global Positioning System
 GSM - Global System for Mobile communication

IV. IMPLEMENTATION AND WORKS

A. RASPBERRY PI

A mini low cost compact computer named the Raspberry Pi is available. Scratch, Python, Java, and other programming languages are a few of those it supports. A 64-bit quad-core processor with RAM memory that can vary from 2 GB to 8 GB, dual-band 2.4/5.0 GHz wireless LAN, Bluetooth connectivity 5.0, Gigabit Ethernet, USB 3.0, and PoE capacity are some of the main features of the product. The modular layout of the dual-band wireless LAN and Bluetooth compliance certification on the board enables it to be integrated into end products with a lot less compliance testing, reducing both cost and time to market. This system's raspberry pi is accountable for executing the Node-RED configuration and the Rabbitmq MQTT broker.

B. Raspberry Pi Cam

For use with Raspberry Pi single-board computers, there is a compact, reasonably priced camera module called the Raspberry Pi Camera. It supports a broad range of picture and video formats and provides high-

resolution imaging up to 12.3 MP. According to its adaptability, the camera can be used for a variety of DIY projects, automated machinery, and surveillance applications.

C. Solenoid lock

A solenoid lock is an electromagnetic device used to secure doors or compartments. When activated, the solenoid's coil generates a magnetic field, moving the lock's bolt or latch to engage or disengage. It provides secure access control and is commonly used in electronic lock systems for enhanced security and convenience.

D. Relay

Relay is an electrical switch that uses an electromagnet to control the flow of current. It works like a remote-controlled switch, where a small electrical signal activates the electromagnet, which then moves a switch to open or close a circuit. This allows a low-power control signal to control a high-power circuit. Relays are commonly used in various applications, such as in automotive systems, industrial automation, and home appliances. They provide a safe and reliable way to control electrical devices and protect sensitive components from high currents or voltages.

E. Node Red:

Node-RED is a visual programming tool that helps you connect and automate devices, APIs, and services. It allows you to create flows by simply dragging and dropping nodes, making it easy to build applications and workflows without writing complex code.

F. MQTT:

MQTT is a lightweight messaging protocol for sending data between devices over a network. It's commonly used in IoT applications to efficiently transmit data with low bandwidth and power requirements. MQTT follows a publish-subscribe model, where devices can publish messages to topics and subscribe to receive messages from specific topics.

G. RabbitMQ:

RabbitMQ is a message broker that enables communication between different systems and

applications. It uses the Advanced Message Queuing Protocol (AMQP) to facilitate reliable and efficient message exchange. RabbitMQ helps decouple components and enables scalable and robust communication in distributed systems.

V. BLOCK DIAGRAM:

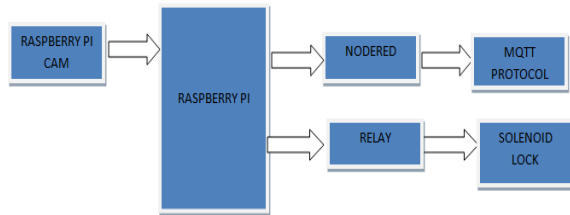


Fig 2: Block Diagram

ILLUSTRATION OF RESULT:

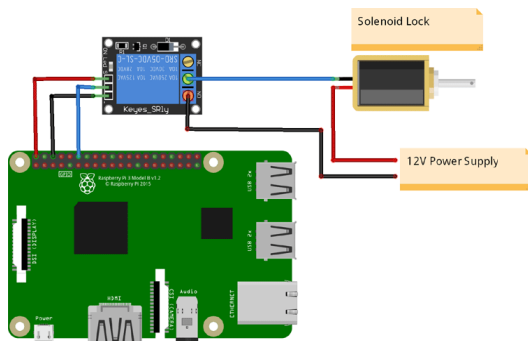


Fig 3: Circuit diagram

The raspberry pi cam and solenoid lock with a relay is connected to the microcontroller, which locks when it receives 1 from the relay and opens when it receives 0 from the relay.

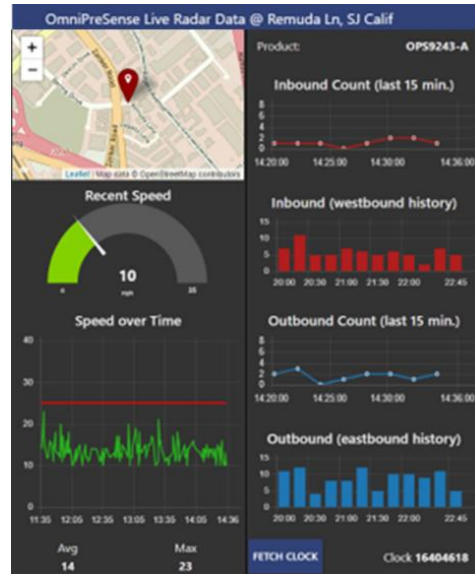


Fig 4: Nodered dashboard

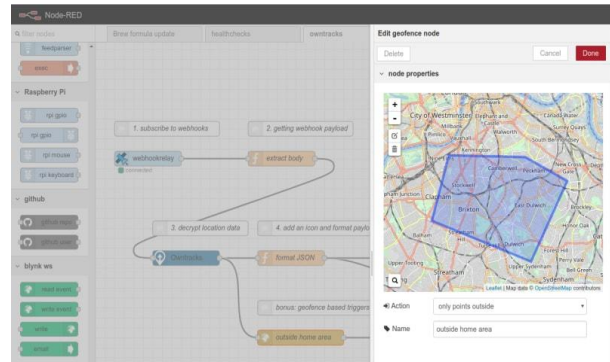


Fig 5: Received GPS location through nodered

we can track the location of the vehicle and send the location to the owner's mobile as text message

CONCLUSION

This study has proposed a vehicle theft detection system that can detect and alert the owner or authorities of a vehicle theft in real-time. The system could also be able to track the location of the vehicle and send the information to the user. The system also sends alerts messages and pictures of the person trying to access the vehicle along with the location to the owner of the vehicle through SMS and also to their whatsapp number. Thus our project includes the development of a user-friendly interface that allows vehicle owners to monitor the status of their vehicles in real-time.

ADVANTAGES/DISADVANTAGES:

Following are advantages of using face recognition library are

- Can perform efficiently even with low storage devices
- Does not require more time since no training involved
- Nodered can seamlessly integrate Location data from various sources such as GPS.
- Can detect pictures accurately

Following are disadvantages of current system:

- Requires network coverage area.

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