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VEHICLE THEFT TRACKING, DETECTION AND LOCKING SYSTEM USING OPENCV

[1]Dr.Shubha P, [2]Dr.Ganapathi V Sagar, [3]Hamsa Rekha S D

[1]Assistant Professor, [2]Associate Professor, [3]Assistant professor
[1, 2,3]Department of Electronics and Instrumentation Engineering,
[1,2,3]Dr. Ambedkar Institute Of Technology, Bangalore, India

Abstract : To maintain safe and secure travelling, the advancement of technology plays a significant role. With the improvement of the growth of traffic and thus road accident count has reached to an enormous scale. Now a days it become very difficult to know that an accident has occurred and to locate the position where it has happened. And there is no system to identify it. The main cause of the death is due to lack of immediate medical facility provide to the victim. The main intention of automatic vehicle accident and theft detection is to find the accident happened at any place and intimating it to the emergency number, control station and family members through mail and GSM respectively and whenever the alcohol is sensed the engine will automatic ally get turned off. Apart from that, it is also helpful to find the stolen vehicle.

IndexTerms - : **road accidents, medical facility, emergency number, GSM.**

I. INTRODUCTION

The surge in automobile usage has led to an increase in road accidents, posing a significant risk to people's lives due to a lack of immediate emergency response facilities. IoT-based automatic vehicle accident detection using GPS has emerged as a promising solution to address this issue by enabling swift emergency assistance. However, despite advancements in vehicle technology, road accidents continue to be a pressing concern worldwide. According to the World Health Organization (WHO), over 1.2 million people die and 50 million are disabled annually due to road crashes. In Bangladesh alone, 4,284 fatalities and 9,112 disabilities were recorded in 2017, with a notable increase in accidents and deaths compared to previous years. Delays in ambulance arrival exacerbate the situation, often due to rescue teams not being promptly informed or unable to locate the accident site accurately. Consequently, lives are lost as emergency response is hindered. Immediate intervention at accident sites could potentially prevent 4.6% of road accident fatalities. Addressing these challenges requires effective implementation of IoT-based accident detection systems to ensure timely emergency response and mitigate the impact of road accidents on human lives.

Road accidents in Malaysia have seen a concerning rise in recent times. According to the Ministry of Transport (MoT) Malaysia, there were 548,598 reported road accidents, resulting in 6,284 casualties in 2021. The timely response of the emergency response department (ERD) is critical in determining the fate of accident victims, as the speed of accident information reaching the ERD significantly influences their chances of survival. Studies indicate that even a one-minute reduction in accident response time could potentially increase the likelihood of saving lives by up to 6%. Factors such as accident severity, location, and traffic congestion play a pivotal role in determining the response time of ERD. In instances of minimal traffic congestion, it is not uncommon for ERD notification to be delayed by up to 24 hours, further underscoring the need for improved accident response mechanisms.

There is a pressing need for a smart accident detection and human rescue system with automatic notification capabilities to save lives effectively. The primary aim of this concept is to introduce an efficient Automatic Accident Detection and Human Rescue System (AADHRS) that accurately detects accidents. AADHRS ensures timely medical assistance to accident victims, facilitating prompt ambulance arrival at accident locations, particularly in remote areas outside the central city. This system aims to minimize response time and maximize life-saving efforts.

II. PROBLEM STATEMENT AND OBJECTIVES

Ensuring the safety of both private and public vehicles is of utmost importance. The primary challenge faced by vehicle tracking systems lies in developing an integrated and advanced solution that incorporates cost-effective innovative technology. This system aims to assist individuals in halting stolen vehicles remotely and identifying thieves through photo analysis captured by a Pi Camera module. The relevant information, including the vehicle's location, is promptly relayed to the owner via Gmail, enhancing safety measures continuously. Moreover, the system's evaluation feature serves to bolster safety measures, providing reassurance to users at all times. Additionally, the system is equipped for automatic accident and theft detection, promptly notifying emergency services, control stations, and family members via email and GSM respectively. Furthermore, in cases where alcohol consumption is detected, the system takes proactive measures by automatically disabling the vehicle engine, further enhancing safety precautions.
The primary objectives are outlined as follows:

- Facilitating the precise tracking of stolen vehicles, enabling owners to receive accurate geo-location updates and notifications upon theft.
- Providing owners with the capability to view images of unauthorized individuals accessing the vehicle.
- Implementing sensors to detect accidents promptly and notify the owner accordingly.

- Integrating an alcohol sensor to automatically deactivate the vehicle engine upon detecting intoxication by the user.

III. LITERATURE REVIEW

Automatic Number Plate Recognition (ANPR) is an image processing technology used for vehicle identification based on license plates [1]. It aims to develop an efficient automatic vehicle identification system for restricted areas like military zones or government offices. Implemented through image segmentation and Optical Character Recognition in MATLAB, the system detects vehicles, isolates license plate regions, and recognizes characters for comparison with database records, providing vehicle owner details and registration information. Tested on real images, it demonstrates precise detection and recognition of vehicle number plates, highlighting its practical significance for security and access control.

The recent advancements in license plate recognition systems have significantly contributed to the development of smart cities by facilitating vehicle management, theft investigations, and traffic monitoring. These systems face challenges in scenarios such as congested traffic and adverse weather conditions [2]. To overcome these challenges, researchers have proposed an enhanced system aimed at minimizing false positives by not only detecting vehicles but also retrieving license plates. This approach utilizes convolutional neural networks to enhance character recognition, particularly in blurry or obscured images, leading to superior accuracy and performance compared to traditional systems.

The paper [3] delves into super resolution, a technique enhancing low-resolution images to high-resolution ones. Concentrating on automating number plate recognition from traffic surveillance videos, the proposed system identifies vehicle number plates from video inputs and employs super resolution to enhance image clarity. Utilizing Optical Character Recognition, the system extracts text from the enhanced number plate image, compares it with the RTO database, and displays vehicle details like owner's name and registration.

Automatic Number Plate Recognition (ANPR) is vital for vehicle monitoring and traffic control, employing image processing to identify number plates [4]. This research presents an effective method utilizing morphological operations to enhance object area and eliminate irrelevant regions. Tested with a number plate database, the technique achieves a success rate of around 92% across diverse lighting conditions, marking a notable improvement over conventional systems.

The study [5] introduces an FPGA-based ANPR system, encompassing Number Plate Localization, Character Segmentation, and Optical Character Recognition. Utilizing a FPGA development board, the system effectively utilizes 80% of the available on-chip slices of a Virtex-4 LX60 FPGA. With a maximum frequency of 57.6 MHz, it processes one image in 11 milliseconds, attaining an impressive recognition rate of 93%.

Facial recognition and biometrics rely on unique person identification through image matching to produce recognizable profiles [6]. This involves extracting facial features for correlation, enabling recognition of similar individuals and distinguishing between identical twins. Features are classified using SVM classifier, known for its computational efficiency and adaptability, particularly in classification tasks.

License plate recognition is increasingly essential in contemporary society due to the growing number of vehicles and related concerns, including theft, traffic violations, and unauthorized access [7]. Accurate registration code recognition is crucial for mitigating these issues. This paper emphasis on segmentation for precise identification. The proposed method employs Hough transform for line detection and edge-based segmentation to enhance accuracy. Through parameter optimization, the approach achieves high recognition rates, outperforming conventional methods.

The increasing prevalence of vehicles in today's society has spurred a growing interest in license plate recognition systems [8]. The proposed method employs median filtering double edge detection for license positioning, a blend of original level and improved vertical projection segmentation algorithm for character segmentation, and a classification template matching approach for character recognition based on font characteristics. Prioritizing recognition speed, this method achieves swift license recognition with high accuracy and precision rates.

In conclusion, the literature review emphasizes the significant role of Automatic Number Plate Recognition (ANPR) systems in enhancing vehicle security, traffic management, and law enforcement. The reviewed studies showcase advancements in ANPR technology, including improved accuracy in license plate detection and recognition, as well as innovative approaches like super resolution techniques and FPGA-based implementations. Despite challenges, such as environmental conditions and technological constraints, ongoing research efforts highlight the continuous evolution and importance of ANPR systems in meeting modern societal needs.

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IV. METHODOLOGY

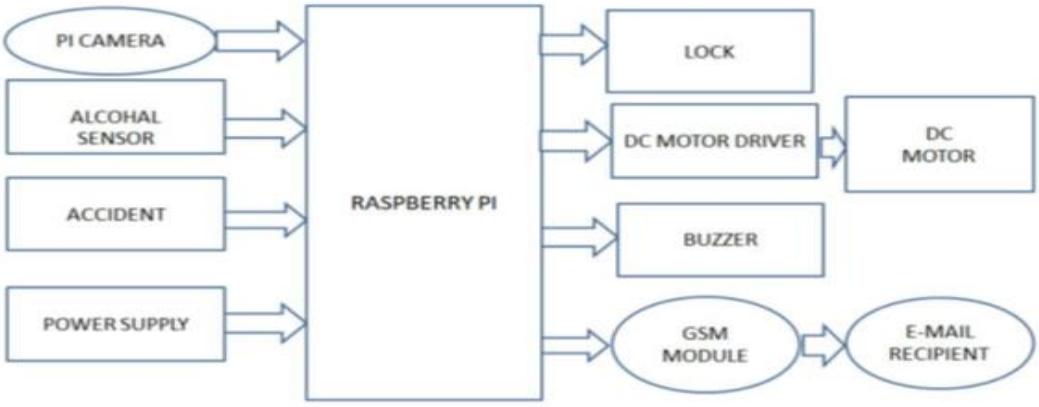

Fig1: Block diagram Representation of the Proposed system

Power supply is a critical aspect of any electronic device, serving to provide the necessary input power from the mains and ensuring compatibility with the device's operational requirements. Typically, the mains input is standardized at 230V AC, which needs to be converted to various required voltages, such as 12V, 5V, or 3.3V, depending on the specific components' needs. This voltage conversion process is pivotal, as different components operate at distinct voltage levels. Consequently, the power supply is divided into multiple outputs, including 12V, 5V, and GND, to cater to diverse component requirements.

At the heart of the proposed system lies the Raspberry Pi microcontroller, which serves as the central processing unit. Programmed instructions are loaded onto the controller to govern the functionality of the entire project. These programs meticulously control each connected module, orchestrating their actions in harmony.

The hardware components integrated into the project include the MPU6060 accelerometer, DC motor driver, DC motor, Pi camera module, buzzer, and switch. The project primarily focuses on accident and theft detection systems. In the event of an accident, the MPU6060 accelerometer assesses the x, y, and z-axis values, triggering an alert if they surpass predetermined thresholds. This alert promptly notifies the vehicle owner, providing the accident location details. Similarly, in theft detection scenarios, any attempt to activate the vehicle prompts an immediate message to be sent to the owner, alerting them to the potential theft and furnishing the vehicle's location via email functionality.

V. RESULTS AND DISCUSSION:

OpenCV, known as the Open Source Computer Vision library, is a versatile software package that encompasses both computer vision and machine learning capabilities. It serves as a foundational tool for various applications in the field of computer vision, facilitating the development and deployment of machine learning models. With real-time processing capabilities, OpenCV empowers developers to implement functions crucial for computer vision tasks.

One of the prominent algorithms utilized within OpenCV is the Local Binary Pattern Histogram (LBPH) face recognition algorithm. Renowned for its robust performance, LBPH excels in recognizing faces from various angles, including both frontal and side views. Leveraging a dataset comprising images of individuals, each image is associated with a unique ID, enabling the algorithm to effectively identify and process the images, producing the desired output. Notably, LBPH excels in capturing local image features and exhibits resilience against grayscale transformations.

The application of OpenCV extends beyond face recognition, encompassing the realm of vehicle theft tracking, detection, and locking systems. This integration, as illustrated in Figure 2, showcases the practical implementation of OpenCV's capabilities in safeguarding vehicles against theft incidents.

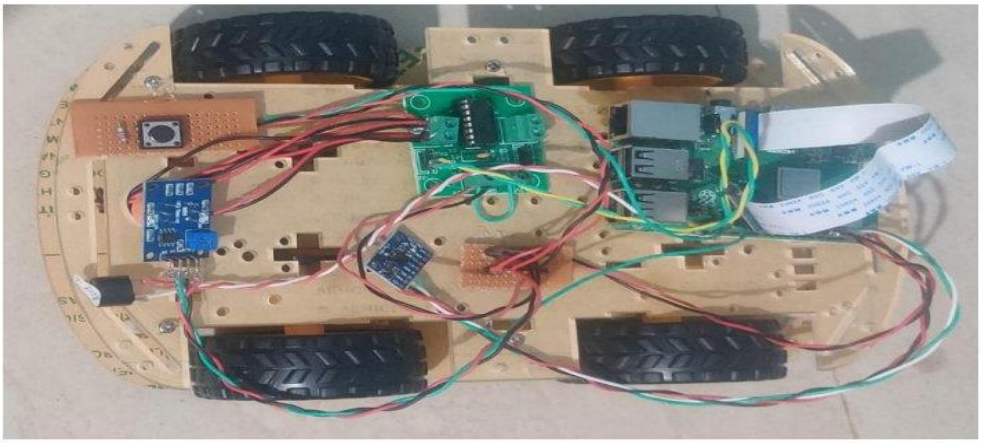

Fig2: Implementation of the proposed system

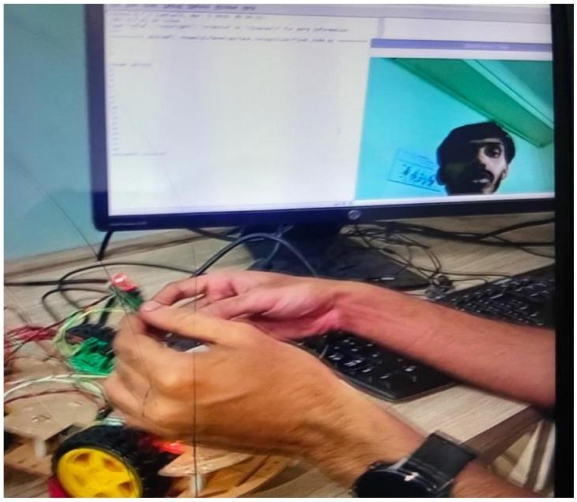

Fig3:Face detection using PI camera

The vehicle will only start if the face is recognized as the trained face otherwise, a photo of the user is sent to the owner's Gmail account along with the location, as shown in Figure 3. In case of an accident, the Gyro sensor triggers the sending of the image and

vehicle location to the owner's Gmail account. If alcohol is detected by the sensor, the vehicle engine will automatically shut off, preventing the driver from operating the vehicle.

VI CONCLUSION:

A vehicle tracking system can be discreetly installed in a hidden location on the vehicle. If tampered with, it automatically sends the user a photo of the perpetrator along with the vehicle's location via Gmail. Additionally, if alcohol is detected from the driver, the engine is automatically shut off to prevent drunk driving. In the event of an accident where the vehicle is tilted, a photo of the accident is captured and sent to the owner along with the location. In the future, an Android app can be developed to pinpoint the exact location on the map instead of just providing coordinates. Furthermore, the app can continuously monitor the driver's heart rate to assess their condition until medical help arrives.

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