Smart Home and Thief Detection using AI

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Abstract*: In our world increasingly interconnected, demand for smart home solutions that prioritizing security a convenient ever-growing. This abstract presents an inventive approach to home security an automation through integration of ESP32-CAM, ultrasonic sensor, a Firebase technology. Our system offering real-time theft detecting a remote controlling of home appliances via mobile app. By leveraging AI-drive theft detection a Firebase's cloud-based platform, users can monitor a managing their homes from anywhere, enhancing both security a convenient. This abstract outline component, workflow, features, a potential future enhancement of our Smart Home and Theft Detect system, offering a glimpse into the future of home automation.*

Keywords: ESP32-CAM

I. INTRODUCTION

- We are presentation on "Smart Home and Theft Detection using AI." To provide Security to our home. In this presentation, we'll delve into the integration of ESP32-CAM, an ultrasonic sensor, and Firebase to create a robust smart home security system.

- By combining these elements, we've developed a solution that not only detects potential intruders but also allows for remote control of home appliances with the touch of a button on your mobile device. The ESP32-CAM can be widely used in intelligent IoT applications and also for AI algorithmic functional purpose such as wireless video monitoring, WIFI image upload, QR identification (in which it is used to scan the pattern of the third-party people), and so on.

- Under each heading we have noted which paragraph style to use – for example, "(Use the Microsoft Word template style: Heading 2)." Again, those notes are not part of the headings. Their purpose is to advise you of the name of the style defined in the AIP Conference Proceedings Word template.

- The ESP32-CAM suit for IOT applications such as: Smart home devices image upload. Wireless monitoring and also same as the AI algorithms.

- The mobile app serves as the centralized hub for controlling and tracking diverse factors of the clever home gadget. The technology is constantly evolving, promising even   more sophisticated theft detection and prevention capabilities in the future.

- Complementing our facial recognition gadget is the integration of ultrasonic sensors, strategically positioned close to entry factors including doorways and windows. These sensors function a further layer of protection, detecting any unauthorized presence inside close proximity to the house. Upon detecting suspicious hobby, consisting of a person drawing close within a predefined distance threshold.

- Upon detecting suspicious rebury, consisting of a person drawing close within a predefined distance threshold. The sensors cause the ESP32CAM to seize and transmit pix of the intruder to the owner of a house's cellular tool thru the accompanying mobile app.

- From remotely unlocking doorways and adjusting lighting fixtures to handling temperature settings and monitoring safety cameras, the app presents customers with unheard of flexibility and convenience. The

technology is constantly evolving, promising even more sophisticated theft detection and prevention capabilities in the future.

II. LITERATURE SERVEY

M.T. Bhatti et al. [1] proposed detection of weapons using Deep Learning. CNN based object detector is used for detecting weapons through real time CCTV.

M.Grega et al. [2] automated a method of identifying the harmful weapons like knives and firearms through CCTV and produce Alert message regarding the same.

H. Gupta and P. Chaudhary [3] proposed a detection technique in CCTV for face parts. The paper provides technique for facial detection with high accuracy and less computation time.

A.B.K.H et al. [4] proposed smart cctv surveillance system for intrusion detection with Live Streaming. According to the paper if the intruder's face is not present in the database SMS and Email will be sent to the user with the intruder's face. The user will also have the choice of live stream the incidents.

K. B. Lee [5] proposed an application for detecting object & tracking system that can obtain moving information of target objects. The object tracking algorithm and deep learning is combined for this process.

Meenal et al. [6] The paper proposed a method for electricity theft detection system, which can detect theft automatically if tapping is done in the transmission line or when additional load is introduced with the help of current transformer.

The future of smart home security looks promising, with AI at the forefront of protecting our personal spaces from unauthorized access and theft.

N.Mucheli et al. [7] proposed smart theft detection system. The system is hidden in electric meters, an automatic message and e-mail will be sent to concerned authorities whenever there is a difference between current crosses threshold value along with location and image of the area.

Pandya et al. [8] the paper presents a method to prevent smart home theft by providing notification of ongoing intrusion. The technique eliminates the need of large amounts of memory for storing data and DVR.

Sashimi et al. [9] proposed an automated way of vehicle theft detection in parking facilities with help of cctv video stream. Canny edge detection is used for object classification and detecting of complex videos.

Sikandar [10] review on human motion detection technique for ATM-CCTV surveillance system. The paper comes to a conclusion that for successful detection of human in ATM requires a combination of several algorithms and that may work better than the existing.

H. Turtiainen et al. [11] came up with the first computer vision object detectors, the goal was to accurately identify CCTV cameras in videos and frames. To build the system several state-of-the-art computer vision frameworks and backbones were used.

Vir Singhender et al. [12] proposed a real-time anomaly recognition through cctv using neural network. To handle complexity both normal and anomalies are considered and that will maximize accuracy.

III. METHODLGY

3.1 Existing method

1. The system captures images of any person entering the premises. It extracts facial features such as eyes, nose, and mouth.
2. If it not matches then an alert message is sent to the homeowner. The goal is to create a safer environment If you prefer to manually insert and number equations, follow this step-by-step guide:
   residents by automating theft detection and response.
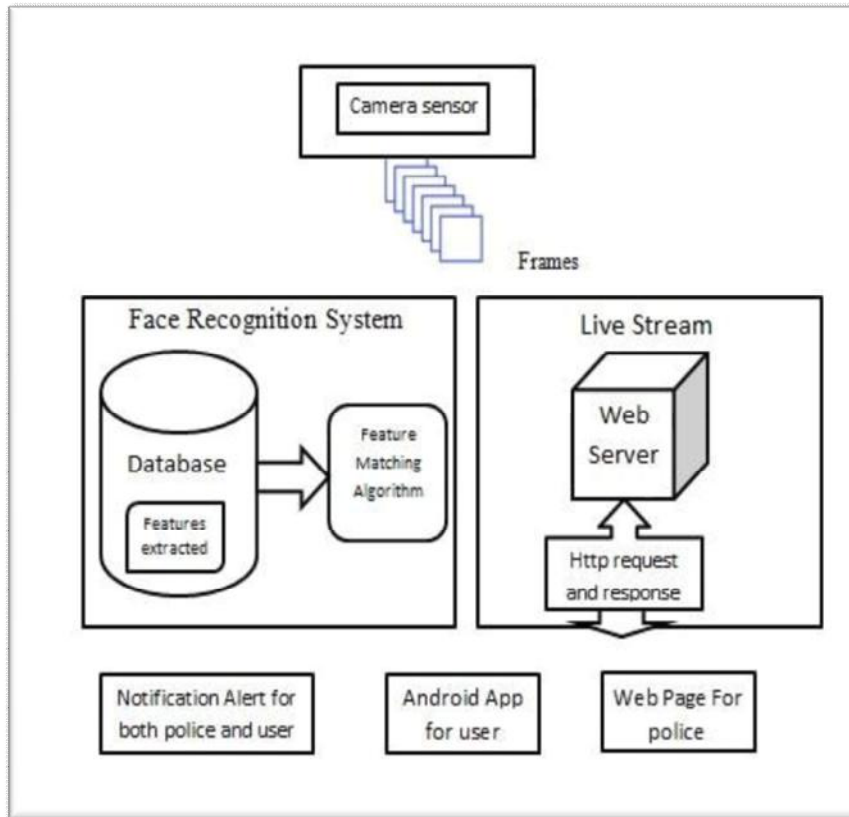
FIGURE 1. a): System Architecture

3. As in the Figure 1 Architecture system consists of CCTV capturing sensor for capturing video in the formation of frame.
4. When a criminal face is recognized, face identification system database, which is extracted based on the features and algorithms that verify for the related traits.
5. A warning notification will be sent to cops and user's (owners).
6. A live telecast of these videos will be broadcast to an external server at the same time.
7. In face recognition system having the database which is feature extracted it means it will analyze the face pattern and easily detecting the face of the person and gives the output to the feature Matching Algorithm.
8. A live stream-Web server request and give the response of the face detection through the notification alert.
9. Notification alert will send to the user mobile app, through telegram notification or any other communication interface mobile app.
10. User can use the Arduino app for notification or else it will be set up to the mail.
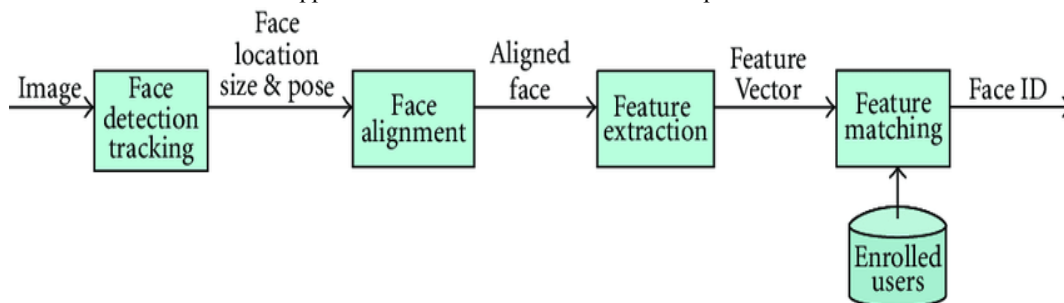
FIGURE 1.b): Face Identification Structure

11. The working of the algorithm is to find faces with help of histogram of oriented gradients (HOG) algorithm features and we also use random forest algorithm in machine learning to find the face signs, then we compare these coded formed cctv video and then compare the detected faces with the faces in the database.
12. If a criminal face is discovered, then an alert will be produced on the user's phone and a notification will be sent to the police station through the web-site.
13. If a user or relative is found on camera then there will no issues. If an unknown person is caught on camera, then first inform the user and if needed user can manually forward the message to the police. This system can find one or more faces at a time.

IV. PROPOSED METHOD

In this proposed method we are re-modeling the this technology with new patterns and ideologies by enhancing the each and every algorithms and which is real-time project and gives the output as much as better.

1. ESP32-CAM is now we are using to get the best real time output and this is one of the modules that we are using.
2. We are using the motion detectors, communication interface, AI algorithms, sensors, camera, Wi-Fi, door lock, and etc.
3. The esp32cam GPIO 12, 13 pins are connected to i2c module with SDA and SCL for 16x2 display.
4. The 14,15 pins are connected to ultrasonic sensor with Trig and Echo.

In this project we are using the 3 relays they are active low relays 1,3,16 pins are connected to relays as first relay for lock.

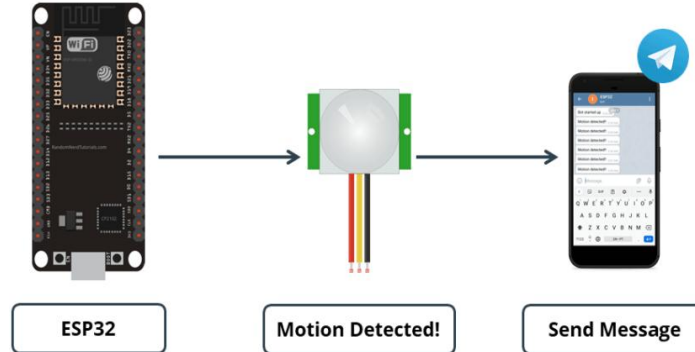- 1st relay for door locker
- 2nd relay for fan.
- 3rd relay for light

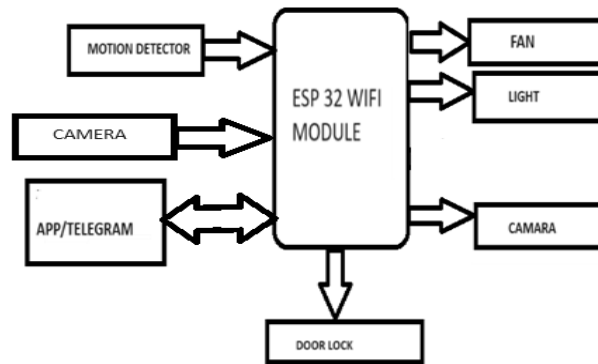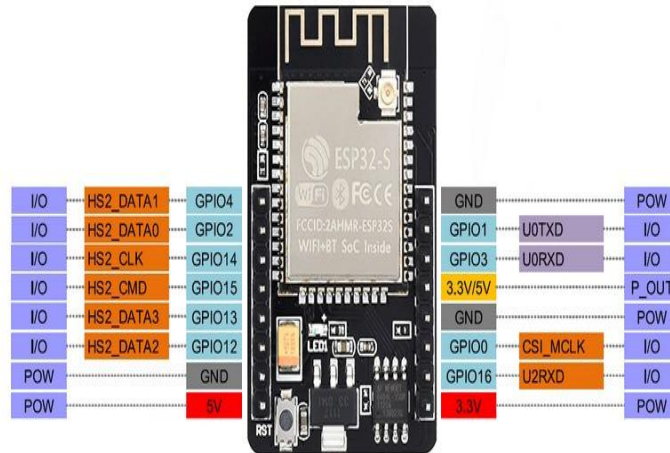**FIGURE 2.a) Notification Alert from ESP32-CAM**

FIGURE 2.b):Proposed method Circuit

464

FIGURE 2.c): ESP32-CAM

The above one is the ESP32-Module which basically describes all the connections that we are using in this project.

1. This pin is basically consisting of the 12 pins and also, we are using the power supply and also each module is connected to the   particular parts and both the hard ware and software are using.
2. AI modules which are most used and this all are used to recognize the patterns and matches the un known face reorganization and if any un matched is found the it automatically sends as notification.
3. Sensors are used to check any changes are happened and it automatically determines.
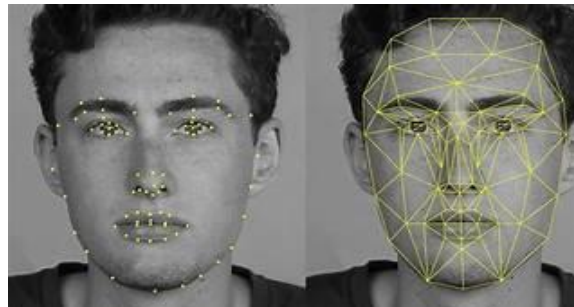
FIGURE 2.d): Face detection

FIGURE 2.e): Thief detection

B. FINAL KEY POINTS TO CONSIDER

- **Face reorganization:** Detects the pattern of face using the AI algorithm.
- **Motion Detection:** It will identify the motion/movements of the person.
- **Telegram notification:** After feature extraction the webserver will send a notification.
- **Data saving in mobile:** Data frames will save on the hard disk.

VI. RESULT & ANALYSIS

Smart homes are increasingly incorporating AI to enhance security, it basically very helpful for identifying the thief by using this AI algorithms and methodologies. In this project both the software and hard ware tools are used to get successful result. While entering any third party in to our private place then this AI tools and algorithms are hopefully identifying the face through the face recognition and simply identifying the movements through the motion detectors. Notification was sent immediately to our mobile communication interface apps like Telegram, what's app and etc.

Smart homes are accurately increased and demanding for intelligent appliances the below graph is showing the accurate result and also the real time result of the notification is purely showing how does it work and give the best way of identifying the thief and also it is the one of the ways to identifying the thieves in the rebury places.

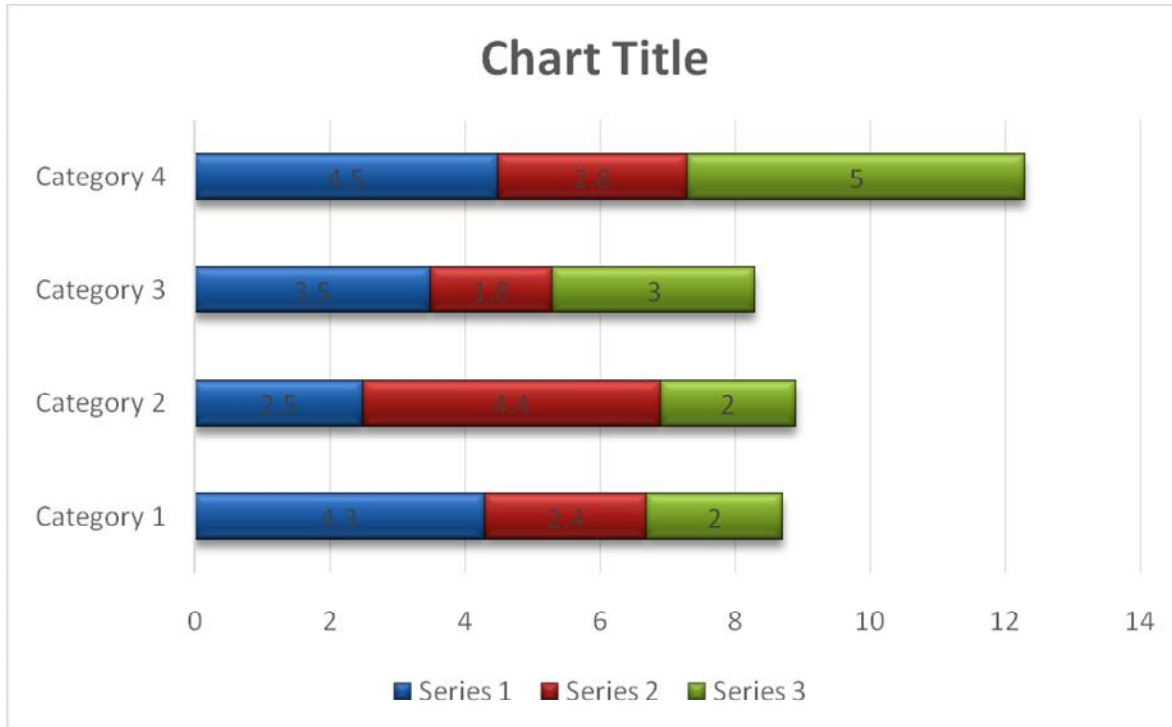**FIGURE 3.a): Thief Detection Notification**

FIGURE 3.b): Graph

VII. CONCLUSION

In conclusion, smart home and thief detection by using AI, gives a various advantage while we looking after a secured home, AI methodology is really helpful for recognizing the face and it will easily identify the outer person and motion deters are helpful for identifying the person movement and can send a notification through our mobile connection app. This may really help full for the people to make their valuable things secured which are present at inside home can be secured through this by using this technology and in most of the cases can also be solved easily by identifying the thief by knocking the notification to our mobile and immediate action may take towards the reburies, and this technology may take the awareness to the people. And also, it suggests that to keep this in mostly happened rebury places

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