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Automated Home Security System using IoT, OTP Verification for Door Opening

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ABSTRACT: The method of Viola Jons, blob Analysis job, was used to allow real-time face detection in the Camera module. The app collects camera video/images of all registered individuals and saves the data in a database. The proposed work is about an artificial framework that uses the CNN (Convolutional Neural Network) algorithm to identify and recognize facial features. The method of Viola-Jones' work was used to allow real-time body detection in the Camera module. The app collects the camera modules of all registered individuals and saves the data in a database. The proposed project is for an intelligent device that can identify a person's face and remember them. Display the person's name and use the CNN algorithm to identify the body. The procedure was broken down into three stages. First, the footage was captured and converted into pictures. Then, for Body Detection from the Camera module, use blob examination, and finally, for classification, use CNN. Additionally, a fingerprint scanner may be used to check a person's identity. The real-time Camera module face detection has been made possible by using the method of Viola-Jones, blob Analysis work. The software first taking Camera video/image of all the authorized persons and stores the information into the database. The proposed work deals with an automated system to detect and classify the Faces using CNN (Convolutional Neural Network) algorithm. The real-time Camera for module body detection has been made possible by using the method of Viola jones's work. The software first taking the Camera module of all the authorized persons and stores the information into the database. Proposed work deals with an automated system to detect the face and recognized the person. Display that person name; classify the body using the CNN algorithm. The methodology is comprised of three phases, first, take video and convert it into frames.

KEYWORDS: Upload image, OTP Generate, Raspberry- pi.

I. INTRODUCTION

The face is a widely used biometric for distinguishing people.Face detection has gotten a lot of attention from security guards due to human behaviors used in a variety of surveillance applications, including forensic, airport, facial recording, and crime analysis, among others. As opposed to other biometric features like thumbprints, fingerprints, palm prints, and so on. They can be taken without the tourist's permission and used for a variety of security-related reasons, including criminal detection, face screening, airport security, and forensic examination, among others. Face recognition involves using a webcam to get a snapshot of someone's face. They took a photograph of the tourist and compared it to the database's records. They are then categorized and stored in the database according to pre-determined classes. Because of the many constraints placed on machine face recognition, such as variations in lighting, head positions, facial expression, occlusion, and aging, face biometrics is a complex field for researchers to study. Researchers suggested several approaches to resolving the issue at hand. Auto facial recognition includes both face extraction and authentication, as well as face detection. The two types of algorithms are geometric feature-based and image template-based face recognition algorithms. Template-based approaches compute similarities between one or more model models and the face to determine the identity of a face. Principal component analysis, kernel approaches, linear differentiate analysis, and other techniques are employed in the development of face models. Ridge lets and other multi-resolution methods are effective in decoding the information

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content of images and have found uses in pattern recognition, computer vision, and image processing. A fingerprint is a pattern of friction ridges on a person's finger that is exclusive to that individual. Fingerprints are highly accurate, last a lifetime, and are impossible to remove. Thanks to the large variety of variants present, fingerprints have proven to be an excellent method of identification.

II. LITERATURE SURVEY

Yigang Huang, Namgyu Kang, "How Metaphorical Door Handle Influence Users' Opening-Door Behaviors"[1] This analysis aims to determine how a metaphorical door handle influences users' opening-door behaviors and what Kansei benefit a metaphorical door handle provides. To do so, we used a group of 200 students from Future University Hakodate to fill out a questionnaire with 12 door handles (created in 3D max). According to five assessment objects, each function was rated on a scale of -2 to 2. For an adaptive sample, the data was computed as average scores, then visual knowledge and theory aspect analysis were performed. As a consequence, we can see how a metaphorical door handle can affect users' opening-door habits. A door handle with an apt metaphor phrase, on the other hand, was discovered to be unique and appropriate for use.

Mone Kijima, Yuta Miyagawa, HayatoOshita, "MultipleDoorOpening/ClosingDetectionSystemUsingInfrasound Sensor"[2]. Our research group is currently researching and developing Internet of Things-based robust emergency and disaster management technologies for communicating tsunami data retrieved from infrasound sensors. To measure the sensor's efficacy daily, it is essential to emit infrared sound. As a result, we took into account the infrasound generated when opening and closing doors in this study, and we used a single sensor to detect the state variations of multiple doors. We developed and tested the detector system for various types of doors.A. Bits and Pieces together.

Jiajun Li1, Jianguo Tao1*, Liang Ding1, Haibo Gao1, Zongquan Deng1, Yu Wu2, "RGBD-based Parameter Extraction for Door Opening Tasks with Human Assists in Nuclear Rescue"[3]. For robotics to perform duties such as home-serving and rescue, they must be able to unlock doors. Obtaining the requisite parameters, such as the width of the door and the length of the handle, is a significant challenge. Because of the complexities of the environment, many researchers use computer vision methods to derive the parameters automatically, which results in fine but not quite consistent results. We suggest a solution that employs an RGBD sensor and a graphical user interface that allows users to "point" at the target area with a mouse to obtain 3D data. Algorithms are being developed to derive essential parameters from the chosen points. We construct a module that can calculate the normal of the plane by pointing at three noncollinear points and then move the robot to the correct orientation to prevent significant internal forces caused by the misalignment of the robot orientation and the normal of the door plane. Experiments were carried out on a live robot. The results demonstrate that the built GUI and algorithms will assist in reliably determining the necessary parameters and preparing the robot for subsequent operations.

Xiangzhong Li1, a Yibing Qu1,b, Shipei Cao2,c, Zheng Liu2,d, Xiangbo Ze1,e, Tao Zou1,f, "Parametric Design of Typical Components of Doors and Windows Based on Open Source Platform"[4]. The interface development tool Qt and the Application Programming Interface were used to carry out secondary development of the open-source CAD to realize the accurate and rapid modeling of the door and window components, and the programmed algorithm for rapid forming of the door and window components was developed, and the parameterized design of the door and window components was realized. The scheme was verified and compared to the conventional approach by using the frame edge in the door and window member as an example. The findings show that the scheme can produce component models automatically and that the design productivity greatly outperforms conventional approaches, laying a strong basis for the subsequent rapid assembly research of the whole window.

Gui-ru LIU, Ming-zheng ZHOU, Lu-lin WANG, "A Radar-Based Door Open Warning Technology for Vehicle Active Safety"[5] To fix the problem of rear closing goals colliding as a result of drivers and passengers opening doors suddenly, a door open warning (DOW) protocol was implemented. The proposed DOW system is made up of three components: a system, a radar network, and key technologies. A-Line Frequency Modulation Continuous Wave (LFMCW) radar sensor was used to detect the approaching targets in the rear of the vehicle. Simultaneously, the CMMA-CFAR (cell maximum and minimum average-CFAR) algorithm was proposed to maintain a higher detection rate by changing the threshold over time in response to the noise level. To integrate the DOW architecture, a DSP-based embedded framework was used. The

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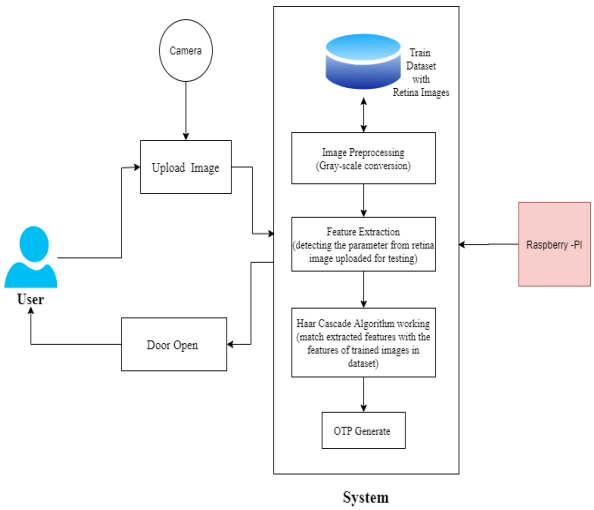
machine was calibrated and validated using a Chery Arrizo7 vehicle. The early average warning ratings for three symbolic closing targets: motorcycles, bikes, and automobiles were up to 98.00 percent, with a 3.50 percent false alarm rate. In a range of daytime and nighttime road conditions, the experimental results show that the proposed DOWS will efficiently detect moving objects that approach the vehicle's behind warning area and give crash warnings to both the driver and the passenger.

Amritha Nag, Nikhilendra J N, "IoT based door access control using face recognition"[6]. In recent years, having a stable security framework that can defend our properties while still protecting our privacy has become increasingly critical. To gain access to an environment such as one's home or office, a typical security system requires a person to use a key, identity (ID) card, or password. The current protection scheme, on the other hand, has several flaws in places where it is simply cast and taken. The majority of doors are operated by people who use keys, identification cards, countersigns, or patterns to unlock them. This paper aims to assist users in improving the protection of critical location doors by using face detection and recognition. Picture capture, face detection and recognition, email warning, and automated door access control are among the subsystems in the proposed framework. Enabled by facial recognition OpenCV is mentioned because it uses Eigen's faces and decreases the size of face images without missing essential features, allowing for the storage of facial images for a large number of people in a database. The door lock can also be controlled remotely using the Telegram Android program from anywhere in the world. For security reasons, the picture taken by the Pi camera will be emailed to the designated user.

III. PROPOSED SYSTEM

This paper is presenting a proposed work of an automated image Capture system using Matlab. This work experiments on user's face we have to used classification methods, viola jones, CNN convolution neural networks algorithms, etc. But improvements are expected to increase its efficiency of classification. This system automatically detects the user's face and detects them by recognizing their face. This system is developed by capturing real-time human faces. The detected faces are matched against the faces in the database and detect the user. Also, the user will identify the fingerprint of a user for more security.

IV. SYSTEM ARCHITEHTURE



V. MATHEMATICAL MODEL

Let S be the Whole system which consists of: S= IP, Pro, OP.
Where,IP is the input of the system.
Pro is the procedure applied to the system to process the given input accordingly.OP is the output of the system.

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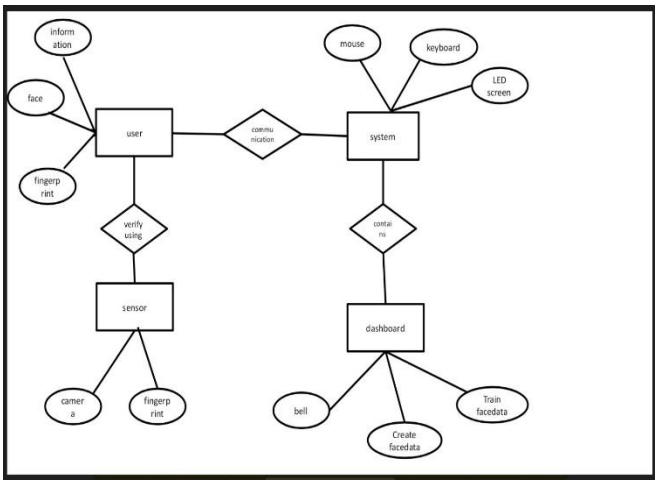
Input:
IP = I. Where, I is a set of images, provided as input. B.

Procedure:
Step1: The camera module captures the user's face.
Step 2: Verify the information into a database.
Step 3: Proposed work deals with an automated system to detect and classify the Faces using a Convolutional Neural Network algorithm
Step 4: The comprised of three phases, first face Detection from the camera module, second apply Convolutional Neural Network algorithm for feature classification and extraction.
Step 5: The most useful and unique features of the face images using haarare extracted in the feature extraction phase.
Step 6: The face image is compared with the images from the database.
Step 7: we empirically evaluate face recognition which considers both shape and texture information to represent face images based on Convolutional Neural Network for person independent face recognition.
Step8: As per comparison show Result.

Output: The camera module detects the face and shows the locks/unlocks the door.

VI. ENTITY-RELATIONSHIP DIAGRAM



VII. HAAR-CASCADE ALGORITHM

In this paper, Viola-Jones algorithm is adapted for face detection. AdaBoost algorithm is united with Viola-Jones algorithm to make a strong classifier. Haar-like features are adapted by Viola-Jones for face detection. From this representation, the light region explains “to add” and the dark region is “to subtract”. It operates with powerful discrimination. The features from the image will get extracted in a live stream using this algorithm. The process in the training period is to train the image samples to be recognized and subsequently in the estimation period, the image to be tested will be compared with the samples trained in the dataset. The binary number is considered as an outcome in the local binary pattern. On account of its powerful discernment and mathematical simplicity, this algorithm became popular in various face recognition applications.

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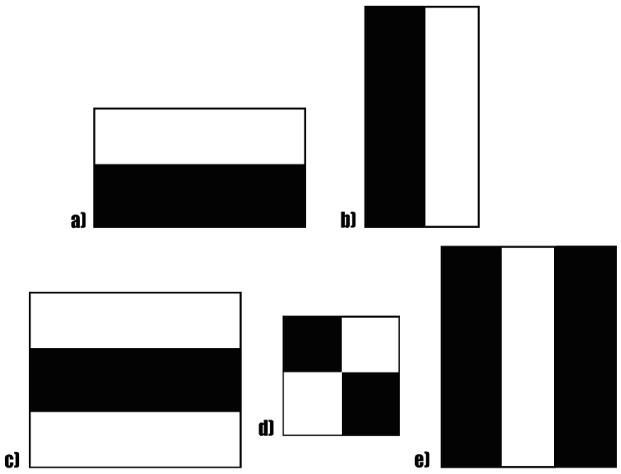

Fig. A sample of Haar features used in the Original Research Paper published by Viola and Jones

After the face is detected, the next step is to extract features this is done using a linear binary pattern algorithm.The initial step of this algorithm is to convert the test image into grayscale. This L x M pixel size image will get divided intoregions. The same pixel size is used for the regions, producing n x n regions. Each region will go through a Linear binary pattern operator. In this process, it will compare the center pixel with its neighbor pixels. If the pixel size is greater than to center pixel it is '1' or it is '0'.

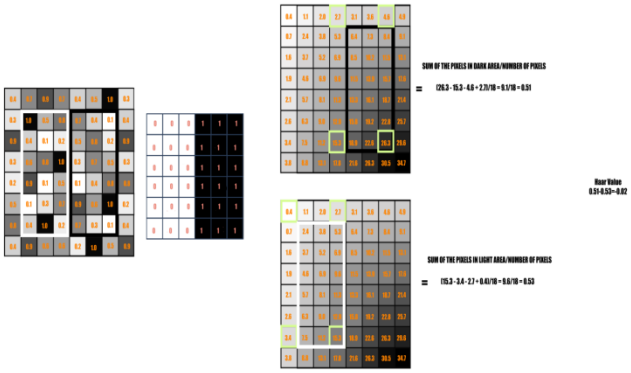

Fig. Integral Image is used here to calculate the haar value.

VIII. HAAR-CASCADE VS OPENCV

The OpenCV Haar-based classifier was significantly faster. After switching it to the MTCNN detector, the video started to lag. It could still run in real-time, but the quality wasn't as good.

The MTCNN detector was able to detect a larger variety of faces correctly. Even if I tilt my face, turn it partially away from the camera, or partially cover it with my hands, it was still able to recognize it as a face. The OpenCV Haar-based classifier could only recognize full front-facing faces and not tilted faces.

The emotion recognition network, trained in accordance with the Haar-based classifier, could only accurately recognize different emotions on full front-facing faces. Hence, even if the MTCNN detector allowed us to draw a bounding box around partially obscured faces, the program couldn't recognize the emotion on the face.

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IX. RESULTS

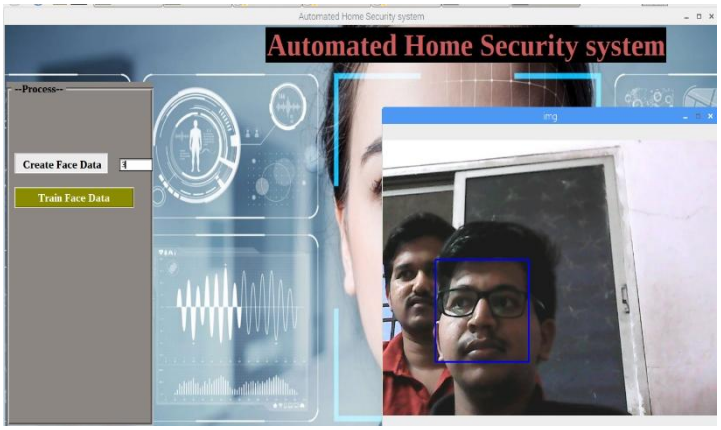
Outcomes are the events, occurrences, or changes in conditions, behavior, or attitudes that indicate progress towards a project's goals. These intended results of the project are expressed as goals within your project outcome.

1) Our project gives us full proof security from the risk of theft to our house and keep the track of everyone visiting home.

2) Our system provides you the verification and validation by the means of OTP. And it's much safe because OTP only goes to the owner.

3) This is much an Automation System that doesn't involve much human work to handle and save the information (images and fingerprints) into the database.

-CREATE AND TRAIN FACE DATA:
When you click the button then your face is captured and saved into the data and then you train them.



-NEW UNKNOWN FACE:
When an unsaved face comes in front of the camera then “Unidentified Face Recognized” is displayed on the screen.

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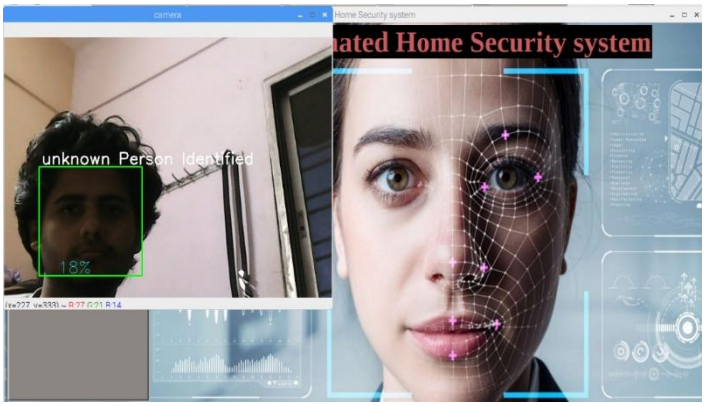
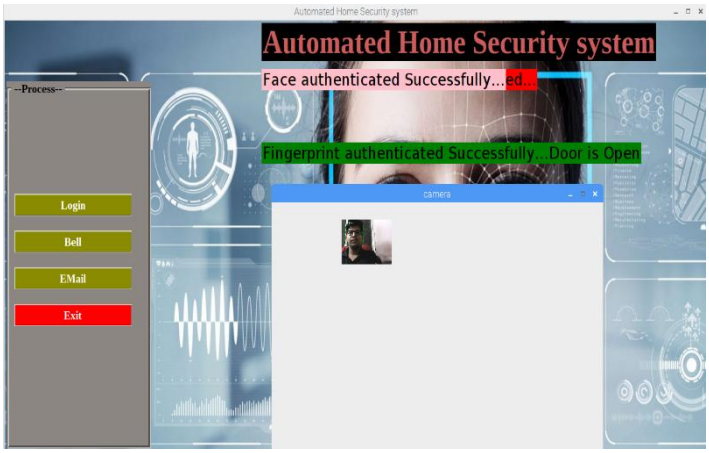


-KNOWN FACE:
When a face that is saved into the database is captured then a message “Face Authentication Successfully” is displayed on the screen.



-WRONG OTP:
When the OTP entered into the box is validated as wrong then a warning pop-up is shown as “The wrong OTP”.

-CORRECT OTP:

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And when you enter the correct OTP then “OTP Successfully Verified... Door is Open” this message is displayed on the screen.

X. CONCLUSION

This project aims to create a framework for home automation. It saves time and money, which is particularly useful when dealing with a wide number of people. It can be used with security cameras to identify people in high-traffic places like bus stops, theatres, and train stations, where facial recognition systems can be used to determine the victims' identities. Face detection is a difficult issue in computer vision that has gotten a lot of attention in recent years because of its many implementations in various fields. This project focuses on developing an automated system for the home. It saves time and effort, especially if it has a huge number of people. Face recognition is a challenging problem in the field of computer vision, which has received a great deal of attention over the past years because of its several. applications in various domains. Although research efforts have been conducted vigorously in this area, achieving mature face recognition systems for operating under constrained conditions, they are far from achieving the ideal of being able to perform adequately in all various situations that are commonly encountered by applications in the real world.

XI.FUTURE SCOPE

Despite intensive development efforts in this field, which have resulted in mature face recognition systems that can operate under restricted conditions, they are still far from meeting the ideal of being able to function adequately in all of the circumstances that applications in the real-world experience.

XII.ACKNOWLEDGMENT

I am profoundly grateful to Prof. Swati Patil for her expert guidance and continuous encouragement throughout to see that this project rights its target from its commencement to its completion. First and foremost, we wish to record our sincere gratitude to our beloved Principal, Dr. R. D. Kanphade, Jayawantrao Sawant College of Engineering, Pune for his constant support and encouragement in the preparation of this report and for making available library and laboratory facilities needed to prepare this report.Our sincere thanks to Dr. A.A. Dandavate, H.O.D., Department of Computer Science and Engineering, JSCOE for his valuable suggestions and guidance throughout this report.We express our sincere gratitude to our guide, Prof. Smita M. Gumaste, Department of Computer Science and Engineering, JSCOE, Pune for guiding us in investigations for this project and in carrying out experimental work. Our numerous discussions with her were extremely helpful. We hold her in esteem for guidance, encouragement, and inspiration received from her.The project on “Automated Home Security System” was very helpful to us in giving the necessary background information and inspiration in choosing this topic for the project. Our sincere thanks to Prof. Swati Patil, Project Coordinator for having supported the work related to this project.

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