RESEARCH ARTICLE

A KEYLESS ANTI-THEFT SECURITY SYSTEM FOR AUTOMOBILES USING OPENCV PYTHON

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Manuscript Info	Abstract
Manuscript History Received: 18 January 2022 Final Accepted: 20 February 2022 Published: March 2022 *Key words:-* Face Recognition, Ecurity, Automobiles Security, GSM, GPS, OpenCV Python	Automobile theft is on the rise all over the world these days. As a result, car owners are turning to an approach known as anti-theft security system to prevent thieves from taking their vehicles. As a result, this system is concerned with the design and implementation of a security system that uses GSM technology to prevent automotive theft. We will demonstrate a paradigm of a real-time anti-theft security system that can be easily constructed by car owners all around the world in this project. A GSM service and a microcontroller are used in this scenario. The password is input as a security option, and if it is approved, the door is unlocked. Face recognition is an instant security feature that analyses the driver's face to a pre-defined database and starts the ignition procedure if they match. In the event that the foregoing process fails, a smart SMS will be sent to the authorised individual.

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Introduction:-

Automobile thefts are on the rise at an alarming rate all around the world these days. Everyone's security could be a major worry. We tend to discover answers to those difficulties by applying image processing. Image processing is defined as a method of performing operations on a photograph in order to improve the image/picture or extract relevant information from it. Image processing is a type of signal processing in which the input is an image and the output data is either an image or image attributes. Image processing is one of the newest technologies to emerge in recent years. Engineering and computing disciplines comprise a core research field.

The following three steps make up the majority of picture processing:
1. Importing the image using image acquiring tools;
2. Analyzing and altering the image;
3. During the outcomes process, the outputs are frequently updated images or reports that could be based on image analysis.

Analog and digital image processing are the two types of techniques used to process the picture/image. For tangible copies such as photographs and prints, analogue image processing is frequently used. While using these visual techniques, image analysts use several translation fundamentals. Digital image processing techniques make it easier to manipulate digital images using computers. The three general processes that each type of information must go through while employing digital technology. The retrieved data is pre-processed, improved, and displayed using these procedures.

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Problems and Challenges:-

On a variety of face recognition tasks, industrial product developers and computer vision researchers have improved the performance of algorithms for automatic face recognition. As a result, humans currently perform face recognition tasks in real-world security situations, but it's unclear whether using algorithms improves security or puts people at greater risk. The very important challenge in the detection and the recognition of face is that the capacity to handle the entire situation. Actually so many different factors will change the looks of the face. Within the facial look the sources of variation may be classified into 2 pair: One is Intrinsic factors another is extrinsic.

1) Intrinsic factors: are determined only by the physical characteristics of the face and are unaffected by the observer. Age, facial traits, and so forth are some examples.

2) Extrinsic factors: - produces changes in the appearance of the face due to the interaction of light with the face and the observer. Pose, scale, and illumination are among these elements.

Proposed System:-

Over the last few years, many anti-theft technologies have been installed. The key will be used to turn the car on and off, as well as to turn the door locking system on and off. Flashing light methods, car alarms that use various types of sensors such as door and tilt, pressure, and shock sensors are examples of existing automotive anti-theft framework. There are a number of remote-controlled security systems in this area that keep the key away. When the car is taken, auto frameworks for the vehicle will be established via controller. Vehicle-to-vehicle communications should be secure.

The keys that come with existing systems are completely eliminated in this system. Face recognition is a more advanced aspect of the proposed system, which provides great security and eliminates the need for a key. The owner authorises access to the car. This study can improve critical parameters in real time and generate alerts at the highest level of efficiency. We use a door password as the first step and face recognition as the second phase in this anti-theft security system, along with a short sending message that says "someone tried with the erroneous password." Please double-check!' The proposed system displays a real-time anti-theft security system that may be simply implemented by car owners all around the world. A GSM service and a microcontroller are used in this prototype.

The security system implements the two steps.
1. The door is unlocked using a password.
2. The driver's face is recognised.

The 4x4 matrix keypad is used to open the door in the first phase. The person attempting to open the door enters the secret key, which is compared to the existing password stored in the database. The anti-theft system recognises the individual as an authorizedperson if the password matches the one saved. When a person or an authorised person enters the vehicle, the second section of the security system is activated. The person who is seated in the driver's seat will be apprehended. The person's taken image will be compared to a database-stored predetermined image. The ignition is triggered if the image taken is coupled with the predetermined image. If this test fails, the person will be marked as Unauthorized, and an email with the Intruder Image will be sent to the owner right away. If the invader is a friend or relative, the owner can send a message to the controller like "allow" to allow that person in. If he refuses to allow, a "stop" message will be issued to him.
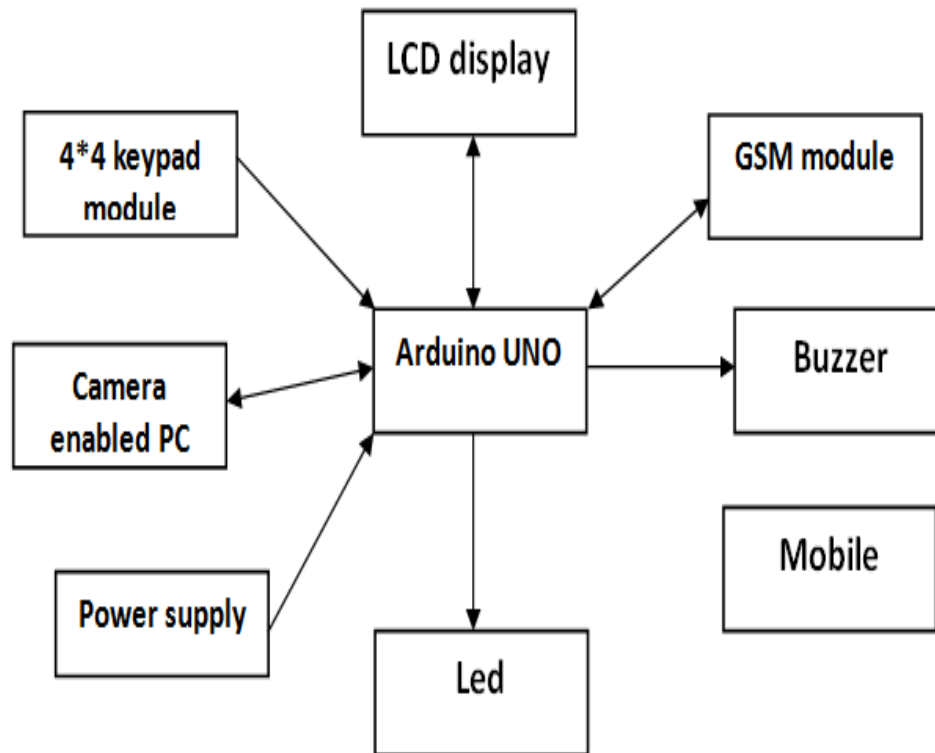
System Design:-

Fig1:- System Architecture.

1. Keypad Is Used For Entering The Password.
2. The Messages Will Be Displayed On LCD.
3. Gsm Is Used For Communication That Is Used To Deliver Messages To The Mobile.
4. Power Supply Is Used To Run The System.
5. Microcontroller Is Used To Perform Specific Task.
6. Camera Is Used To Capture The Image.
7. Buzzer Is Used To Beep For False Condition.
8. Led Gets On When Ignition Starts.

ALGORITHMs Used:-

Matrix Keypad Algorithm:
At first, all of the switches are presumed to be turned off. As a result, there is no link between the columns and the rows in this case. So, when any of the switches is pressed, the associated columns and rows are connected (means short circuited). As a result, the column pin will become low, despite the fact that it was previously high. The key pushed could be identified using this method.

Local Binary Pattern
Face recognition is a difficult task since the face of an unknown individual viewed during the extraction phase differs significantly from that seen during the classification phase. We used the LBP methodology to implement facial recognition in this project. LBP usually works on the image's local features when using the LBP operator. This operator explains a picture's unique local structure. A number of comparisons are conducted based on the brightness of pixels between the centre and its relative 8 surrounding pixels in a Local Binary Pattern. The following formula is used to do a local binary pattern comparison:

$$LBP(x_c, y_c) = \sum_{n=0}^{7} s(i_n - i_c) 2^n$$

In which ic is a value that converts the value of pixels surrounding by eight directions into the value of pixels corresponding to the centre of the pixel (xc,yc). It is used to determine the local features of a face and works by employing the LBP operator. The imported feature matrix is initially 3*3, and the resulting values are compared to the matrix's centre pixel, after which the binary pattern code is obtained, and the LBP code is formed by converting the binary pattern code to a decimal number.

Result and Discussion:-

The GSM module is used to access cars using a face recognition technology. The technology is simple to install in any vehicle and can deliver accurate results in any situation. The use of a GSM module will notify the owner of a burglary in the event of theft. Figure 2 depicts the suggested system's model.

Fig.2:- Prototype.

When the client wishes to get inside the vehicle, he or she will ask for the secret code, as shown in Figure 3. If the secret code entered is accurate, the system will open the door and display pass acknowledged, as seen in Figure 4.

Fig.3:- Display device to enter password.

Fig.4:- LCD display as pass accepted.

After the door has successfully opened, the following step is to activate the face recognition system in order to gain access to the vehicle. If the secret code is incorrect, the LCD will display "wrong password" as illustrated in Figure 5. In addition, a prepared message would be provided to a proprietor as an unapproved is attempting to use, and finally, a smart SMS would be sent to the phone number, as shown in Figure.6.

Fig.5:- LCD display as invalid password.

Fig.6:- Theft alert Message.

So, whatever trial outcomes we achieved, they satisfy the framework's requirements. The main goal is to protect the vehicle from robbery by using a secret word and then using OpenCV to recognise the face. To recognise the face contrast with the prepared image, the Face Recognition System waits for the input face as shown in Figure.7.
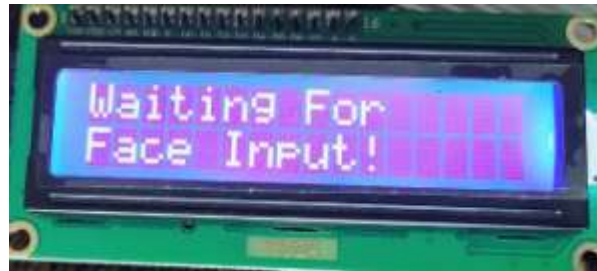

Fig.7:- Waits for the input image.

If a face-containing image is linked with a specified image, as shown in Figure.8, the engine will turn on as shown in Figure.9.
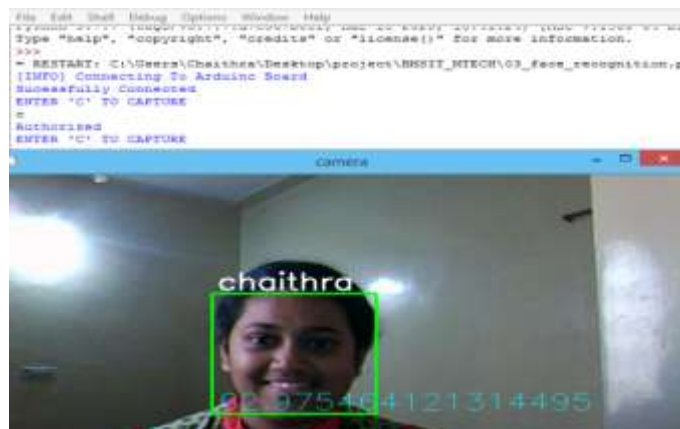

Fig.8:- Face Recognition output when paired.

Fig.9:- Ignition started after Recognition.

If a driver's input face does not match any of the predefined images stored in the database, the message is displayed on the LCD as shown in Figure.10, and an alert Email message with that intruder image is sent to the proprietor (owner) as shown in Figure.11, allowing the owner to easily identify the thief.

Fig.10:- Face does not match with the database.

Fig.11:- Face Recognition output when not matched with the database.

The FRS, which makes use of OpenCV libraries, allows clients to learn more about a visitor than just a notification left by the visitor. This framework has been successfully deployed in a real-time context, with the ability to record an image that appears ahead of the camera in less than 10 seconds.

Conclusion and Future Work:-
Conclusion:-
Face recognition is an important but difficult approach for recognising people. The proposed method has been established for all sorts of vehicles and can be utilised wherever where facial recognition is necessary. This proposed framework reduces the current high number of vehicle thefts. It is quite dependable when compared to traditional automotive frameworks. Because of the outside lightning circumstances, face recognition has a significant chance of being questionable. As a result, we're relying on histograms and the LBP method, which has a minimal impact on the external world. Using an OpenCV and an Arduino UNO Microcontroller, a stunning person detection and recognition system is presented. To deal with each aspect of the fundamental picture, the suggested face detection technique relies on simple cascade classifiers. The complete framework's structure is divided into two sections: software and hardware.

The framework included second confirming or validating procedures, such as adding the owner's secret code to allow others to obtain the owner's permission to use the car. The protection elements for the liability and stability of human face recognition were greatly improved in this. The FRS innovation allows clients to track down visitors without relying on the visitor's notification. This framework has been successfully deployed in a real-time context, with the capacity to capture a picture that appears in front of the camera.

Future Work:-

The proposed system will achieve great efficiency by increasing the GSM baud rate to a high level, as well as the GPS module for co-ordinates. It is also clear that while the results achieved from the system of face recognition are satisfactory, there is room for future improvement. The main change can be found in the exhibitions and the apparent continuous facial recognition. With the final objective in mind, the development of a programme for facial image recognition, as well as the tidying up/neatening of the software, must be done. When comparing a face image to a database, a number of issues arise, including illumination, changes in expression, age fluctuations, and facial obstructions. To provide a more unified system, video-based face recognition, edge determination based on quality, posture correction based on stamp coordinating methods, and maturing correction have all been combined.

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