

IMPLEMENTATION OF FACE RECOGNITION METHOD FOR VEHICLE SECURITY

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Abstract

In the present scenario, standard of Automobile sector is evolved with smart system. The manufacturing of automated vehicle and its usage are increasing day by day. On the other side number of vehicle security related issues are also increasing. Now Vehicle security is the major challenge for manufactures. So, Vehicle Security is a vital aspect in the modern automobile sector. This paper proposes a real time vehicle security system by using face recognition method. In order to provide security to the vehicle, this proposed work, has been developed and implemented. The valid user authentication is done by face recognition method. The vehicle ignition unit will be activated only for authorized person. When unknown person tries to access the vehicle, the proposed system prevents the unauthorized entry and sends alert information to the owner of the vehicle through GSM module. This vehicle security system has been designed by using artificial neural network, ARM processor and GSM module.

Keywords: Artificial Neural Network; ARM Processor; Face Recognition; GSM Module.

I. INTRODUCTION

Nowadays, the use of motor vehicles have been increased and it becomes important everywhere. Vehicle theft cases are also getting increased than any other time. It is important to safe guard the vehicles. For this purpose, many security systems are developed to protect vehicle from theft. So we are in the need to design and prevent unauthorized access to our vehicle for security purposes. Initially, the real-

time car lock security system was proposed using principal component analysis (PCA) algorithm and Skin color detection [1], and the authentication was done by the skin color based face detection. The car security system with geological location information was introduced. The MATLAB code was used for image processing and embedded system was used for sending geological location [2]. The low cost automobile safety system was introduced by using OpenCV tool [3]. The biometric technology was used for the vehicle security system to increase its safety level. The facial recognition using fisher face method was implemented [4]. A real time vehicle security system has been developed and implemented in the proposed work. The proposed security system will ensure that only recognized person will be allowed to use the vehicle. Thus the vehicle is protected from unauthorized entry. Face recognition method prevents any unauthorized access, and sends the alert information to vehicle owner, through GSM MODEM and its operation is similar to mobile phone. GSM MODEM can be activated with SIM (Subscriber Identity Module) card and also it has IMEI (International Mobile Equipment Identity) number for identification [4].

II. METHODOLOGY

The block diagram of the proposed system is shown in the fig.1. It consists of ARM processor, GSM module, face recognition module, Input image capturing module and vehicle ignition module.

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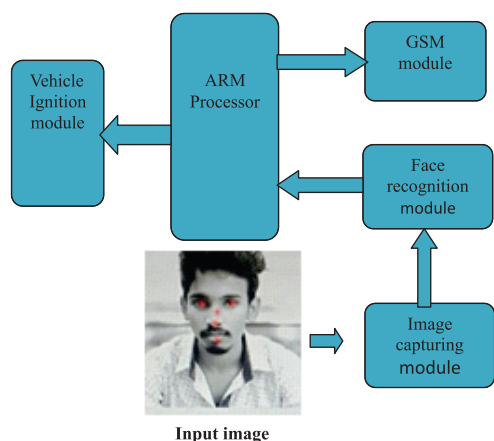


Fig.1. Block diagram of proposed system

The image is done by camera and captured image is fed as an input image to face recognition module. The face recognition is performed by MATLAB tool. The input image is processed and compared with data base image which are already stored in the database. If the vehicle user is an authorized person, then face recognition module will send an authenticated signal to the ARM processor. The Arm processor issues the control signal to enable vehicle ignition module and also sends the SMS alert to the owner of the vehicle through GSM module.[5] If the vehicle user is an unauthorized person, then face recognition module will send an unauthenticated signal to the Arm processor. The ARM processor disables the ignition module. The image of the unauthorized person will be sent to the vehicle owner and the vehicle cannot be operated. The ARM processor interconnects software and hardware platforms. GSM module consists of GSM MODEM and is used for performing wireless communication between security system and cellular network.

III. FACE RECOGNITION MODULE

The major part of this proposed work is face recognition. It is performed by using simulation software, MATLAB with image processing tool box.[6][7]. The image of the person who is trying to enter into the vehicle is processed by MATLAB tool and the classification is done by using feed forward neural network classifier. The feed forward neural

network algorithm has been used for face recognition. The process flow of face recognition module is shown in the fig.2. When the vehicle user tries to access the vehicle, the user image is captured by the camera. When an image is captured by the camera it will be sent to face recognition module for processing. It involves pre-processing, feature extraction, face detection and comparison for authenticated output.

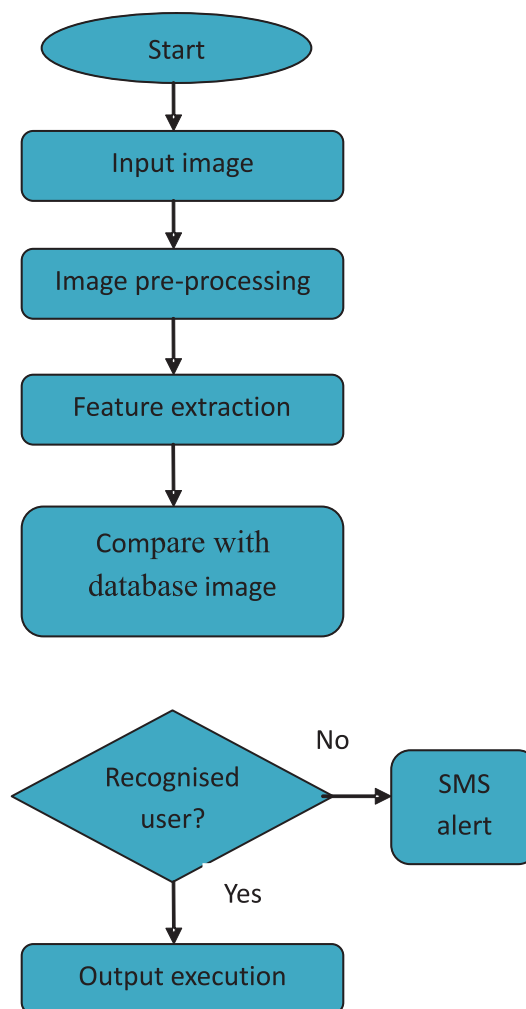


Fig.2. Process flow model of face recognition module

The feed forward Artificial Neural Network Algorithm has two phases, Train phase and Test phase. First the samples are collected and the sample data set is stored in database.[8] The proposed algorithm is applied on the data set and the algorithm is trained with the available data set. This procedure is called Train phase. During test phase, Facial features are extracted, and compared with features of stored

data set. Based on the features the recognition is done. The algorithm is validated using performance metrics. Facial feature extraction is vulnerable to noise. There are several methods are used for feature extraction, such as Geometric model, colour segmentation based method and appearance based method. The most commonly used method is geometric model based feature extraction method where the geometrical shape of the face image is considered for feature extraction.[9]

IV. HARDWARE MODULE

The hardware module has ARM processor, GSM module and vehicle ignition module. The overall operation of the proposed system is controlled by ARM processor.

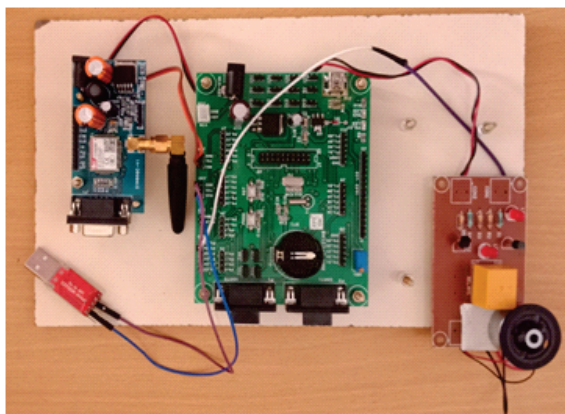


Fig.3. Prototype model of proposed system

The Prototype model of proposed system is shown in the fig.3. When unknown person tries to enter into the vehicle, the proposed system will turn-off the vehicle ignition module.

V. RESULTS & DISCUSSION

The authorised person’s image is stored in database initially. If someone enters into the vehicle, their image is captured by the camera. Then the image is sent to the face recognition module. The features of a person are compared with data base and it verifies the new person’s image with the saved images. If the captured image is verified and authenticated, then the engine will be started by ARM processor and the person can access the vehicle. The fig.4(a)-4(f) are the output of face recognition module for an authorised person. This process has eyes detection, nose

detection, facial regions detection and then the facial features are extracted.

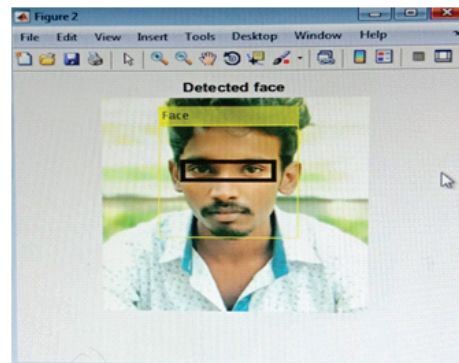


Fig.4(a)

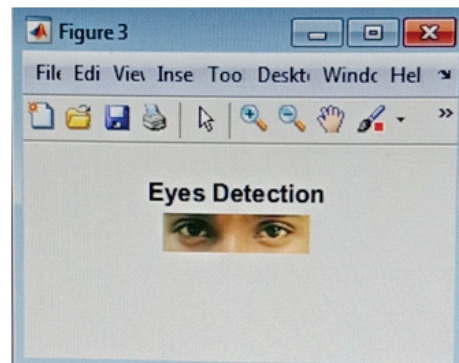


Fig.4(b)

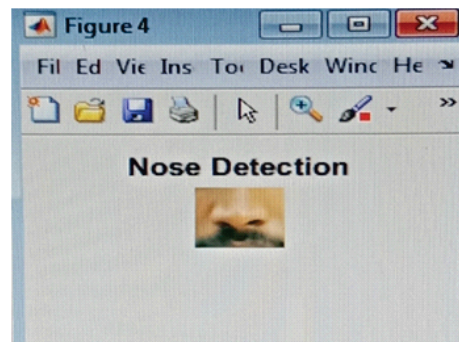


Fig.4(C)

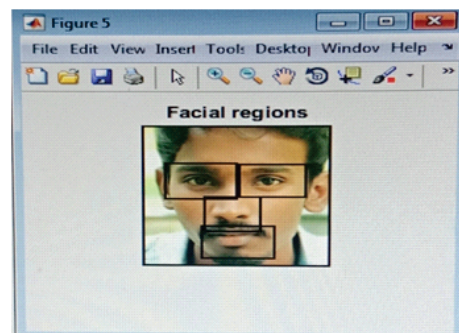


Fig.4(d)

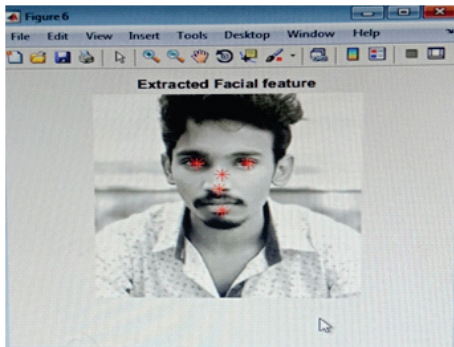


Fig.4(e)

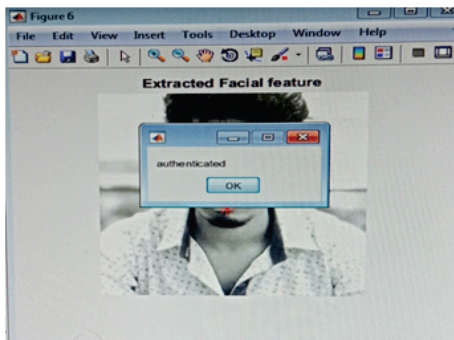


Fig.4(f)

Fig.4(a)-4(f) Simulated output for Authentication

In output, the fig. 4(a) shows the captured image of a person whose face is detected and checked whether it matches with database image or not. If that process is done then it moves to the next process, In that next step the persons eyes are detected as shown in fig.4(b). In fig.4(c) the persons nose is detected and verified. Then the facial regions like eye,nose,mouth are checked as shown in fig.4(d). In fig.4(e) the facial features are extracted. The extracted facial features are eyes, nose and mouth.Finally the process confirms that the features matches with the data base image,then the simulated output has been authenticated, as shown in fig.4(f)then the system turns on the ignition system,then the authorised person can access the vehicle.

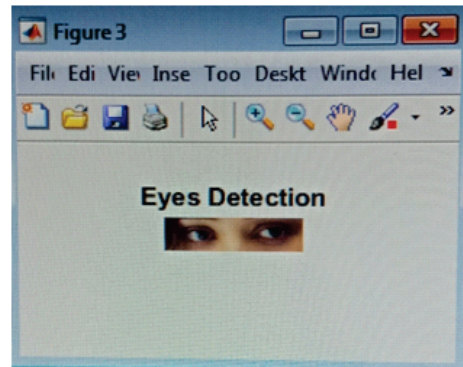


Fig.5(a)

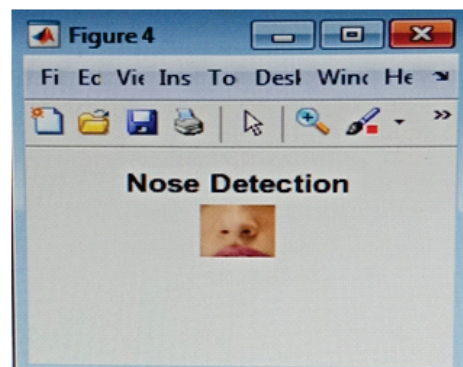


Fig.5(b)

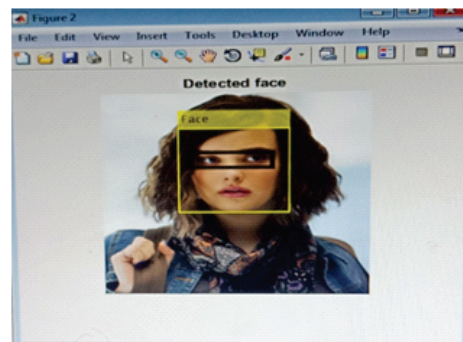


Fig.5(c)

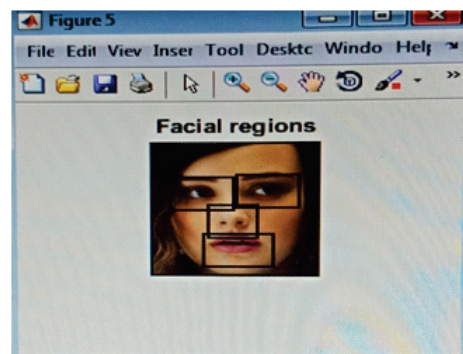


Fig.5(d)

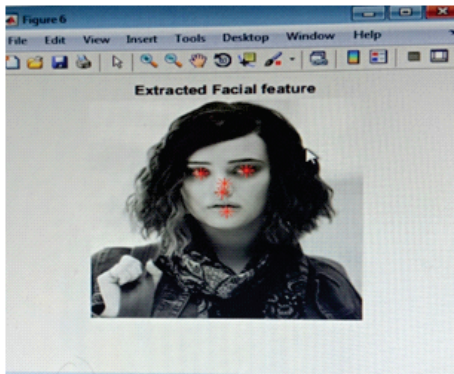


Fig.5(e)

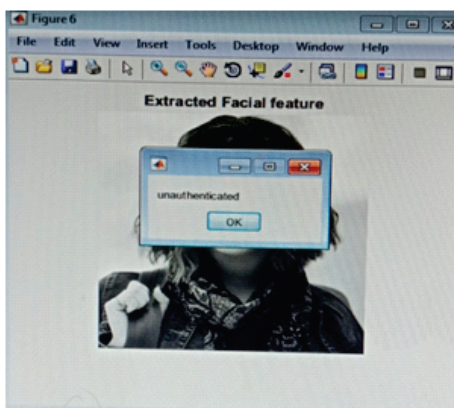


Fig.5(f)

Fig.5(a)-(f) Simulated output for unauthentication

The fig.5(a)-(f) shows the simulation results for unauthorised person. If the captured image does not match with the database image, then the simulated output will be unauthenticated and the person cannot access the vehicle.

In output, the fig.5(a) shows the eyes detection, and nose detection is shown in the fig.5(b), in the next step face is detected and shown in the fig. 5(c). Then the facial regions like eyes, nose and mouth are checked as shown in the fig.5(d). Then the facial features are extracted and is shown in the fig.5(e). Finally the process confirms that the features do not match with the data base image, then the simulated output has been unauthenticated, as shown in fig.5(f) then ignition system can't be turned ON. So the unauthorised person cannot access the vehicle.

Then the alert message has been sent to the owner of the vehicle through GSM modem.

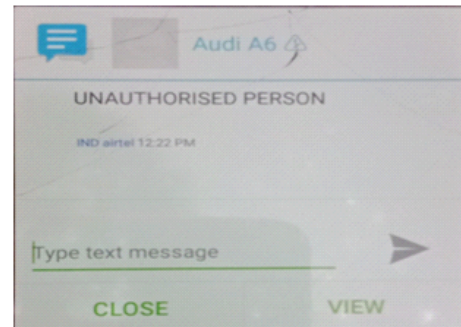


Fig. 6. Received Message in mobile phone

The fig.6 shows the received message of the vehicle owner, when the unauthorised person tries to access the vehicle.

VI. CONCLUSION

Vehicle security is the one of the emerging fields in the present days. The vehicle usage is increased day by day and thereby security requirements have also increased. The proposed system gives a solution for vehicle security issue by image based authentication using facial recognition method. The feed forward neural network has verified the user authentication. When an unauthorized person tries to operate the vehicle, the proposed system sends alert information to the owner through GSM and also deactivates the ignition module. This proposed security system will be helpful to the society and provides smart and safe environment.

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