

## ANN BASED VEHICLE SAFETY SYSTEM USING FACE RECOGNITION

### APPROACH

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### ABSTRACT

In recent years, computer vision has played a significant role in biometric identification and user recognition. Biometric identification based security systems are considered to be the most secure especially due to their ability to identify people with minimal ambiguity. Based on this information in the present work, authors applied the artificial intelligence system to develop a face recognition technique based vehicle safety model.

*Keywords: Vehicle safety system, ANN, Face recognition system*

### INTRODUCTION

These days, a vehicle security framework has ended up a fundamental portion for all vehicle proprietors because it guarantees the security of their resources. This framework is vital as the vehicle is a costly resource so the misfortune due to burglary cannot be compensated. Innovations for vehicle security frameworks are created exceptionally quickly each year these days. These security frameworks control and oversee nearly those gadgets where the security issue is the best need [1-4].

A critical perspective in progress independent vehicles is the security framework. Security framework plays an imperative part in vehicle security framework, particularly in case of burglary and an authorized individual [5]. These days, conventional security frameworks such as code sticks, and ID cards, are exceptionally well known in numerous nations. Be that as it may, conventional security frameworks have the potential to be misplaced, stolen, or replicated [6, 7]. In expansion, numerous activity mishaps are for the most part due to robbery due to youthful drivers and vehicle security framework. Based on these circumstances, a security framework able of avoiding car burglary is fundamental.

One of the arrangements to the issue is to actualize a security framework that's as if it were competent to be enacted by an authorized individual. The biometric recognizable proof framework is one of the arrangements to authorize the individual. The biometric distinguishing proof framework is one of a kind

and individual which is exceptionally well pertinent for distinguishing proof of a person. There are numerous distinguishing proof frameworks based on biometrics, such as a person's confront, unique finger impression, signature, and eyes. Biometric verification alludes to the arrangement of personality based on physical and behavioral characteristics of an individual such as confront, unique mark, hand geometry, iris, keystroke, signature, voice, etc. [8, 9]. Biometrics frameworks have focal points, they cannot be misplaced or overlooked; Biometric characteristics are troublesome to duplicate, share and convey; And they require individuals who are affirmed to be displayed at the time and put off confirmation [10].

Computerized picture handling could be a strategy utilized to change over a picture into an advanced organize to perform a few operations on a picture. A few of these operations are utilized to upgrade picture highlights such as sharpness, differentiation, highlight, analysis, optimization, and extricating various useful information from the picture. It could be a sort of flag handling in which the real picture serves as the input and the yield can be a picture or include related to that picture. With regard to industry, advanced picture preparation is one of the developing innovations for its application in a wide assortment of areas. It is broadly utilized in the therapeutic fields such as analyzing medical images to discover the cause of malady and a few other inquires. It is additionally utilized in application computer programs for altering such as Microsoft Paint, Adobe Photoshop, Picasa, and Prisma. One of the multinational innovation companies employments advanced picture handling applications for the center security highlights of its gear. In terms of security measures, the proposed progressed framework gives a moved forward security framework for in part computer-based vehicles. The progressed framework employments facial acknowledgment to recognize authorized clients of the vehicle. When the client begins the vehicle, the progressed framework will be activated consequently. The progressed framework authorization will at that point give three alternatives for the client which are to begin the vehicle, enroll or include modern users/drivers, and erase the client or clear all information. The client will be, to begin with an inquiry to enter the title and filter the user's confronted, after effective enlistment and approval the client can presently begin the vehicle. So, in case unauthorized faculty attempt to get to the vehicle, the progress framework will filter the confront of the individual and check the database to see on the off chance that the picture matches that of the enrolled client of the vehicle. On the off chance that the checked picture does not coordinate, the alarm/buzzer will go off and caution the adjacent individual that somebody is attempting to take the vehicle. To address these issues, within the display work, the creators connected fake insights frameworks to create facial acknowledgment innovation-based vehicle security models.

## METHODOLOGY

Within the present work, test pictures are utilized as crude for confront acknowledgment framework. These images were taken by employing a camera. These test pictures are utilized in preparing the proposed show to distinguish how the proposed framework act when comparing identified picture with test pictures. For this reason, 10 test pictures from two diverse individuals are taken. A general show of the proposed car security reason based on confront acknowledgment framework. After capturing the test pictures, the comes about of the proposed confront acknowledgment framework is at that point utilized as input to Arduino to trigger the transfer. From that point, the associated hand-off will directly turn on the vehicle. In arrange to realize the objective of this work. The assenting technique for this work appears in Fig. 1.

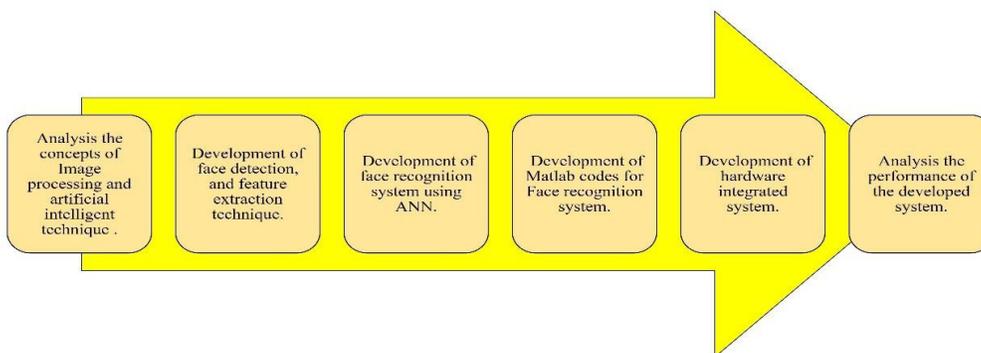


Fig.1 Adoptivemethodologyofpresentwork

## FACERECOGNITIONTECHNIQUES

Picture procurement handle comprises taking the picture by utilizing the camera. At that point, the picture will be extricated by including extraction. In this preparation, the extraction information is utilized as input to the confront acknowledgment portion. At last, the confront acknowledgment to do the preparing handle to acknowledgment the individual based on their confront. At first, the picture is taken from the camera sensor, and the confront picture is recognized based on Viola-Jone's strategy. Position discovery is the foremost successful in frontal pictures of faces. At that point, Division preparation utilizing the Canny Edge strategy is performed. Generally recognized as the leading 'all round' edge location strategy created to date.

## ARTIFICIALNEURALNETWORK

In recent years, the attention of researchers has been a substantially increased in artificialneural networks (ANN's) for solving problems containing complex, non-linear, ill-defined orincomplete

information. ANN's are able to learn from examples, so they can handle noisy and incomplete data. Trained networks can be used for high-speed prediction and generalisation of non-linear complex problems. ANN's are robust in nature and behave like the institutional nature of the human mind. These networks are not only used in the area of engineering but also in social science, management and humanities. They have a wide range of applications in the different sectors of engineering such as robotics, machine learning, manufacturing, process optimization, control systems, power systems and pattern recognition etc. The neurons of an artificial neural network are inspired by a biological neuron of the human brain. The main function of the neuron is to receive the coded information from the synapses towards the axon and transmit to the other neurons. These receiving and transferring tasks are performed through the electrochemical media or neurotransmitters. It has been estimated that the human brain has almost 100 billion neurons and each neuron is interconnected with 10,000 other neurons.

An artificial neural network (ANN) is a type of computing system which simulates the pattern of knowledge transfer of the human brain through artificial neurons. A basic model of an artificial neuron is shown in Fig. 2. In this model, inputs, outputs, non-linearity function and produced signal are represented by  $X_i$ ,  $O_i$ ,  $f_i$  and  $R$  respectively.

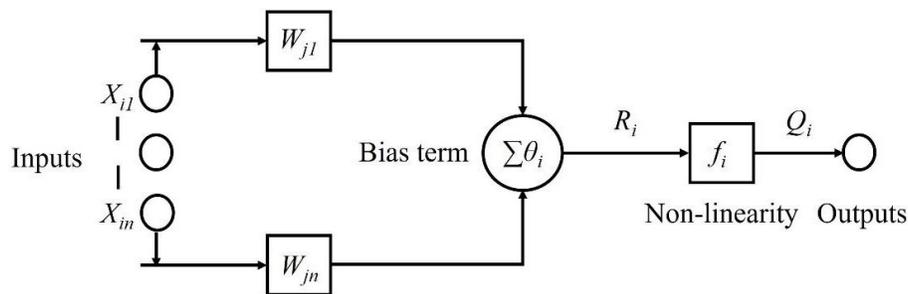


Fig.2 Model of artificial neuron

## RESULTS & DISCUSSION

### Development of ANN Model

A square graph of the proposed strategy of the confront acknowledgment framework is displayed in Fig. 3. Within to begin with arranging, each confronts picture is computed, and include vectors are shaped from the discrete cosine change coefficients. The moment organizes employments a self-organizing outline (SOM) with an unsupervised learning method to classify vectors into bunches to recognize if the subject within the input picture is "present" or "not present" within the picture database. In the event that the subject is classified as a display, the most excellent match image found within the preparing database

is shown as the result, else the result shows that the subject isn't found within the picture database. Within the proposed framework a camera is utilized to capture and follow the pictures of individuals.

The captured face image, then processed in an intelligent face recognition system which will recognize the person's identity based on his/her Face. Recognized faces are then used as an input to the microcontroller device. In this system, all of the face data processing and face recognition algorithms are implemented using MATLAB.

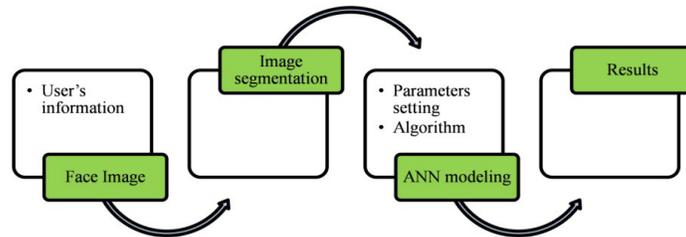


Fig.3 Image Processing based Authorization.

The network used here contains N nodes ordered in a two-dimensional lattice structure. In these cases, each node has 2 or 4 neighboring nodes, respectively. Typically, a network has a life cycle of three phases: the learning phase, the training phase and the testing phase. During the learning phase, the neuron with weights closest to the input data vector is declared as the winner. Then weights of all of the neurons in the neighborhood of the winning neuron are adjusted by an amount inversely proportional to the Euclidean distance. It clusters and classifies the dataset based on the set of attributes used. The learning algorithm is summarized in Fig.4.

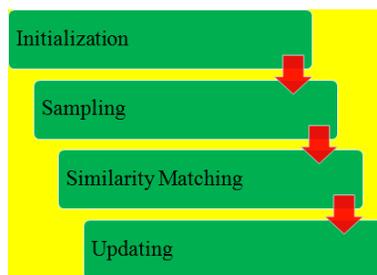


Fig.4. Learning algorithm steps of unsupervised learning

Thereafter, training images are mapped into a lower dimension using the network and the weight matrix of each image stored in the training database. During recognition trained images are reconstructed using weight matrices and recognition is through untrained test images using Euclidean distance as the similarity measure. Training and testing for proposed system was performed using the MATLAB codes.

Further, training of proposed system is performed. During the training phase, For each node, the number of “wins” is recorded along with the label of the input sample. The weight vectors for the nodes are updated as described in the learning phase. By the end of this stage, each node of the network has two recorded values: the total number of winning times for subject present in image database, and the total number of winning times for subject not present in image database.

During the testing phase, each input vector is compared with all nodes of the network, and the best match is found based on minimum Euclidean distance. The final output of the system based on its recognition, displays if the test image is “present” or “not present” in the image database. The pseudocodes of developed network are listed below:

```
clear all; close all; clc;
if ~exist('main.m')
    fprintf('You must navigate to the folder which contains main.m\n');
    fprintf('Use dir command to make sure you are in the correct folder.\n');
    fprintf('Use cd command to navigate to the folder.\n');
    return; end
if ~exist('./data/gabor.mat','file') run('include/createGabor.m');
end
if ~exist('./data/net.mat','file') run('include/menuCreateNetwork.m'); end
if ~exist('./data/imgdb.mat','file') run('include/menuLoadImages.m'); end
end
while(1==1)
    choice = menu('Face Detection',... 'Create Database',... 'Create Network',... 'Train Network',... 'Test on Photos',... 'Exit');
    if(choice==1) run('include/menuLoadImages.m'); end
    if(choice==2) run('include/menuCreateNetwork.m'); end
    if(choice==3) run('include/menuTrainNetwork.m'); end
    if(choice==4) run('include/menuScanImage.m'); end
    if(choice == 5) clear all; clc; close all; return; end
end
```

In order to evaluate the effectiveness of the proposed system based on face recognition system using ANN as shown in Fig. 5.

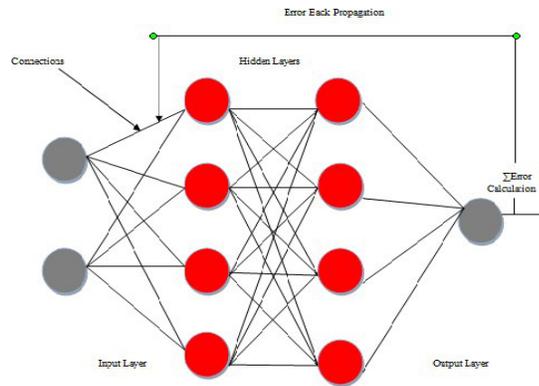


Fig.5 Structure of ANN system

In this proposed framework, captured pictures are taken as input neurons in terms of the quality of pixels and contrast. Accepting the inputs shapes the primary step within the following handle. A PC is utilized in getting the inputs that's the video pictures and changes over them to outlines. These changed over outlines of video pictures are at that point utilized in closer view discovery. In arrange to check whether the person pixels of a specific video outline have a place to the foundation or frontal area, the closer view locator performs a comparison of the color or grayscale of that specific video outline with a foundation show. It at that point computes a frontal area veil. Given an arrangement of either gray-scale or color video outlines, the closer view locator computes the closer view cover utilizing Gaussian Blend Model (GMM). GMM is utilized to identify the closer view which makes a difference within the transformation of closer view cover to twofold arrange. Gaussian Blend models are shaped by combining multivariate ordinary thickness components. These are regularly utilized for information clustering. These binary images that are reproduced as output by foreground detector is subjected to filtering.

The experimental evaluation reveals that there is a considerable drop in false positive per frame and increase in true positive rates. True positive rate is defined as the ratio of detected vehicles to total number of vehicles. False positives are a factor that is employed in the estimation of false detection rates. False detection rate is defined as the ratio of false positives to the sum of detected vehicles and false positives. These two parameters are thus involved in estimating the performance, efficiency and linearity of the tracked regions. This work is implemented using MATLAB version R2017a, which is a numerical computing environment and fourth generation programming language. This most recent version of MATLAB employs computer vision system toolbox. This toolbox offers tools and algorithms for the simulation and design of video processing systems and computer vision.

It also includes systematic procedures for detecting the motions, extracting the features, object detection and tracking, video processing and analysis, stereo vision etc. For swift prototyping and embedded system design, the system toolbox bears fixed point arithmetic and C-code generation unit. During network training it has been observed that the training error falls to zero with 1000 iterations, this merely reflects that the network can perfectly classify the set on which it was trained, not a true indicator of real performance. As graph shows that the recommended number of iterations, 500, is a good choice. Figure 6 shows the linearity plot of the developed network. It shows that the coefficient of determination is 1 and the developed model can be used for further application.

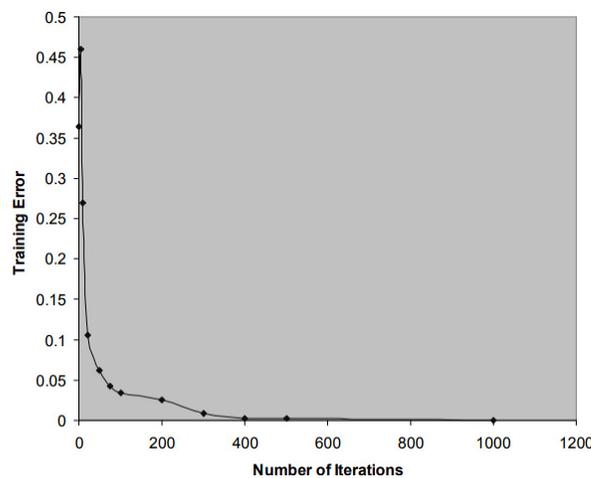


Fig. 6 The affect of increasing the number of iterations on training error

## CONCLUSIONS

In the present work, an ANN based model has been developed for vehicle security system. For this purpose, an ANN model has been developed using face recognition technique. Moreover the performance of developed model has been also analyzed. A feed forward backpropagation neural network has been employed for the same. After the execution of network it gave the value of coefficient of determination is 1, which shows that developed model is significant.

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