

Face Recognition Based Door Lock System

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ABSTRACT

Today we deal with safety and safety problems in every element. So, we have to deal with these problems by utilizing upgraded innovation. In this job, we are utilizing the Deal with acknowledgment component to catch human pictures and to suit with kept data source pictures. If it suits with the licensed individual after that the system will open the door by an electro-magnetic secure. The require for face acknowledgment system that's quick and precise that constantly enhancing which can spot intruders and limits all unapproved individuals from extremely protected locations and helps in reducing human mistake. Deal with acknowledgment is throughout a one amongst the primary Protected System compared to biometric pattern acknowledgment method which is utilized in a big range of applications. The moment and precision element are considered regarding the primary issue which defines the efficiency of automated deal with acknowledgment in real-time atmospheres. Different services have been suggested utilizing multicore systems. By thinking about today difficulty, this offers the total building develop and suggests an evaluation for a real-time deal with acknowledgment system with Ficherface formula. In this formula, it transforms the picture from shade to greyscale picture and splits into pixels and it'll be assigned throughout a matrix develop and people pictures will be kept in the data source. If a photo is spotted after that microcontroller will send out power to the electric motor chauffeur system after that the electro-magnetic secure will open the door and it'll secure once again when there's no power provide to that system. Lastly, this paper wraps up for the progressed applications accomplished by incorporating installed system designs versus the convention.

Keywords : Biometric Pattern, Electro-Magnetic, Microcontroller

I. INTRODUCTION

In this new era of technology where people always try something new to make our life easier and for that

we invest a lot of our capital and to protect all this we require a strong security management system that should not require contious monitoring from human and should be self servelance. Security is our right

which no one can deny and justify, which requires lots of works and researches. where security is much more important than anything and lock or other traditional ways of locks are not that successful at present date as digital locks provides sense of information and allows to increase the security to next level security helps us to improve our standard of living.

Face recognition and detection is like an ocean of research and innovation, at present with the applications of image analysis and algorithm-based understanding. Face Recognition based door lock system we have proposed system. Facial recognition involves the detection and identification of the image. It uses an image capturing technique in the system using Fisher face algorithm.

The Raspberry pi camera catches the live facial picture and compares it with the images which is stored in the database and provide a quick response time, it is just as polishing or brushing up the security of an organization to another level. The proposed work "Face Recognition based Door lock" will work as a technique which will be integrated on the door, of the room which we want to be secured. The objective of facial recognition is finding a series of data of similar faces in a set of training images in to the database from the input image, If the image captured will match to any of the image stored in database, then the door will be unlocked else it will remain lock.

BLOCK DIAGRAM

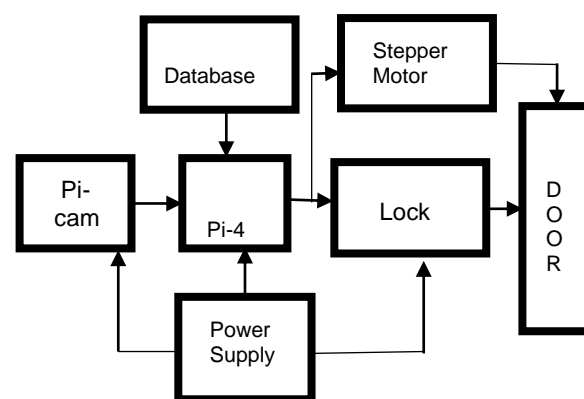


Fig 1. Block diagram of proposed system

II. LITERATURE SURVEY

Face recognition system are used for Once many decades. it's gained popularity thanks to its applications. [1] designed deal with acknowledgment system utilizing Eigenfaces method that was initially designed by Sirovich and Kirby. This was an advancement for Deal with acknowledgment system and because of this the base of Deal with Acknowledgment Formula was developed. They designed a close to actual time determining system which will spot and track a topics head likewise fete the individual by contrasting particular of deal with to people who are understood. [2] likewise suggested a deal with acknowledgment formula sustained Independent Element Evaluation. The PCA [5] formula is relaxed on the really truth that essential info of picture is included in support smart connection in between pixels whereas ICA is relaxed on the really truth that some essential info might likewise be included within the high- purchase stats. [13] have suggested deal with acknowledgment system utilizing customized ICA for much far better delicacy. [4] suggested a deal with acknowledgment system utilizing PCA to evaluate back Dimensionality and utilized neural network for brace. The neural network based deal with acknowledgment system are naturally influenced and birth like neurons of population which bring indicates from one location to a various. a little bit like neuron a perceptron

determines weighted amount on numerical inputs and identifies if an existing is honoured or otherwise and neural network needs great deal of computational work.

Thus from literary works inspect, it is remove that a great deal of formulas are suggested for deal with acknowledgment system. Therefore this paper suggests Deal with Acknowledgment System by incorporating 2 shown formulas for deal with acknowledgment system PCA and LDA. Both these formulas birth computation of Eigen Worths and Eigen Vectors. Jacobi system is utilized to determine the Eigen Worths and Eigen Vectors. The uniqueness of this method is to prolong acknowledgment price and decreases acknowledgment time. Any type of actual time procedure that requirements deal with acknowledgment system can utilize this method to create Deal with Acknowledgment System utilizing any type of bedded system.

III. PROPOSED METHOD

Camera pi module and implementation of face recognitions algorithm has been provided. In this system a Facial recognition-based door lock system is with the help of Raspberry pi 4B is proposed. And the proposed method for deal with acknowledgment system is fisher deal with technique which is developed to acknowledge the deal with picture by coordinating the outcomes of its function removal. To recognized the tested image is the expectation from the proposed system.

In this research, a data set of 100 facial image taken from 20 students where every student has several different pictures with various facial expression. As stated below proposed system consisting of three phases:

- 1] Input
- 2] Processing
- 3] Output

1]Input phase: -

Input aims to collect resource in the form of facial pictures. The face should be straight in front of camera and make sure that the face is not blocked by other objects. The collection of data is done by the Pi camera module.

1.1 Pi camera

In this proposed system the input data i.e., face images will be taken by the Raspberry Pi camera which is a compatible camera for Raspberry Pi. . All Raspberry Pi video cams can taking high-resolution photos, together with complete HD 1080p video clip, and can be completely regulated programmatically.

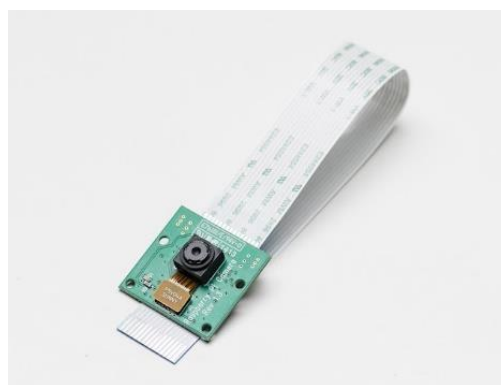


Fig 2. Raspberry pi camera

2] Processing phase: -

In the processing phase the data obtained in the form of face image is then transfer to the next module i.e., Raspberry pi.

2.1 Raspberry pi

The Raspberry Pi is a small device which has many applications and can used in many fields like IoT and automation. it can be programed and reprogramed by various languages like python. In this proposed system Raspberry Pi will take the input i.e., face image and process the given data as per the fisher face method.

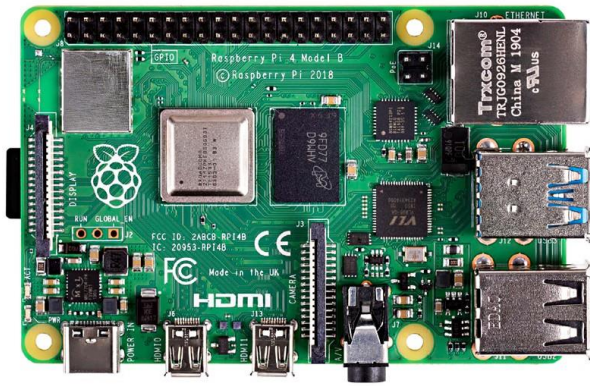


Fig 3. Raspberry Pi

The processing phase is split into 2 phases: preprocessing phase and refining phase that includes function removal and acknowledgment.

• Image Preprocessing

The facial picture which we are using should undergo first from the stage of preprocessing. and it consist of image acquisition and then converting a RGB image into black and white. Recognizing face with the help of camera. The picture of this purchase might be a 24-bit RGB picture of JPG style with dimension 92 x 112 pixels.

A deal with picture of RGB is exchanged 8-bit grayscale and BMP style with dimension 40 x 40 pixels. Additionally, the deal with information is divide into 2 components i.e., one a component of a component of the picture are most likely to be utilized as educating picture (educating dataset) and one section of the picture are most likely to be utilized as examination picture (screening dataset).

• Picture Processing

At this picture refining phase, Fisher deal with technique are most likely to be put on obtain function vector of face picture information utilized by system after that to suit vector of characteristics of training picture with vector particular of examination picture utilizing Euclidean range formula.

• Function generation procedure.

Functions to be drawn out might be a function of the deal with picture of people of Papua. the strategy utilized is fisher deal with technique might be a technique that is combine in between PCA and LDA techniques.

Let's see how the mentioned algorithm are utilized in the proposed system

PCA Algorithm

- Step1: prepares the training face obtained facial images E1, E2, E3....., En (training faces).

The deal with pictures should be cantered and of the dimension.

- Step2: prepare the information establish each deal with picture Ei in the data source is changed into a vector and put into a training sets S..

$$S = \{F1, F2, F3, F4.....Fn\}$$

In this instance N = 34. A collection is developed by a changed picture of dimension N*N. For simpleness, the deal with picture is presumed to be of dimension N * N leading to a factor in N² dimensional area. An ensemble of pictures, after that, maps to a collection

$$\text{of factors in this hugs area. } [I1] = \begin{bmatrix} c_0 \\ \vdots \\ c_{m^2} \end{bmatrix}, [I2] =$$

$$\begin{bmatrix} d_0 \\ \vdots \\ d_{m^2} \end{bmatrix}, [I3] = \begin{bmatrix} e_0 \\ \vdots \\ e_{m^2} \end{bmatrix}, [I4] = \begin{bmatrix} f_0 \\ \vdots \\ f_{m^2} \end{bmatrix}$$

$$[I5] = \begin{bmatrix} g_0 \\ \vdots \\ g_{m^2} \end{bmatrix}, [I6] = \begin{bmatrix} h_0 \\ \vdots \\ h_{m^2} \end{bmatrix}, [I7] = \begin{bmatrix} i_0 \\ \vdots \\ i_{m^2} \end{bmatrix}, [I8] = \begin{bmatrix} j_0 \\ \vdots \\ j_{m^2} \end{bmatrix}$$

- Step3: the typical deal with vector $\square(\rightarrow \top x)$ needs to be determined by utilizing the complying with formula:

$$\rightarrow_x = \frac{1}{X} \begin{bmatrix} c_0 + d_1 + \dots + n_1 \\ \vdots \\ c_{N^2} + d_{N^2} + \dots + n_{N^2} \end{bmatrix}$$

or written as $\vec{x} = \frac{\vec{c} + \vec{d} + \dots + \vec{h}}{X}$

• Step4: Calculate the covariance matrix we obtain the covariance matrix C in the following manner,

$$c_x = \begin{bmatrix} c_0 & - & x_0 \\ \vdots & \vdots & \vdots \\ c_{N^2} & - & x_{N^2} \end{bmatrix}, \quad d_x = \begin{bmatrix} d_0 & - & x_0 \\ \vdots & \vdots & \vdots \\ d_{N^2} & - & x_{N^2} \end{bmatrix},$$

$$e_x = \begin{bmatrix} e_0 & - & x_0 \\ \vdots & \vdots & \vdots \\ e_{N^2} & - & x_{N^2} \end{bmatrix}, \quad f_x = \begin{bmatrix} f_0 & - & f_0 \\ \vdots & \vdots & \vdots \\ f_{N^2} & \dots & x_{N^2} \end{bmatrix},$$

$$g_x = \begin{bmatrix} g_0 & - & x_0 \\ \vdots & \vdots & \vdots \\ g_{N^2} & - & x_{N^2} \end{bmatrix}, \quad h_x = \begin{bmatrix} h_0 & \dots & x_0 \\ \vdots & \ddots & \vdots \\ h_{N^2} & \dots & x_{N^2} \end{bmatrix},$$

$$i_x = \begin{bmatrix} i_0 & - & x_0 \\ \vdots & \vdots & \vdots \\ i_{N^2} & - & x_{N^2} \end{bmatrix}, \quad j_x = \begin{bmatrix} j_0 & - & x_0 \\ \vdots & \vdots & \vdots \\ j_{N^2} & - & x_{N^2} \end{bmatrix}$$

Or written as

$$\vec{X} = \begin{bmatrix} \vec{c} & - & \vec{x} \\ \vec{d} & - & \vec{x} \\ \dots & \dots & \dots \\ \vec{j} & - & \vec{x} \end{bmatrix} = \begin{bmatrix} c_x & d_x & \dots & j_x \end{bmatrix}$$

Step5: Calculate the eigenvectors and eigenvalues by using the method add to the matrix X. list the eigenvector then reduction with the PCA method or algorithm.

Given below are some example of training images using PCA algorithm



Fig 4. examples of training images

LDA Algorithm

Calculate the average of each authorize person

$$a = \frac{1}{2} \begin{bmatrix} p_1 & + & q_1 \\ p_2 & + & q_2 \\ p_{N^4} & + & q_{N^4} \end{bmatrix}, \quad b = \frac{1}{2} \begin{bmatrix} r_1 & + & s_1 \\ r_2 & + & s_2 \\ r_{N^4} & + & s_{N^4} \end{bmatrix}$$

$$c = \frac{1}{2} \begin{bmatrix} t_1 & + & u_1 \\ t_2 & + & u_2 \\ t_{N^2} & + & u_{N^2} \end{bmatrix}, \quad d = \frac{1}{2} \begin{bmatrix} v_1 & + & w_1 \\ v_2 & + & w_2 \\ v_{N^2} & + & w_{N^2} \end{bmatrix}$$

Construct the scatter matrix R1, R2, R3, R4

$$R1 = (p_m p_m^T + q_m q_m^T),$$

$$R2 = (r_m r_m^T + s_m s_m^T),$$

$$R3 = (t_m t_m^T + u_m u_m^T),$$

$$R4 = (v_m v_m^T + w_m w_m^T)$$

and equation within class scatter (ScatV = R1 + R2 + R3 + R4)

The build of likewise matrix in between course scatter, (ScatA)

$$ScatA = 2(a - m)(a - [m])^T + 2(b - m)(b - [m])^T + 2(c - m)(c - [m])^T + 2(d - m)(d - [m])^T$$

• Compute the reproduction of matrices transpose of qi, (qeT), with ScatV and ScatA up till acquire:

$$Scc = qeT * ScatA * qe$$

$$Ssv = qeT * ScatV * qe$$

- Discover eigenvector (VeScc) and generalized eigenvalues (NeSvv) of (Scc, Svv) and after that kind in ascending purchase.
- Forecast back VeScc with Pe eigenfaces after that developed (Pe * VeScc) Output as Fisherface.
- Normalization Fisher deal with qi*VeScc*N
- Discover the transpose of the normalized Fisher deals with, qi*VeScc*Nt
- Determine Weights for every picture into a normalized fisher deal with, $U = q_i * VeScc * Nt * A$.
- The outcome of the over procedure is the weight of each picture through eigen vector which will be utilized to discover resemblance with deal with picture which will be acknowledged by utilizing Euclidean range formula.

Recognition or acknowledgment formula.

The acknowledge category actions are as complies with:

- Conversion of the deal with picture determined by the dimension of $N * N$ into the column vector develop $\{r_i\}_{(N \times 2)}$
- Normalization of deal with picture input to the picture of educating by discovering the worth of various matrix $\{U_{inp}\}$ by subtracting the typical worth of keep pictures.
- Determines the weight of the offered pictures by multiplying the eigenvalue transpose matrix V^T with the matrix $\{U_{inp}\}$; $U_{inp} \{V^T\}$
- Determine the range of the distinction in between the picture screening with offered deal with picture utilizing Euclidean range.

$$\{r_i\} = \sqrt{(\|V - V_{inp}\|)^2}; j = 1, \dots, M$$

The outcome of the acknowledgment is the picture that has the tiniest range with the examination picture showed by the system.

IV. CONCLUSION

Deal with acknowledgment system utilizing fisher deal with techniques able to acknowledge the picture of deal with screening properly with 100% portion for the examination picture the like the educating picture and able to acknowledge the picture of deal with screening properly with 93% when the examination picture various from the educating picture. The suggested system with fisher deal with technique not just efficient in carrying out an intro to the examination deal with pictures with various shade elements of the educating picture of the initial picture. To conquer the initially element, can be done by utilizing much far better picture scaling, while for the position issue can relapse by providing more educating pictures with different positions.

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