International Journal of Advanced Research Methodology in Engineering & Technology
Special Issue, March 2017, ISBN 978-1-63535-324-2

Neoteric System Design Using Histogram Sequence of Local Binary Pattern

Prabakaran Annamlai[1], Muralidharan M[2], Muruganantham S[3], Lakshmana Eswaran M[4] and Subhashini N[5],
[1,2,3,4,5]Department of ECE,
Valliammai Engineering College, SRM Nagar, Kattankulathur, Tamil Nadu, India

***Abstract*—This paper delivers an idea of alternate way of authentication of systems. Security now-a-days is an important and one of the serious issue. Door security plays a vital role at home and in various commercial applications. Now the conventional CCTV is used for monitoring with help of humans, it is tedious to monitor continuously for 24 hours and prone to errors. This paper provides a feature of automated door opening with existing camera is optimized in terms of cost, memory and power. Thus, the authentication of person is verified before allowing the person to access the secured area.**

***Index Terms*—Face recognition, Face Detection LBP histogram, Local Binary Patterns, Feature extraction, LBP code, Texture features.**

I. INTRODUCTION

THIS paper aims to produce an efficient and effective security systems which will be a best alternative for conventional CCTV monitoring and biometric security systems. This proposed system can be implemented in home and various commercial places. It's a real-time system that alerts the user immediately when authentication fails. CCTV only records the face and actions of the persons but our system will provide an additional feature of real time security information to the user. In this paper, we attempt to create a different, yet simpler version of door security and Automation using Raspberry Pi module. This system will be integrated with a door opening module. Hence it increases the security by allowing only authentic persons with the help of Face recognition(LBP) technique.

Face recognition is an active research area and they can be utilized in a wide range application such as surveillance and security. Face is a sophisticated multidimensional structure and needs a good computing technique. Face recognition system can be utilized in two modes: Verification and Identification. There are two forms of solution to extract features from facial images and they are:

Geometric feature considers a deviation fit, location, space between two eyes and period of nose. Look feature presents the Wrinkles and furrows. The Look feature needs to be extracted on either the whole face image or specific regions in a facial image. Recognizing different human faces is not a arduous task for humans, but it is quite hard to the system to acknowledge the human faces. LBP generate the binary code that describes local texture pattern by normalizing intensity values in neighborhood eyes and the nose region is extracted from the LBP face image and LBP histogram are drawn for each pixel of image. PCA is just way of identifying patterns in data and expressing the info to highlight the similarities. The proposed face recognition consists of five main parts:

a. *Image Acquisition*

This is actually the first faltering step where we acquire image using any digital device Images employed for facial image expression recognition are static images or image sequences. 2-D monochrome (grey scale) facial image sequences are the most popular form of pictures employed for automatic expression recognition.

b. *Pre-Processing*

Image pre-processing takes the form of signal conditioning (such as noise removal, and normalization from the variation of pixel position or brightness), along with segmentation, location, or tracking of the face or its parts.

c. *Feature Extraction*

Feature extraction converts pixel data into a higher-level representation of shape, motion, color, texture, and spatial configuration of the facial skin or its components.

d. *Classification*

Expression categorization is conducted by a classifier, which frequently contains types of pattern distribution, coupled to a choice procedure. A wide range of classifiers, covering parametric along with non-parametric techniques, has been placed on the automatic expression recognition problem.

e. *Post- processing*

Post-processing aims to boost recognition accuracy, by required domain knowledge to correct classification errors or by coupling together several degrees of a classification hierarchy.

The remainder of paper is organized as follows. The local binary pattern is introduced in section II section III represents the histogram sequence, section IV describes proposed module, section V describes the system design, section VI

describes its application and final section concludes the paper.

II. LOCAL BINARY PATTERN

The area binary pattern (LBP) was originally designed for texture description. It's invariant to monotonic grey-scale transformations which are essential for texture description and analysis for the reason of computational simplicity processing of image in real-time is possible.

With LBP, it's possible to explain the texture and model of an electronic digital image. This completed by dividing a picture into several small regions from which the features are extracted. This features contains binary patterns that describe the environmental surroundings of pixels in the region. The original LBP operator labels the pixels of an image with decimal numbers, called LBP codes. Thus, as illustrated in figure 1: each pixel is compared with its eight neighbors in a 3x3 neighborhood by subtracting the center pixel value; the resulting strictly negative values are encoded with 0 and others with 1; a binary number is obtained by concatenating all these binary codes in a clockwise direction starting from top-left one and its corresponding decimal values use for labeling. The derived binary numbers are referred to as LBP codes.

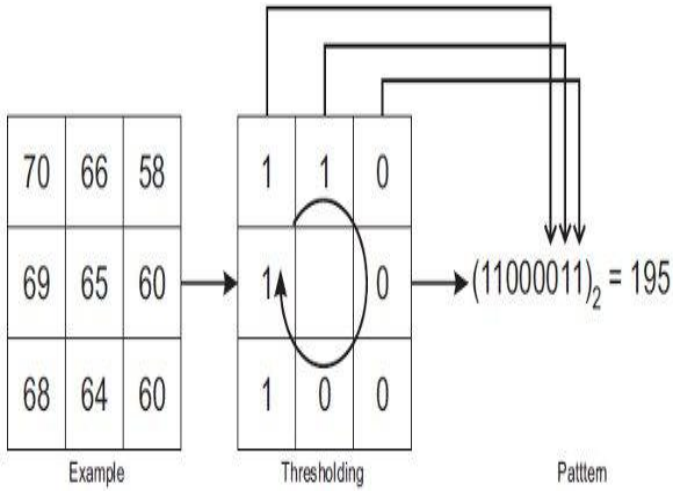

Fig . 1. An example of basic LBP operator

One limitation of the basic LBP operator is that its small 3x3 neighborhood cannot capture dominant features with large scale structures. To deal with the texture at different scales, the operator was later generalized to use neighborhoods of different sizes. A local neighborhood is defined as a set of sampling points evenly spaced on a circle which is centered at the pixels to be labeled, and the sampling points that do not fall within the pixels are interpolated using bilinear interpolation, thus allowing for any radius and any number of sampling points in neighborhood. Fig.2 shows some examples of the extended LBP operator, where the notation (P, R) denotes a neighborhood of P sampling points on a circle of radius R.

Formally, given a pixel at (x_c, y_c), the resulting LBP can be expressed in decimal form as:

$$LBP_{P,R}(x_c, y_c) = \sum_{P=0}^{p-1} s(ic - ip)2^p$$

Where i_c, i_p are respectively gray-level values of the central pixel and P surrounding pixels in the circle neighborhood with a radius R, and function S(x) is defined as:

$$S(x) = \begin{cases} 1 \; if \; x \geq 0 \\ 0 \; if \; x < 0 \end{cases}$$

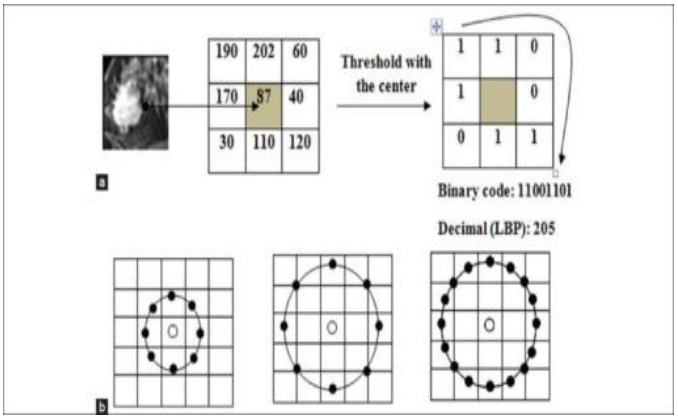

Fig. 2. An example of extended LBP operator: the circular (8,1),(8,2)(16,3) Neighborhoods

There are plenty of variations for improved performance in different applications. These variations focus on different aspects of original LBP operator: (1) improvement of its discriminative capability; (2) enhancement of its robustness; (3) selection of its neighborhood; (4) extension to 3D data; (5) combination with other approaches.

III. HISTOGRAM SEQUENCE

The LBP texture analysis operator is a gray-scale invariant texture measure, based on texture in neighborhood area. The existing LBP operator is different from its basic version: initially, it is extended to arbitrary circular neighborhoods, and various types of extensions have been developed. However, fundamental idea is a binary code that describes the neighborhood texture pattern is built by thresholding a neighborhood by the gray value of center.

LBP has three issues:

1. Description of different local patterns of texture and then exact extraction of these local patterns. Since not all of LBPs are with same important to texture analysis.
2. Selection of Primary subset of these local patterns to represent textures.
3. Utilization of selected local patterns to form a fruitful texture, descriptor.

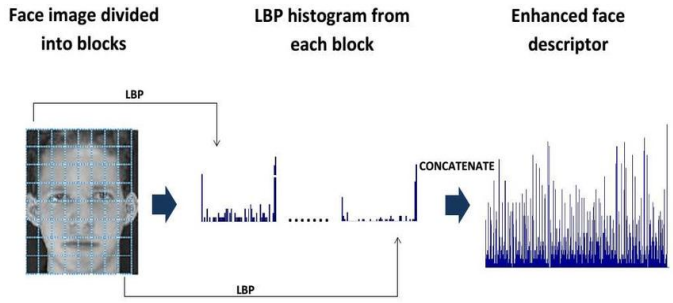

Fig. 3. Face Description with LBP Histogram.

IV. PROPOSED MODULE

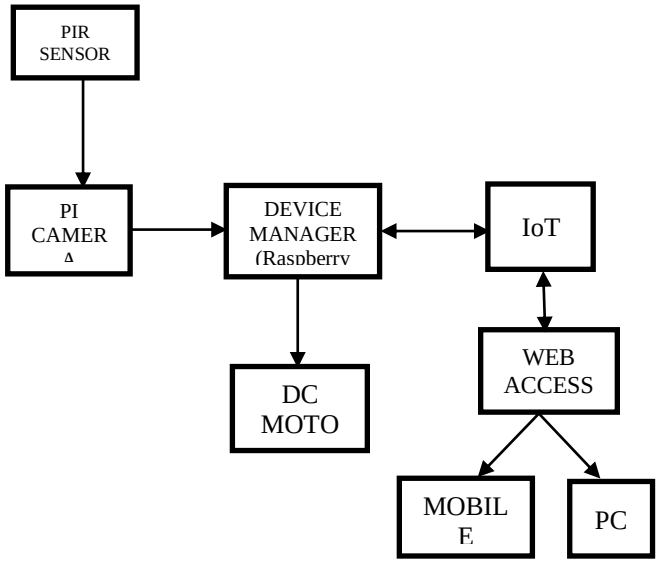

Fig. 4. Block Diagram of Proposed System.

To bring the smart environment into picture, using keyless entry with the help of face recognition and IoT. Every user who is experienced in the existing system may think of a system that may add more flexibility and run with some common applications such as android. This work is designed in such a way to avoid the disadvantages of the existing system.

The proposed system supports more flexibility, comfort capacity and safety. The main objective is to design and to execute a cost effective and open source home automation security system that's capable of authenticate persons who entering the home. The predictable system contains a great flexibility by using wireless reliable technology to interconnecting module to the user through web access. This in turn reduces the implement cost; will add to the flexibility of advancement, and system reconfiguration.

The proposed system can make use of wireless LAN connections between sensor, hardware module and server, and various communication protocols between user and server.
The block diagram of proposed module is shown in fig. 3.

V. SYSTEM DESIGN

a. *PIR sensor and Camera interfacing*

In this proposed module PIR (Passive Infrared) sensors are used. The term passive in this instance refers to the fact that PIR devices do not generate any energy for detection purposes. They work entirely by detecting the energy given off by other objects. The PIR sensors are turned to detect when human being or an animal arrives in their proximity. This triggers the PI module then it turns on the PI camera.

The PI camera is used to take high definition still photographs or video. The camera consists of a small circuit board which interfaces to Raspberry Pi by one of the small sockets on the upper surface of the board and uses dedicated serial bus interface. The camera's image sensor has a native resolution of five megapixels and has a fixed focus lens. it's capable of static images of pixel size 2592x1944, supports 1080p30, 720p60 and 640x480. It has high performance such as (high sensitivity, low cross-talk, low noise, etc.). It has some inbuilt automatic image control functions – (automatic exposure control (AEC), automatic band filter (ABF), automatic black level calibration (ABLC), automatic white balance (AWB), automatic luminance detection).

b. *Raspberry pi*

The Raspberry pi is a low-cost credit card sized single board computer developed by raspberry pi foundation. Raspberry pi controlled by a modified version of Debian Linux optimized for the ARM architecture. The core of the home automation is this minicomputer. After the OS selection, we need to configure raspberry-pi using Rasp-config command. We can enter into rasp desktop using startx command.

Captured image send to Pi for verification of the person's identity in the existing database. Pi compares the input with the data in the database. If comparison is true, it drives the motor using motor driver IC L293d to open the door. If comparison fails it sends the captured image to the user for authentication via telegram app using web access. User can command the Pi either to open the door or trigger the buzzer or alarm.

c. *Proposed IoT architecture*

The physical layer consists of the module which is to be controlled. The data link layer consists of IoT gateway router, device manager and various communication protocols. Device manager will be the part of Raspberry Pi. Raspberry Pi is used as the IoT gateway which communicates to Pc or mobile by internet in the network layer and transport layer. The application and presentation layer consists of web access through which we can control the module.

d. *User Interface*

User interface enables user to see and act with. This module supports any smart phones and computers with telegram app to control the home security system. The module provides the image of the intruder and information about the authentication to user.

VI. APPLICATION

a. *Verification (one-to-one matching):*

When presented with a face image of an unknown individual along with a claim of identity, ascertaining whether the individual is who he/she claims to be.

b. *Identification (on-to-many matching)*:

Given an image of an unknown individual, determining that person's identity by comparing (possibly after encoding) that image with a database of (possibly encoded) images of known individuals.

- Security (access control to buildings, ATM machines and border check point, airports/seaports.)
- Surveillance, General identity verification (Banking, e-commerce, electoral registration, passports, employee and student IDs, national IDs)
- Image database verification (searching image databases of immigrants, licensed drivers, benefit recipients)
- Smart card applications(Aadhar)

Advantages

We cannot use our hand to make the motor to rotate the other way to open the door from inside. So, we created an interrupt in the form of button, which when pressed instructs the motor the remove the latch, enabling the opening of the door.

In this proposed module, keys are not mandatory. All it requires is that the authorized personnel to stand in front of the door, the door open itself. If he wants to come out, he can press the interrupt button to come out. Since all the required security components are inside, the intruder has to use brute force to enter the house. Even if the intruder knows about this security and uses magnet to disrupt the reed switch, all it will do is to turn the system off and he will still not be able to enter.

VII. CONCLUSION

Thus, we have added intelligence to the normal camera and the security of the place can be ensured well. Even if our camera doesn't detect a person, our system will not fail because it will send the intruder's image to the user and it's the user choice to allow the person to enter or not. The PIR sensor will always detect the person's movement without fail. It always triggers the camera to take the picture. Thus, we have ensured high security system in an optimized manner than the conventional CCTV camera.

REFERENCES

[1] Face Description and identification using Histogram sequence of Local Binary Pattern by Wei Quan, and Chunnling Han. 7th International Conference on Advanced computational i*ntelligence Mount Wuyi, Fujian, China; March27-29,2015*

[2] IOT based Monitoring and Control System for home Automation by Pavithra. D, Ranjith Balakrishnan proceedings of 2015 Global Conference on Communication Technologies

[3] Li Liu, Lingjun Zhao, Yunli Long, Gangyao Kuang, Paul Fieguth, Extended local binary patterns for texture classification: Image and vision computing 30(2012) 86-99.

[4] Chetan Ballur & Shylaja's "Application of local binary pattern and principle component Analysis for face recognition" International journal of Electrical, Electronics and data communication, issn(p):2320-2084, volume-1, issue-, July-2013

[5] S. Z, Li and A. K. Jain, Eds., Handbook of face recognition. Springer, 2005.

[6] M.Turk and A. pentland, "Eigenfaces for recognition", journal of cognitive neuroscience, vol. 3, no. 1, pp. 71-86,1991

[7] B. Heisele, P. Ho. J. Wu, and T. Poggio, "Face recognition: component-based versus global approaches," computer vision and image understanding, vol. 91, no. 1-2, pp. 6-21, 2003

[8] Abonen, T., Halid, A., Peitikanen, M: Face descripton with local binary patterns: Application to face recognition. IEEE trans. Pattern Anal. March. Intel. 28(12), 2037-2041(2006)