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Smart Authentication System for Airport

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Abstract:-

As an essential constituent of many associations' security and safety precedence, Image Processing has established its importance and benefits numerous times by providing immediate supervising of possessions, people, environment and property. This project deals with the design approach of an embedded real-time surveillance system based on P.I.R sensor for intruder detection that reinforces surveillance technology to provide essential security to people life and associated control and alert operations.

Keywords:- P.I.R, Camera, Computer system, Image processing.

1. INTRODUCTION

The security system to be designed in this project can be used extensively to monitor facilities by owners. The owner shall be able to monitor their property from wherever they are in the world. It will not replace the use of CCTV and camera surveillance systems but reduce the cost of implementation of a basic security system. This thus will enable owners to secure their facility at a cheaper cost. The images captured are compared with images in the dataset using the LBPH (Local Binary Pattern Histogram) algorithm. The LBPH algorithm is combined with HOG (Histogram of the Oriented Gradient) algorithm to improve detection performance. The face recognition consists of two phases viz. includes extraction and classification. Feature extraction is the process of dividing the image into small regions called cells and extract LBP histogram for each cell. In classification phase all the histograms are concatenated to form a single histogram representing the image. The benefit of LBPH is that it does not look at the image as a whole, but instead its local structure by comparing each pixel to its neighboring pixel, hence, it is not much affected by light. This project will design and implement a security system based on passive infrared sensor (PIR).

The system should be able to detect motion (intruder), activate a camera to capture image after motion is sensed and then compare the captured image with images present in the dataset stored in computer system. If image is matched send the information (stored in dataset) related to image to the owner through E-mail. Otherwise send only image and Date Timestamp.

1.1 System Overview:-

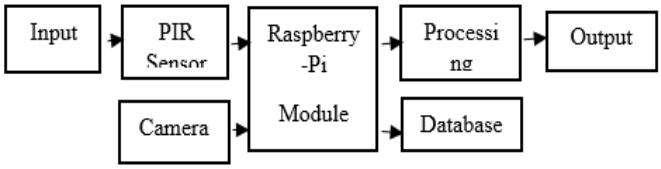

Fig 1-Block Diagram of Smart Authentication System for Airport

- The whole working of the system starts with PIR sensor and camera .
- The proposed system architecture shown in block diagram is a security system based on the ethics of image recognition. The system consists of a P.I.R sensor, camera, computer system along with internet connectivity connected to the computer system.
- As the human body low level infrared radiation comes in contact with PIR sensor then sensor sends signals to the computer system to activate the camera, this feature of the sensor allows us to implement a power efficient system.

1.2 Hardware resource required

- **Computer system**

1. SoC: 64 bit Windows 10 Operating System.
2. CPU: Intel Core i5 Processor (7th Gen.)
3. GPU: NVidia GeForce 940MX.
4. RAM: 8 GB DDR4 RAM.
5. Networking: 10/100 Ethernet, 2.4GHz 802.11n wireless.
6. Storage:1 TB HD

- **Software resource required**

1. Operating system : Windows 10.
2. Coding Language : Python and Java.
3. Framework used :Django version 1.10.
4. Packages used : Open CV 2, Numpy, SMTP, MEME.

1.3 Input Resources

We are using PIR sensor and camera as a input device.

- **P.I.R. Sensor**

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyro electric", or "IR motion" sensors.

Specifications:-

- Infrared Sensor with Control Circuit Board
- The Sensitivity and Holding Time Can be adjusted
- Sensitive Setting: Turn to Right,Distance Increases(about 7M);Turn to Left,Distance Reduce(About 3M)
- Blockade time: 2.5s(Default)

1	Vcc	Input voltage is +5V for typical applications. Can range from 4.5V-12V
2	High/Low Ouput (Dout)	Digital pulse high (3.3V) when triggered (motion detected) digital low(0V) when idle(no motion detected
3	Ground	Connected to ground of circuit

- **Camera**

Camera is used to capture the image. As the human body low level infrared radiation comes in contact with PIR sensor then sensor sends signals to the computer system to activate the camera.5MP Camera module is connected to the Raspberry pi module.

Specifications:-

- Connection Type:- USB
- USB Type:- USB 2.0
- Optical Resolution:- True 640x480
- Focal length:- 2.3mm
- Image Capture:- 640x480, 1.3MP, 3Mp,5MP.
- Frame Rate(Max):- 640x480@30

- **Raspberry Pi 3 B+**

The Raspberry Pi 3 Model B+ is the latest product in the Raspberry Pi 3 range, boasting a 64-bit quad core processor running at 1.4GHz, dual-band 2.4GHz and 5GHz wireless LAN, Bluetooth 4.2/BLE, faster Ethernet, and Poe capability via a separate Poe HAT. The dual-band wireless LAN comes with modular compliance certification, allowing the board to be designed into end products with significantly reduced wireless LAN compliance testing, improving both cost and time to market. The Raspberry Pi 3 Model B+ maintains the same mechanical footprint as both the Raspberry Pi 2 Model B and the Raspberry Pi 3 Model B.

Specification:-

- Processor:-Broadcom BCM2837B0, Cortex-A53 64-bit SoC @ 1.4GHz
- Memory:-1GB LPDDR2 SDRAM
- Connectivity:- 1-2.4GHz and 5GHz IEEE 802.11.b/g/n/ac wireless LAN, Bluetooth 4.2, BLE 2-Gigabit Ethernet over USB 2.0 (maximum throughput 300Mbps), 3-4 × USB 2.0 ports
- Access:-Extended 40-pin GPIO header
- Video & Sound:- 1 × full size HDMI
  MIPI DSI display port
  MIPI CSI camera port
  4 pole stereo output and compositevideo port
- Multimedia:-H.264, MPEG-4 decode (1080p30); H.264 encode (1080p30); OpenGL ES 1.1, 2.0 graphics
- SD Card Support:-Micro SD format for loading operating system and data storage
- Input Power:-5V/2.5A DC via micro USB connector 5V DC via GPIO header Power over Ethernet (PoE)–enabled (requires separate PoE HAT)
- Environment:-Operating temperature, 0–50°C

- **DataBase**

As in our computer system we have a dataset of images, those are the images Of authorized person from each view such as front view, right side view, leftside view with their black and white format, those image set are faces of various person.
We are using MySQL database to store the details of the persons.
MySQL is the world's most popular open source database, enabling the cost-effective delivery of reliable, high-performance and scalable Web-based and embedded database applications.

The data flow diagram provides a view of all the data that is exchanged by the security system's module.

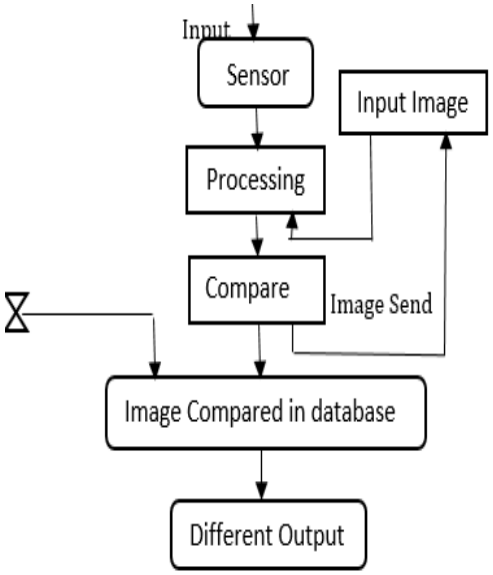

Fig 2:- Data Flow Diagram of Smart Authentication System For Airport.

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2 Result- Test Cases

Test Case Based on 20 Database.

1) By Camera-

Efficiency = 97+95+95+94+89/5 = 94%

2) By Image-

Efficiency=100+100+99+99+99/5

=99.4%

3) New Image capture(New Face)-

Efficiency = 100+100+100+100+100/5

=100%

4) Total Efficiency = 94+99.4+100/3 = 97.8%

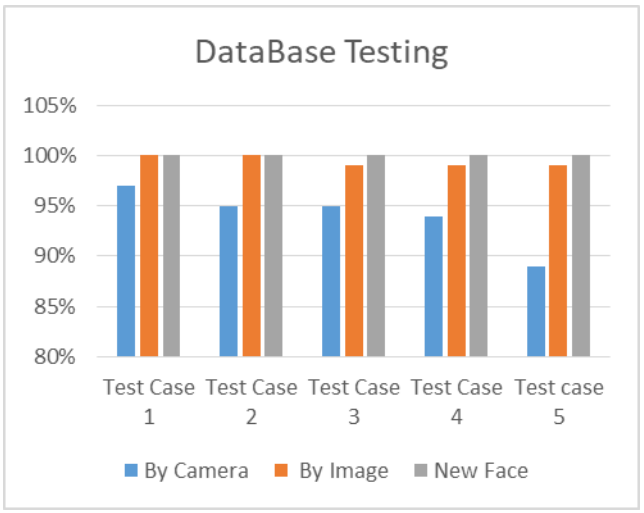

Chart 1:- Test Cases of Database.

Above Chart shows the result of 20 Database By using Camera, Image and find New face.

The data has been collected by Real time evaluation by using the system.

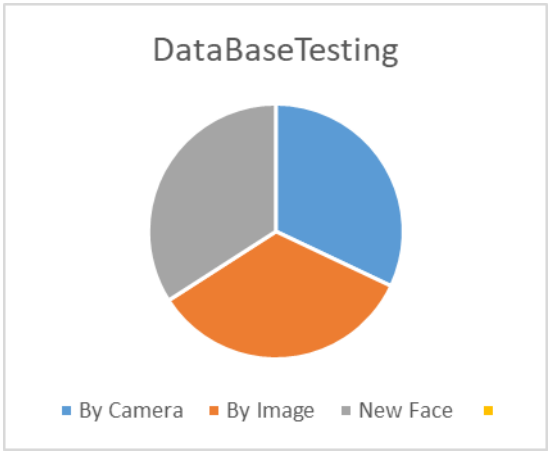

Chart 2:-System Efficiency Chart.

Above Chart shows the Efficiency of Five Test cases based on three condition. This helps us monitor the performance of the System Efficiency.

3 Conclusion:-

In the proposed system PIR sensor is used which consumes less power and it is cost effective as well. It has a wide focal point extend and is easy to interface with the system. The affectability scope of the sensor is 3 to 4 feet, yet it can be expanded up to 20 feet.

In the proposed system camera module is used and the specifications of this camera may change according to user or application. The images captured are compared with images in the dataset using the LBPH (Local Binary Pattern Histogram) algorithm. The LBPH algorithm is combined with HOG (Histogram of the Oriented Gradient) algorithm to improve detection performance. The face recognition consists of two phases viz. includes 'extraction' and 'classification'. Feature extraction is the process of dividing the image into small regions called cells and extract LBP histogram for each cell. In classification phase all the histograms are Concatenated to form a single histogram representing the image. The benefit of LBPH is that it does not look at the image as a whole, but instead finds its local structure by comparing each pixel to its neighboring pixel, hence, it is not much affected by light.

In the proposed system we have utilized PIR sensor, a camera module and a face recognition algorithm which is capable of capturing images of the intruder and sending the image and information of intruder (if intruders image matches with the image in the dataset) to the owner or administrator via an e-mail. The constant reconnaissance of workplace can be made conceivable with the assistance of the proposed system.

Future Scope

As per the future implementation of the project , If microwave and laser sensors instead of PIR sensor as it may show irregularities in high temperature. Instead of using basic web camera, If use of high resolution cameras are used of more sensitive sensors that can helpful in low lighting environment. For better authentication we can use Aadhar database.

Application

- Other than Airport this system is used in Organization,large Commercial spaces, universities, hospitals.
- By implementing some changes in base module it can be use in defense.

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