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Biometric Identification Using Opencv Based On Arduino

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Abstract - *Dynamic identification of biometric system in real world is difficult and it is an important task. With the advent of computers, there are growing interest on identifying context generated from human known as human biometric identification. The main aim of this project is to design and build a manually controlled biometric system. The main purpose of this system is that a system should be able to roam around in a given environment. The work is to identify the realistic human face and eyes through camera. Our method consists of three main components they are HC-SR501(PIR) sensor which senses and detects the object and by transferring the data serially from Arduino to 12C Interface which is connected to camera for classifying the activities and recognizing the complex action classes. The captured video can be enhanced and made intelligible using further image processing on the remote PC thereby eliminating the need for extra hardware on the system.*

Keywords: ***Camera, Arduino, 12C Interface, PIR Sensor, biometric, identification***.

1.INTRODUCTION

In those late years, identifying individuals to a feature scene of a reconnaissance framework is attracting a greater amount consideration because of its extensive variety about requisitions done abnormal occasion detection, human walk characterization, pernickety numbering clinched alongside An thick crowd, individual identification, sex classification, fall identification for elderly people, and so forth throughout this way, observing and stock arrangement of all instrumentation may be enha [12].

1.1 Benefits of Video Surveillance

This is the process of monitoring a situation, an area or a person. This generally occurs in a military scenario where surveillance of borderlines and enemy territory is essential to a country's safety [2]. Human surveillance is achieved by deploying personnel near sensitive areas in order to constantly monitor for changes. But humans do have their limitations, and deployment in inaccessible places is not always possible [1]. Thus, in recent times, surveillance technology has become an area of great research interest. The field of surveillance robots is quite popular. A lot of work has been done in control system of wireless surveillance robots. A common theme is also the use of a camera on the robot in order to receive live video feedback.

1.2 FACE DETECTION:

Face Detection is an important functionality for many categories of mobile applications. It can provide search capabilities in photo catalogs, social applications etc..Face detection is a first step in face recognition functionality[10].

1.3 EYE DETECTION:

Activate Face Detection to automatically detect human faces and focus with Eye Detection AF to ensure accurate focus on human eyes, even when using a shallow depth-of-field [3]. Combine these two functions to take your portrait photography to a new level. We are currently working on extracting higher level features.

1.4 BIOMETRIC:

Biometrics generally refers to the study of measurable biological characteristics [4]. In computer security, biometrics refers to authentication techniques that rely on measurable physical characteristics that can be automatically checked.

2. SYSTEM DESIGN

The block diagram of the proposed system as shown in Fig. 1 consists of sensing unit such as PIR Moisture

Sensor to sense the objects and these components are connected to Arduino along camera and buzzer.

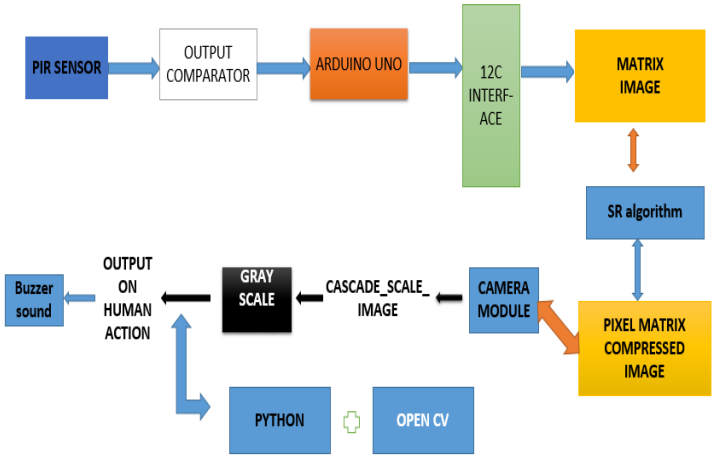

Fig -1: Proposed system design for biometric identification

2.1 Components Description

2.1.1 Arduino Uno:

A microcontroller is a little PC on a solitary coordinated circuit containing a processor center, memory and programmable info/yield peripherals. The one we utilized is the Arduino Uno in light of ATmega328P Arduino is a solitary board microcontroller intended to make the way toward utilizing gadgets in multidisciplinary prepare that can be more open. The equipment comprises of single open source equipment board planned around a 8-bit Atmel AVR(Automatic Voltage Regulator) microcontroller. An Arduino board comprises of an Atmel 8-bit AVR microcontroller with integral parts to encourage programming and consolidation into different circuits. An essential part of the arduino is the standard way that connectors are uncovered, permitting the CPU board to be associated with an assortment of compatible extra modules known as shields. The product comprises of a standard programming dialect compiler and a boot loader that executes on the microcontroller. Arduino is an open-source project that created microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices. The project is based on microcontroller board designs, produced by several vendors, using various microcontrollers. The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

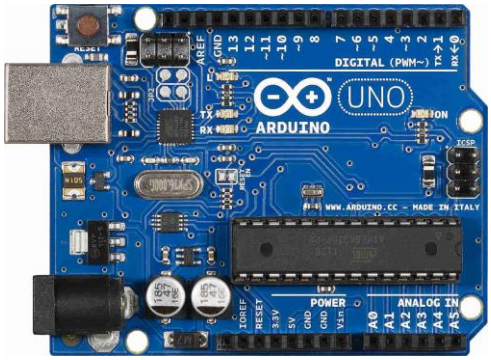

Fig-2: Arduino Uno module

2.1.2 12C Interface

In embedded systems a simple function rarely exists alone. A simple pushbutton and LEDs controller is useful but if that controller cannot report when a user has pressed a button or share the status its LED indicate, the controllers is not worth it. Many embedded systems include peripheral devices connected to the microprocessor in order to expand its capabilities. For example Ad fruit Motor Shield SPI, L3G4200D 3-Axis Gyro I2C or SPI, 1.44"LCD Display USART etc. Data transmission between two these entities plays a major role in designing embedded systems. In general the medium of data transmission can be either serial or parallel. All these peripheral devices interface with the microcontroller via a serial protocol. Protocol is a language that defines the mode of communication between systems and devices like protocols specify the aspects of inter-device communications including bit ordering, bit pattern meanings, electrical and mechanical aspect. UART, SPI, TWI or USB are some of the protocols widely used in embedded systems for serial data communication. The key to increase the value is communication on a communication bus of choice for embedded systems of all sizes.

2.1.3 PIR Sensor:

PIR sensors permit you to detect movement, quite often used to recognize whether a human has moved in or out of the sensors go. They are little, cheap, low-control, simple to utilize and don't destroy. Thus, they are regularly found in apparatuses and devices utilized as a part of homes or organizations. They are frequently alluded to as PIR, "Latent Infrared", "Pyroelectric", or "IR movement" sensors.

Object detection: Object detection and segmentation is the most important and challenging fundamental task of computer vision. It is a critical part in many applications such as image search, scene understanding, etc

Object Tracking: Tracking is usually performed in the context of higher-level applications that require the location

and/or shape of the object in every frame.

Fig-3: PIR sensor

3. WORKING OF PROJECT

Initially the PIR sensor (Passive Infrared sensor) sense the object up to some area that can be given in the programming and the delay time that the object can sense from one object to the another object is 1 second which is the minimum time. The sensed object from all the sensors are collected into a single location that is called as output comparator. The sensed objects are in the form of pixel matrix but it is not the matrix of the real image it is matrix of the image that is converted into the binary format. In order to get the pixel matrix of the real image we will capture the image or a video from the camera which is connected to the system through USB. The output of the PIR sensor is given to the Arduino UNO where the processor of Arduino UNO is ATmega 328. Here the low resolution pixel matrix of binary image and the pixel matrix of the real image are combined using the Super Resolution algorithm. Then the image is converted into the gray scale so that background subtraction process can be done and the face, eyes of a person are detected that is shown by en-rectangle the face and eyes of a more that one person. When the face and eyes of a person are detected we can hear an buzzer sound that has been connected to the camera through Arduino.

3.1 Arduino Connections:

Initially the Arduino sense the signal to ~2,~4,~5. Then the pin ~2,~4,~5 activates the PIR sensor. Next the Arduino UNO sense the input pulse and sense to the PC database. Programming checks for the images or the video through PC camera or any other external camera that is connected through USB and then it checks for the images in the PC database they may be default images also when we install the software. The camera checks the image in a data base and sends back to the Arduino. Then the Arduino board activates the 5V and GND from this we can hear buzzer sound [9]. The super resolution algorithm is as follows.

3.2 Super Resolution

Super-resolution is based on the idea that a combination of low resolution (noisy) sequence of images of a scene can be used to generate a high resolution image or image sequence. Thus it attempts to reconstruct the original scene image with high resolution given a set of observed images at lower resolution [10]. Thus the accuracy of imaging model is vital for super-resolution and an incorrect modeling, say of motion, can actually degrade the image further. The observed images could be taken from one or multiple cameras or could be frames of a video sequence. These images need to be mapped to a common reference frame. This process is registration. The super-resolution procedure can then be applied to a region of interest in the aligned composite image. The key to successful super-resolution consists of accurate alignment i.e. registration and formulation of an appropriate forward image model.

The central aim of Super-Resolution (SR) is to generate a higher resolution image from lower resolution images. High resolution image offers a high pixel density and thereby more details about the original scene. The need for high resolution is common in computer vision applications for better performance in pattern recognition and analysis of images. High resolution is of importance in medical imaging for diagnosis. Many applications require zooming of a specific area of interest in the image wherein high resolution becomes essential, e.g. surveillance, forensic and satellite imaging applications [10].

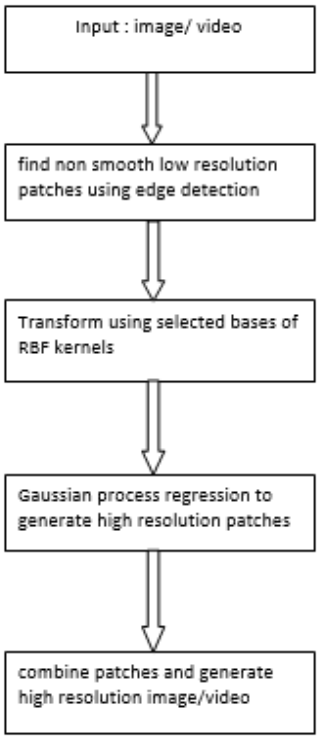

Fig-4: Steps in Super Resolution(SR) algorithm

3.3 HARWARE OF PROJECT

Fig.5 shows hardware part of project. Here we will be considering connections in our project. Here initially PIR sensor which is used to sense the object even in the dark environment also the output of all the three sensors is given to the output comparator which stores the results and give to the Arduino and the camera captures the image through the dynamic video. We all know that the camera captured the object through the sound of buzzer.

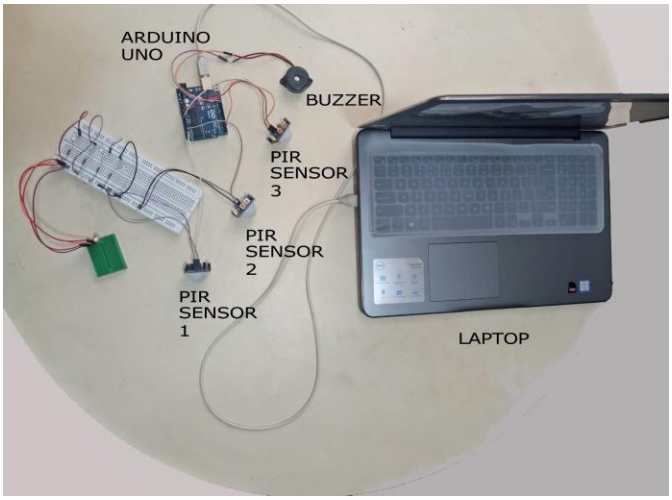

Fig-5: Schematic representation of Biometric identification

3.4 CONNECTIONS

The wiring is simple and straightforward, however, due to the fact that there are 5 of everything except the servo motor, the number of wires starts to add up quite a bit. Check out the circuit diagram and schematics at the bottom of this page for more details, but here are the basics [11].

the LED status lights...

I used a mini breadboard to keep the LED lights separate from the rest of the circuitry in order to allow for easier removal if needed. Each LED responds to a different PIR sensor and will light up anytime it detects motion. Simply connect each LED to a separate digital input (9-13) on the Arduino, and ground them through a 220 ohm resistor.

the PIR motion sensors...

I used the HC-SR501 model PIR sensors for this project. Each PIR sensor needs to be connected to a digital input (2-6) on the Arduino, 5V power, and ground. If you're using the same PIR sensor as me, you can (carefully) pop off the cover and the pins are marked underneath.

4. RESULT

Dynamic video is captured by camera. The video captures the actions that are performed by the human. Those actions are en-rectangled. When the objects are detected we can hear sound through buzzer.

4.1 TEST CASE RESULTS:

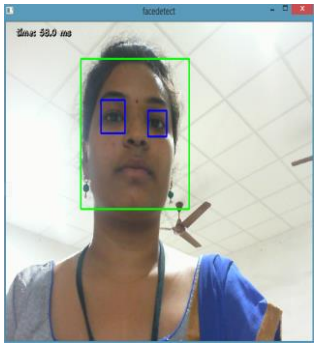

Fig-6: single person frontal view ...The above results show that a person is identified that can be seen in en-rectangle box and the eyes are also detected.

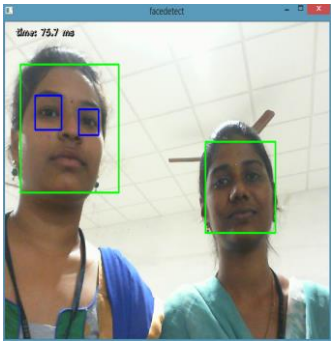

Fig-7: two persons frontal view.. The above results show that two persons are detected that can be seen in the en-rectangle box and the eyes are also detected.

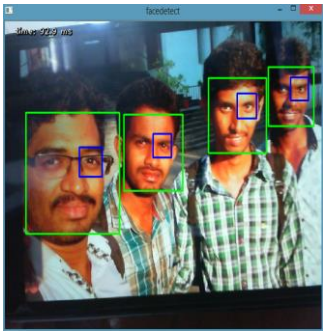

Fig-8: group of persons frontal view This is the failure case image because the four persons heads are detected but all persons eyes are not detected due to some reasons like the person have spectacles.

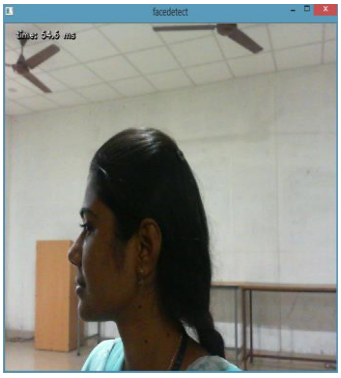

Fig-9: single person facing side view This is the failure case image because the four person's heads are detected but all person's eyes are not detected.

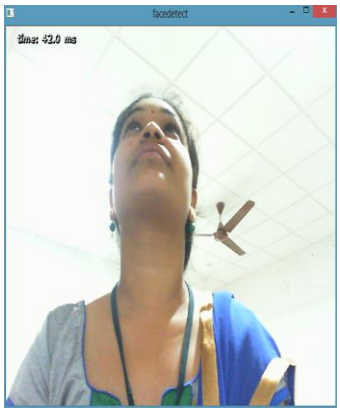

Fig-10: Single person face with up view..This is the failure case image because in this no face is detected and eyes are no detected . When viewed from up.

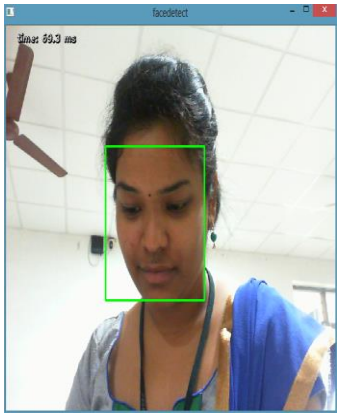

Fig-11: Single person face with down view…Face can be detected when it is in the down position also. It is the failure case because here eyes are not detected when the face is viewing downward.

Table-1: Accuracy percentage of all the test cases

Test case name	Number of images	Success / Failure	Accuracy
Single person frontal view	10	10	100%
Two persons frontal view	10	9	90%
group of persons frontal view	10	7	70%
side view	10	5	50%
up view	10	4	40%
down view	10	9	90%

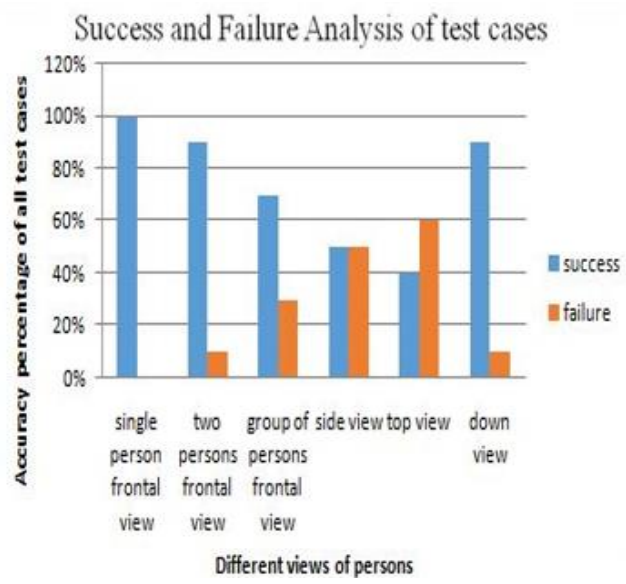

Chart-1 : A graph showing accuracy percentage of all the test cases.

5. CONCLUSION

In this proposed system have presented the new innovative Surveillance system. The implemented algorithm is running effectively for some cases as shown in the above test cases. Few cases are not accurate like side view and detection of the eye with spectacles. This work can be extended in identifying verities of gestures so that this project can be useful in surveillance applications.PIR sensor senses the object and give the output in the format of pixel

matrix to the Arduino. The Arduino will pass the captured image to the camera. Where the image is in the form of gray scale. The captured object is en-rectangle. To know that objects are detected buzzer sound can be heard.

The future work is to detect the entire human body and get the results more accurately. The buzzer sound can be used to get different sounds for different detection of the human actions through camera.

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