TRUE ALARM USING ARTIFICIAL INTELIGENCE AND INTERNET OF THINGS

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Abstract- In recent years, monitoring homes and providing security measures are raising alarm due to several break-ins. Security automation is a must which has to be integrated in this smart world. For effective mechanism, we use multiple PIR- motion detecting sensors, and Arduino kit for both wired and wireless communication, in this project. In the proposed project, whenever the PIR sensor senses heat radiated from the body of human, the sensed data is sent to Arduino kit which processes them and sends trigger in the form of a message to the owner as well as to the nearby police station. The uninterrupted power supply is provided to the sensor. To avoid unnecessary panic, a weight detector (pressure sensor) is setup with some threshold value, below which it indicates that a false sense has been encountered. To enhance higher security, a camera is kept outside which will identify strangers using face recognition technique and warning notification will be triggered by comparing with the previously recorded details of individuals and the strangers information will be updated in the database for future reference, once the owner authorizes .By using shape recognition method weapons can be found and violent actions can also be found using artificial intelligence. The dark cameras have been set up inside the house in each room, so that the captured footages can be sent through mail to the police, in-case of the absence of the owner. Though the implementation is a complex one, it provides high security.

KEYWORDS: **PIR Sensor, Load-Cell, Arduino, Thermal Infrared Cameras, Pressure sensor, Universal Serial Bus, Personal Computer**

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I. INTRODUCTION:

Sensors are devices which detect and measure any physical properties such as radiations, heat, or energy, record them and infer useful information. There are two types of sensors- active sensors and passive sensors. This project deals with passive sensors which do not radiate any energy or signals but absorb or sense radiations emitted by human objects and produce valid data output necessary for processing. PIR sensors are used in the project which detects the motion of human and provides high security to home. The sensor output will be indicated as a high or low pulse. This pulse data can be further processed by Adriano microcontroller and triggers can be sent through serial communication port to the personal computer. The proposed project can be used anywhere where the security has to be provided effectively. The images captured using camera that is placed outside the house, is being applied with the technologies such as face recognition and shape recognition, such that the facial characteristics are analyzed providing the most effective evidences to the police.

II. PROTOTYPE

The projects "Human Motion Detection Using Passive Infra-Red Sensor"[1], "Human Motion Detection Using Raspberry Pi" which was developed earlier and other developed sensor related embedded systems used for home security based on single motion detecting PIR sensor and sound buzzers, or PIR Sensor communicating with Adriano kits find to be less effective in-case of home security because the sensor may result in false triggering by detecting all the objects with temperature above absolute zero including tiny animals like rodents, mice, cats or other living things than human or may fail temporarily due to some external factors, and there were no cameras set inside the house to capture footages. These projects failed to provide high level security which is much required in this smart world.

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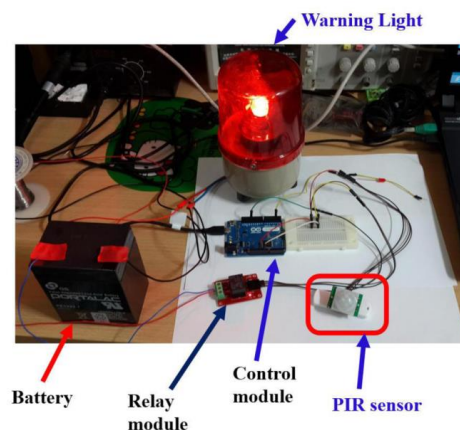
III PROPOSED SYSTEM

The proposed project "True Alarm", unlike the other developed projects, can be used for two different purposes: **i) To know if there occurs any theft when the members of the house are out of station and to find the thief too, ii) To get notified whenever a stranger arrives home using modern techniques in order to avoid unnecessary violent issues.** These can be achieved by implementing the ideas that are explained as follows. For the former purpose, we use multiple PIR sensors [2] in order to provide high precision result while encountering motion of a human by absorbing radiations. The power supply to the sensors should be suspended by arranging some back up in times of power shutdown. The pressure sensor (weight detection sensor) is placed in the floor. Whenever the pressure sensor senses some pressure applied to it by a moving object, it compares the pressure observed with that of the pressure which has been set as minimum threshold value to avoid the problem faced with the existing projects. Once the pressure is verified, the data sensed by PIR sensors are sent to the Arduino kit for processing. The Arduino kit[4][5] interfaced with personal computer will send the message to the owner and police if any threat is found. The thermal infrared cameras which have been set in each room start capturing the footages once the sensor becomes active and send them immediately to the nearby police station. In order to achieve the latter purpose a camera has been kept in the entrance of the home. The digital images of the known members of the family are captured and their facial characteristics are analyzed using face recognition technique and the details along with their images are updated in the database and they are considered to be the authorized persons. When a stranger arrives, the digital image is captured and facial features are updated and they are compared with the previously included records in the database. If unfound a warning message along with the captured photo will be sent to the owners mobile. Once the owner authorizes, the stranger is updated in the database as a known person and the next time when the same person arrives the owner will not receive any notification. If the owner does not authorize the individuals, they may be considered as a threat and using shape recognition and few library functions, the violent movements and patterns of the stranger can be analyzed and those data are sent through mail to the nearby police station.
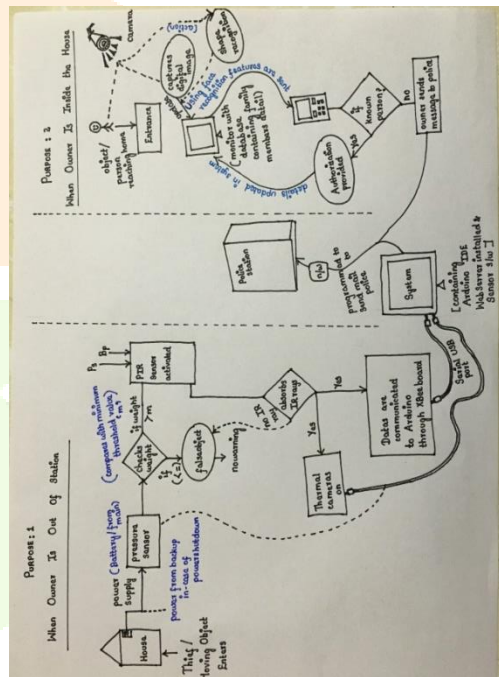

FIG: OVERALL FLOW DIAGRAM:

IV .Hardware and Software Specification:

a. Hardware Specification:

- PIR Sensors
- Load Cell
- Arduino Kit
- Thermal infrared cameras
- ESP8266 Wifi Module
- Pressure Sensor HX711
- Serial communication cables (USB)
- Connecting cables

b. Software Specification:

- Arduino IDE

- aREST library functions
- Cylon.js- Java script framework
- OpenCV tool

V HARDWARE

A.*PIR* Sensors [2]

PIR sensor is a pyro-electric passive infrared sensor which detects infrared radiation emitted from an object and produces some useful inference. The human body emits heat in the form of infrared radiation. The PIR sensor[2] can detect the radiation up to a distance of 10 meters and at an angle of about + or - 15 degrees. The PIR sensor[2] consists of two components: i) Fresnel lens and ii) pyro-electric module. When a human body emitting heat in the form of infrared radiation is detected by the PIR sensor[2], the absorbed heat radiation is converted to electrical signals and focused to the pyro-electric module. The sensor module consists of three pins: i) ground ii) DC for power supply iii) the output pin which shows either high or low condition, based on the presence or absence of moving object in its field of range. There are 3 more pins for enabling modes and for jumping. The modes are: i) non-repeatable trigger mode- where the sensor output remains high when the object is detected and the time slice which has been set is over, the output changes from high to low, and ii) repeatable trigger mode- which keeps the output high all the time until the object is present in the sensor range, irrespective of the time. It also contains two potentiometers, one for adjusting the time slice value and the other for modifying the sensitivity of the sensor.

FIG: PIR SENSOR WITH ARDUINO

B. Pressure sensor hx711 & Load Cell:

Load cell is connected to "hx711" weight sensor which converts the force applied, to an equal magnitude of electrical signal. The red, black, white and green wires of load cell are connected to the E+, E-, A-, A+ pin of hx711sensor respectively using

Jumper wires. This sensor converts the analog signal to the digital signal and sends them to the Arduino[4][5], by connecting the GND,DT,SCK,VCC pins of sensor to GND, A2, A3 and +5V of Arduino respectively. Then the program for load cell and Arduino are uploaded in the Arduino using C++ language and aREST library functions in Arduino IDE.
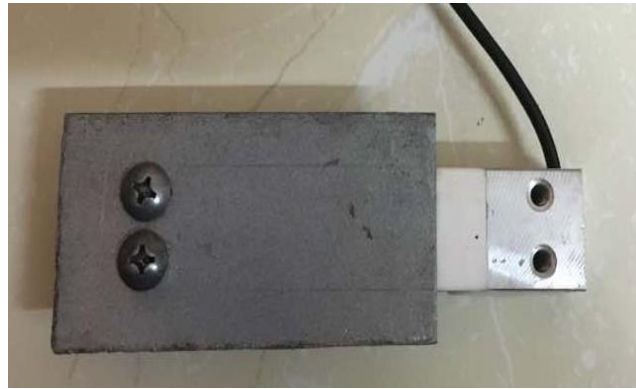

FIG: LOAD CELL WITH HX711 SENSOR

FIG: LOAD CELL

C. **Arduino kit[4][5]:**

Arduino circuit board consists of micro-controller as well as an IDE or software which runs on our personal computer and used for writing codes. It reads the sensor output and produces output as a triggering message in the computer using serial port communication. After detection the mail will be sent to the police and the owner. One Arduino[4][5] can control six sensors. The range of one Arduino controller[4][5] is about 90 meters.

D. **Thermal infrared camera:**

Thermal infrared cameras are used in each room, which captures image or video even in dark when infrared emitted by human body is detected. The evidence is collected easily through the footage and can be used to take further actions.
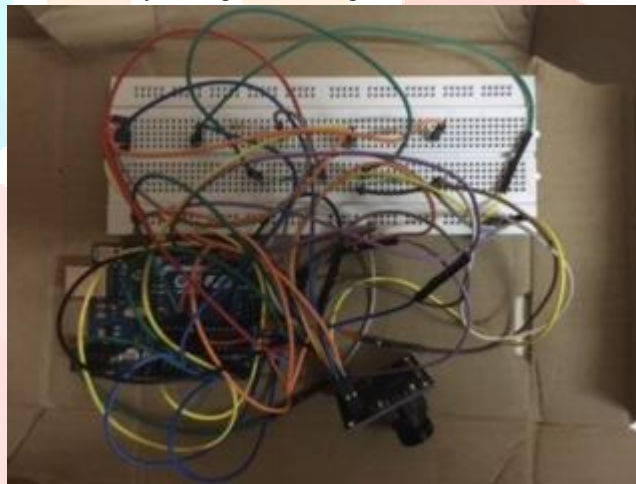

FIG: OV7670 CAMERA WITH ARDUINO

VI.SOFTWARE:

A. Arduino IDE*:*
The open-source Arduino Software (IDE)[5] makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing. This software can be used with any Arduino board[4][5].
B. aREST library functions:

The aREST library actually includes more than just the basic Arduino functions. The feature that we are going to see is the access to variables stored on the Arduino board. If you have a sensor that can be read directly using basic Arduino[4][5] functions, like an analog temperature sensor, you can directly get the value from the sensor by calling the analog REST call.

C.Cylon.js- Java script framework*:*

It's a JavaScript library that allows you to abstract sensors and actuators and many other low-level hardware functions.

D. OpenCV tool*:*

OpenCV is released under a BSD license and hence it's free for both academic and commercial use. It has C++, C, Python and Java interfaces and supports Windows, Linux, Mac OS, iOS and Android[3][4]. OpenCV was designed for computational efficiency

and with a strong focus on real-time applications. Written in optimized C/C++, the library can take advantage of multi-core processing. Enabled with OpenCL, it can take advantage of the hardware acceleration of the underlying heterogeneous compute platform. Adopted all around the world, OpenCV has more than 47 thousand people of user community and estimated number of downloads exceeding 9 million. Usage ranges from interactive art, to mines inspection, stitching maps on the web or through advanced robotics.

E. Face Recognition:

Face Recognition, the latest technology is an application of artificial intelligence which helps to identify a person by capturing and comparing with the digital image of the person. This technique uses an algorithm which identifies the facial characteristics based on few parameters such as: measuring the distance between the eyes, width of the nose, the shape of the facial bones, the jaw line's length, depth of the eye sockets, and shape of the eyebrows. The working of face recognition involves four operations: capturing, extracting, comparing and matching. Sometimes beards, eyeglasses and makeup are considered to be the noises that may slightly affect the exact result. So the threat can be easily found by applying combination of "Fisher-face" and "Eigen-face" algorithms, which can create more than hundreds of classes of grey-scale complexion for an individual image, in this project TRUE ALARM.
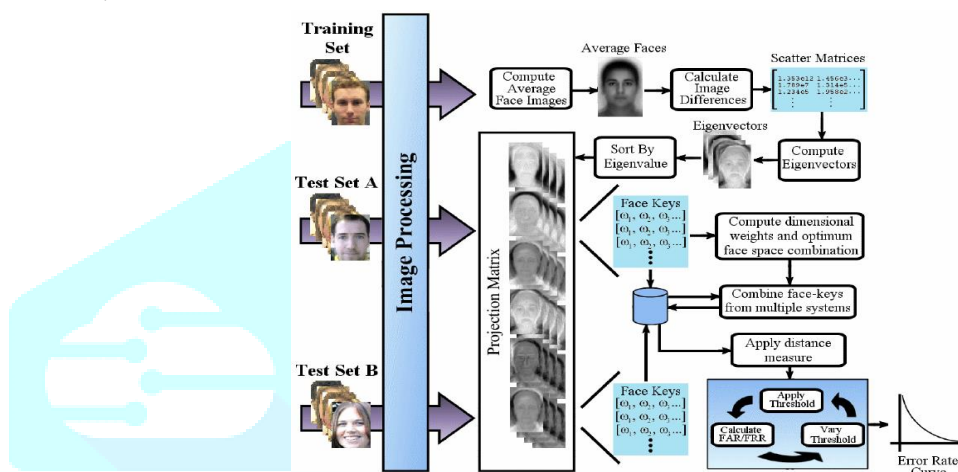

FIG: COMBINATION OF FISHER-FACE AND EIGEN-FACE ALGORITHM

F: Shape Recognition:

Shape Recognition is another major application in the field of computer science. Extracting the features of actions and categorizing them based on motion, appearance, space-time value and space-time interest points. The two main steps involved in shape recognition is frame-prototype matching and prototype based sequence matching. In frame prototype-matching, the frame correspondence based on the estimated alignment path is evaluated for same actions performed by different persons. The prototype based sequence matching uses Dynamic Time Warping (DTW) in order to align two sequences of actions and measure distances between them to produce best result. Using shape recognition algorithms, violent actions performed by stranger can be visualized and they are captured and sent to the nearby police station in this project.

VII. ADVANTAGES OF PROPOSED SYSTEM:

- Multiple sensors were used
- Pressure sensor is used to avoid false triggering
- High security
- Authorization is given by owner
- Thermal infrared cameras are used to capture the footage

VIII. APPLICATIONS:

- Home security purpose

IX. CONCLUSION:

The implementation of this project can bring a major change in security related issues. It will meet all the requirements of the user. It helps us take immediate action when not present inside home. The project is more reliable though little expensive.

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