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Security System for Industries Using Raspberry PI and IOT

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Abstract:

Internet of things is the communication of anything with any other thing, the communication mainly transferring of useable data, for example a sensor in a room to monitor and control the temperature. It is estimated that by 2020 there will be about 50 billion internet-enabled devices. The Internet of things presently is being used in the fields of automobiles, agriculture, security surveillance, building management, smart-homes, and health care. The IOT expects to use low-cost computing devices where there is less energy consumption and limited impact to the environment[1].

This paper aims to describe a way for giving security to IT companies, scouting units, business organizations and volunteer groups. Among the person identification methods, face recognition is known to be the most natural ones, since the face modality is the modality that uses to identify people in everyday lives. This face detection differentiates faces from non-faces and is therefore essential for accurate security. The other strategy involves face recognition for marking the employees. The Raspberry pi module is used for face detection & recognition. The camera will be connected to the Raspberry pi module. The employees database is collected. The database includes name of the employees, there images & ID number[2].

This RFID reader module will be installed at the front side of organizations in such a way that all employees provided by the RFID cards. Raspberry pi system have the database of the employees so comparing the database if employees details are matched employ can entered into company. Thus with the help of this system, time will be saved and it is so convenient to record employees. And the details of the employees will be sent to the corresponding head of organization using IOT technology

Keywords — **IOT, Face recognition, Raspberry Pi, Raspberry Pi camera, Employee database, RFID Tags, RFID reader.**

I. INTRODUCTION

Now days as the number of employees working under IT companies increased so number of industries also increased. For the sake of that one of the easy way to give security for company is Face recognition and providing RFID cards. Mainly Face recognition is used to check either the employ is known or unknown one. Checking employees using Real Time Face Recognition (SMARTFR) provides flexibility to identify employees one by one. To increase the accuracy, efficiency and reliability of the recognition, algorithms are needed. It is important to take the database of the employees working under the organization, The database includes name of the employees, there images & ID number, address etc...All the employees provided by RFID tags to record of login/ out.

Face detection and recognition module detects faces from the image captured by the camera, and the image of the face is cropped and stored.

The module recognizes the images of employees face, which have been registered manually with their names and ID codes in the database. Face detection data and face recognition data are recorded into the database and using the stored database, it will checks the either person is known or unknown and number of absentee will be calculated. If person is unknown then capturing person image and information will be sent to head of industry using IOT technology. so that he can take care of problem and If in place of absentee the unknown

person will present means automatically message would be sent to head so that he can take care it.

II. EXISTING SYSTEM

A) RFID

Radio Frequency Identification (RFID) is an affordable technology that can be used for applications such as security, tracking, and access control. This Application Note will detail the required steps to program a RFID Card Reader for access control in an ArcelorMittal Plant. This Application Note will show and describe the programming needed to successfully identify the unique digital ID of a RFID tag and either grant or deny it access. These steps include the use and programming of a microcontroller.[1]

RFID, radio---frequency identification, uses electromagnetic fields to transfer data. RFID is not a single product but rather a system, which is composed of: a RFID tag (transponder), reader (transceiver) and back---end application system (or database), which require the support of a computer network [2]. For this system the transponder is a passive RFID tag. Passive tags are cheaper, lighter, and smaller than the other tag options. That is because unlike other RFID tag types, passive tags do not require batteries. Passive tags use radio energy transmitted by the reader as a power source. Since the RFID reader powers the RFID tag the tag must be within 2 to 5 inches of the RFID reader in order to be read. It is also because the tag is passive that our RFID reader must be active. The RFID reader not only communicates with the RFID tag, but a microcontroller as well. The microcontroller in this application will serve as the middleman between the RFID reader and the database. The microcontroller notifies the reader if the serial identification code from the RFID tag has the clearance to gain access to the plant or not.

B) RFID tagging:

It is an ID system that uses small radio frequency identification devices for identification and tracking purposes. An RFID tagging system includes the tag itself, a read/write device, and a host system application for data collection, processing, and transmission. An RFID tag (sometimes called an RFID transponder) consists of a chip , some memory and an antenna .RFID tags that contain their own power source are known as *active* tags. Those without a power source are known as *passive* tags. A passive tag is briefly activated by the radio frequency (RF) scan of the reader. The electrical current is small -- generally just enough for transmission of an ID number. Active tags have more memory and can be read at greater ranges. Increasingly, RFID tagging is used in supply chain management as an alternative to bar code technology. Although more expensive to use than the bar code stickers, RFID tags don't get dirty or fall off or require an unobstructed line-of-sight between the tag and the reader.[2]

III METHODOLOGY

The proposed system provides solution to identify person entered in industry. The employ bio-data (Matriculation number, Name, Gender and Date of Birth) is enrolled first into the database.
This section describes the software algorithm for the system.
The algorithm consists of the following steps

- Image acquisition
- Face detection
- Face recognition
- comparison
- RFID reader
- RFID tags

In the first step, image is captured from the CCTV camera. The application used is real-time which does not record the amount of frames of images to analyze. This study of Haar Cascaded Algorithm for object and digital image recognition (Ms. Jaya M et al., 2013) leads to Haar features have been studied intensely for the detection of objects, in particular for face detection (P.Viola and Jones, 2004). One another major feature used for object detection is provided by HOG as evaluated in (P. Dollar et al., 2009).

a) Haar Features and HOG Algorithm

Haar features are based on Haar wavelets, which are functions that consist of a brief positive impulse, followed of a brief negative impulse. In image processing, a Haar feature is the difference between the sums of all pixels in two or more regions. Papa Georgiou et al. were the first to use Haar features for face detection. They used three types of Haar features of size 2×2 and 4×4 pixels, for a total of 1,734 different features in a 19×19 face image.

Figure.1 (a) Haar features introduced. (b) Extension to the basic set.

Viola and Jones proposed a basic set of four types of Haar features that are shown in Figure 1(a). The value of Haar feature is given by the sum of intensities of the pixels in the light region minus the sum of intensities in the dark region. Usingall possible sizes, they generate around 180,000 features for a 24×24 pixel image. Lienhart and Maydt presented an extension to the basic set with rotated Haar features as we can see in Figure 1(b).

Using a straightforward implementation, the time required to perform the sum of pixels increases linearly with the number of pixels. Viola and Jones proposed to use the integral image as preprocessing to compute the sum of any region of any size in constant time. Each element of the integral image contains the sum of pixels in the original image that are above and to the left of that pixel; using this idea allows to compute a two-region Haar feature using only six memory access and a three-region feature Haar with only eight.

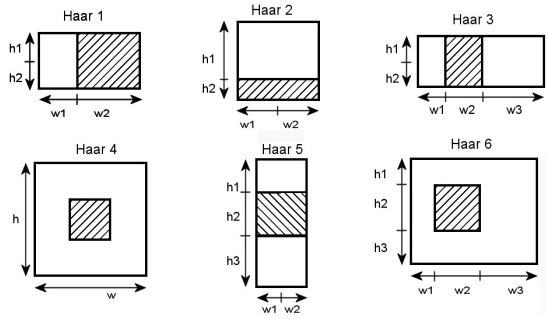

Figure.2 Asymmetric Haar features

The basic Haar features, which it call Asymmetric region Haar features, which are shown in Figure 2. In contrast with basic Haar features, these new features can have regions with different width or height, but not both. It will be shown that these features are able to capture defining characteristics of objects more accurately than traditional ones, allowing the development of simpler and more effective classifiers. By allowing asymmetry, the number of possible configurations for Haar features grows exponentially and is an over complete set. For the 6 Haar features shown in Figure 2, there are around 200 million possible configurations for a 24 × 24 image. Using all the possible configurations is unfeasible, therefore, to deal with this limitation we propose to use a Genetic Algorithm to select a subset of features.

b) RASPBERRY PI

The Raspberry Pi: It is a credit card-sized single-board computer developed in the UK by the Raspberry Pi Foundation, which can plug into any HDMI input device or RCA video input device and a keyboard is required for operation. Once it is initialized the HDMI and keyboard are also not required for its operation as you can then operate it by other means such as ssh for command line interface and VN C if graphical user interface is desired. The main technical specifications of the latest model of Raspberry Pi also known as Model B have the following features:

• 700 MHz ARM CPU
• 512MB SDRAM
• 101100 Ethernet RJ45
• 2 x USB 2.0
• HDMI (1.4) and Composite RCA

The Raspberry Pi runs Linux based operating systems and there is a specialized version of Linux based kernel known as Raspian which can run almost all programs which are Linux compatible. Hence in this project we have used 'python' and 'wput', script written in python for motion detection and wput for storing the files on an external server.

A. Advantages: The Raspberry Pi being small as a credit card server still has the capabilities of working as a normal computer it can play 10S0p resolution videos without lagging. It has a low price relatively as compared to machines in the market and can serve as a server for light traffic such as web traffic or DNS servers or NTP servers, which can run on low power also for example it can be powered by portable batteries which can act as UPS (uninterrupted power supply), when there is a power cut and notify about the power cut to the network administrators.

B. Disadvantages: Although Raspberry Pi can perform discrete tasks, it has some limitations due to its hardware. Firstly, it cannot run xS6 operating systems such as Windows and some Linux distributions.

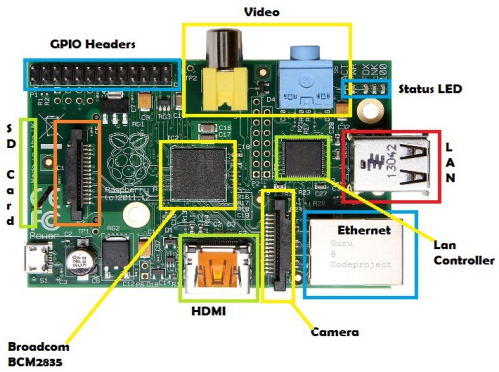

Fig. 3 Raspberry pi board

c) Raspberry Pi Camera

There are three applications provided are: 1)raspistill 2) raspivid and 3)raspistillyuv

- raspistill and raspistillyuv are very similar and are intended for capturing images, where raspivid is for capturing video.

- All the applications are command line driven which runs over OpenMAX it makes system to easy. Note that Broadcom specific API used only on Video-core systems.
- The applications use up to four OpenMAX(mmal) components - camera, preview, encoder and null_sink.
- All applications use the camera component
- raspistill uses the Image Encode component
- raspivid uses the Video Encode component and
- raspistillyuv does not use an encoder, and sends its YUV or RGB output direct from camera component to file strip would be having 15 pins in rebel cable.

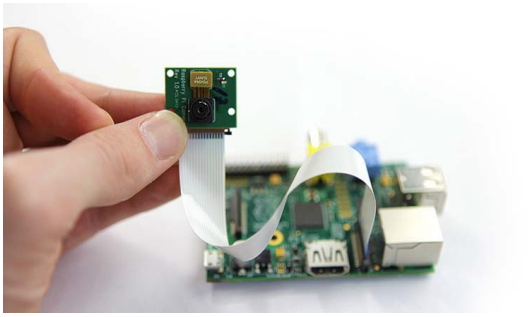

Fig. 4 Raspberry pi camera

d) RFID card reader

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These steps include the use and programming of a microcontroller. RFID, radio---frequency identification, uses electromagnetic fields to transfer data. RFID is not a single product but rather a system, which is composed of: a RFID tag (transponder), reader (transceiver) and back---end application system (or database), which require the support of a computer network For this system the transponder is a passive RFID tag. Passive tags are cheaper, lighter, and smaller than the other tag options. That is because unlike other RFID tag types, passive tags do not require batteries. Passive tags use radio energy transmitted by the reader as a power source. Since the RFID reader powers the RFID tag the tag must be within 2 to 5 inches of the RFID reader in order to be read

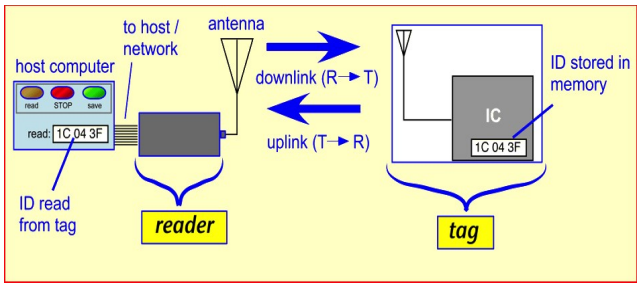


Fig. 5 RFID reader and tags working

An RFID tag (sometimes called an RFID transponder) consists of a chip , some memory and an antenna .RFID tags that contain their own power source are known as *active* tags. Those without a power source are known as *passive* tags. A passive tag is briefly activated by the radio frequency (RF) scan of the reader. The electrical current is small -- generally just enough for transmission of an ID number. Active tags have more memory and can be read at greater ranges. Increasingly, RFID tagging is used in supply chain management as an alternative to bar code technology. Although more expensive to use than the bar code stickers, RFID tags don't get dirty or fall off or require an unobstructed line-of-sight between the tag and the reader.

This RFID reader module will be installed at the front side of organizations in such a way that all employees provided by the RFID cards. Raspberry pi system have the database of the employees so comparing the database if employees details are matched employ can entered into company. Thus with the help of this system, time will be saved and it is so convenient to record employees. And the details of the employees will be sent to the corresponding head of organization using IOT technology.

Fig. 6 RFID tags

IV SYSTEM OVERVIEW

The block diagram in Fig.4 explains about the overall requirement of the paper.

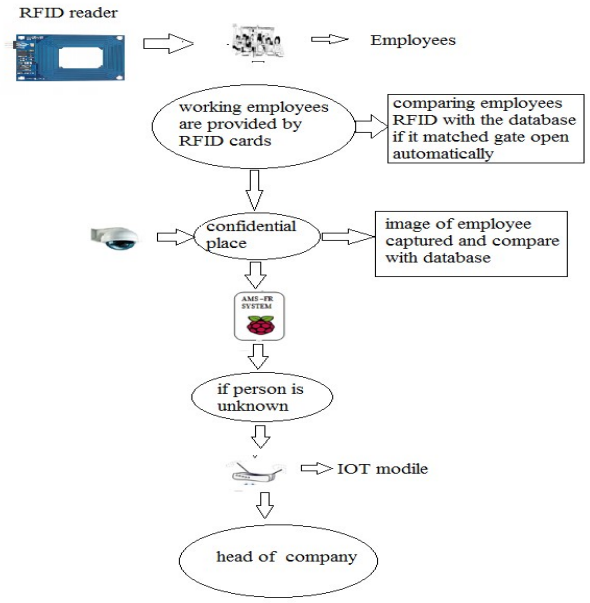


Fig. 7 overview of project

Now days as the number of employees working under IT companies increased so number of industries also increased. For the sake of that one of the easy way to give security for company is Face recognition and providing RFID cards.

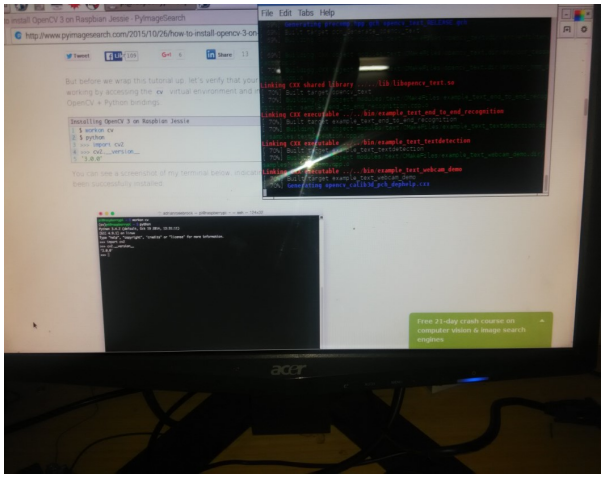
This RFID reader module will be installed at the front side of organizations in such a way that all employees provided by the RFID cards. Raspberry pi system have the database of the employees so entered employees comparing with database. (The database includes name of the employees, there images, address & ID number ext....), if employees details are matched automatically gate is opened so employ can entered into company. Thus with the help of this system, time will be saved and it is so convenient to record employees.

when the employees want to enter into the confidential place in company. RFID can track with the RFID reader and camera would be placed in confidential place it would be capture photo of employ and compared with database. Using study of Haar Cascaded Algorithm for object and digital image recognition of the face was identified. The total number of employees and their faces were stored in the raspberry pi. The raspberry pi board act like a pc. If details are matched it would be ok otherwise if not matched using max232 the detail will be transmitted through IOT technology, to the particular Head officer. Using this project we can detect unknown persons entered into the organization.

V. OUTPUT AND RESULT

This paper aims to describe a way for giving security to IT companies, scouting units, business organizations and volunteer groups. RFID reader module will be installed at the front side of organizations in such a way that all employees provided by the RFID cards so that known employees can enter into company and unknown persons can be detailed.

The system proposed is a real-time system. It takes input image through a web camera continuously. When the employees are entering through confidential place camera their image will be marked automatically and compare with the database. If it gets to employ is unknown it would request leaves via a SMS message to head . The system could detect faces with 88% of accuracy so far. The output for the AMS using Rasperry pi face recognition technique is shown in fig below. By this project mainly detecting of unknown persons entered into company.



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