A PRACTICAL AND ECONOMICAL SYSTEM THAT COULD IDENTIFY ANY KIND OF THEFT IN REAL-TIME AND IMMEDIATELY NOTIFY THE HOMEOWNER

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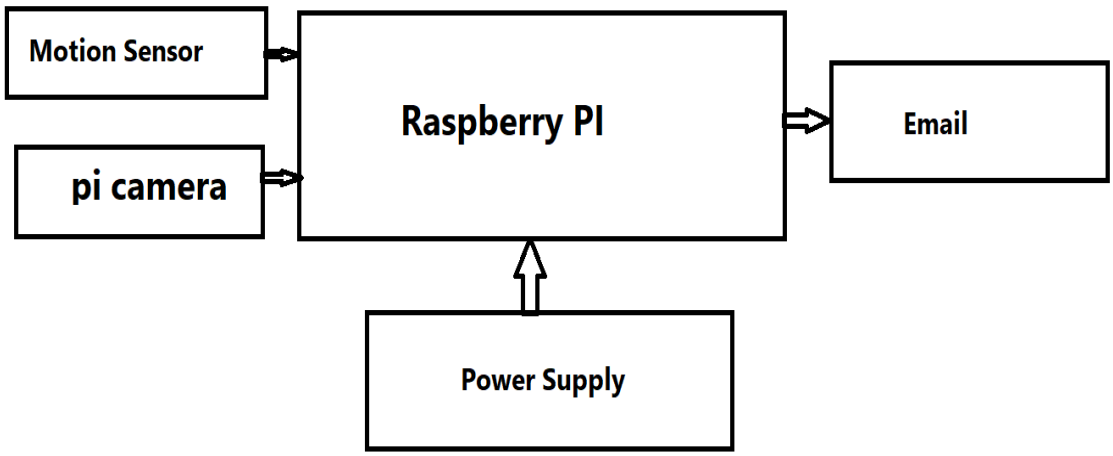
Abstract:

A broadly implementable framework for instantly notifying a home owner or member of an ongoing theft (unauthorised entry to their property) is the goal of the suggested study technique. A thorough evaluation of current systems was carried out to pinpoint areas where more study is needed in order to achieve this goal. Current systems have limitations, such as not being able to differentiate between human and non-human things or only being able to identify the thief after the fact. The ideas, methods, and applications of smart homes are being expanded via Wireless Sensor Networks (WSNs) in conjunction with the Internet of Things (IoT) and Cognitive Internet of Things. An innovative smart home anti-theft system is suggested in this study. It has the ability to identify an intruder regardless of whether their face is partly or completely concealed by clothes, leather, fibre, or plastic. Even without night vision, the suggested approach can identify a potential invader. The primary concept was to create a practical and economical system that could identify any kind of theft in real-time and immediately notify the homeowner. In addition to home security, the system claims to be able to handle massive amounts of video data in real-time. The investigation's findings confirm the suggested system's effectiveness.

1. Introduction:

These days, people are increasingly concerned about their personal safety and security, and security measures are always evolving to meet their needs. As technology has become more pervasive in people's daily lives, it is imperative that home security systems keep pace. Building a system that can open and close doors using a Raspberry Pi camera module is the main objective of this project. A webcam for visitor detection, a Raspberry Pi Model 3 with an integrated Wi-Fi module, and a mobile device for system interface make up the major components of this system. The system was designed to automatically capture images whenever someone stood in front of a door and transmit them to a mobile device. A user's smartphone may be used to operate the door. The system's appliances may be managed by consulting the specifications provided in the mobile device. A webcam receives a signal from a motion detector, snaps a picture of the subject, and then transmits the image to the user's mobile device over a Raspberry Pi and the Internet of Things (IoT). The intended outcome of this project is to let the designated individual enter the home by requiring them to authenticate their access to the door using an app. Two Internet connections, one at the raspberry end and one at the user end, are necessary for this project. An very safe way to lock and unlock the door while it's within Wi-Fi range is to use optimised door locking with the internet of things (IoT). When it comes to assisting physically impaired people in reducing their workload, this method is crucial. The plan is to use the Raspberry Pi Wireless system to communicate with the door using mobile devices or cameras. A user may lock and open a door from anywhere in the home as long as there is Wi-Fi coverage.Sensors that are relevant to the Raspberry Pi may also be connected to it. Many academics have studied different parts of face recognition (FR) during the last 20 years, and it has gotten a lot of attention [6]. The first may be due to our interest in investigating potential

security and commercial uses, and the second to the fact that practical computing resources are available for creating and executing programs with demanding computational needs. In reality, FR has grown into a major concern in several domains, including security systems, access control, criminal identification, and credit card verification. Improving one-person identification or recognition, for instance, would be feasible if one could model a specific face and differentiate it from other face image models. However, there are limits to the FR method on its own, since it relies on subjects being very cooperative in order for it to work. In fact, the capacity to recognise faces, as opposed to just being able to notice them, may be critically essential. The reason for this is because face detection was the first automatic technology for recognising faces. Face recognition would be rendered impossible in the absence of a recognised facial area. On the other hand, face identification is an extremely advanced computer vision problem that may include several early vision approaches. Extraction of significant elements from facial photos is the first stage in human face identification. Naturally, one wonders how accurately one can quantify face traits. A computer should be able to recognise a face given a collection of characteristics if such a quantisation is achievable. When it comes to solving the facial recognition issue, there are essentially three main schools of thought. Facial features utilised by humans for face recognition have been the focus of the most extensive subset. Two sets of algorithms employ feature vectors generated from profile silhouettes to identify people, while a third set uses feature vectors extracted from a frontal view of the face [1]. Algorithms for facial recognition typically use either a feature-based or an image-based strategy. A face may be represented using a collection of geometric characteristics, such as the size and distance between the eyes, via feature-based approaches. The predicted templates are used to calculate these attributes using simple correlation filters. These techniques may partly account for changes in camera position and are mostly unaffected by variations in lighting.But they pick up on signs of ageing and emotions in the face. An issue that requires further mathematical research is the lack of clarity about which properties are crucial for categorisation. Although they have not been completely used for face recognition, there are basic mathematical conclusions in the literature that attempt to address these problems [2]. This study presents the creation of an automatic facial recognition system application for door access control.The famous Eigen face method, which is a subset of Principal Component Analysis (PCA), is the foundation of the FR system that was created.



2. Hardware Components:

RASPBERRY PI

With the goal of bringing computer science education to underserved communities, the Raspberry Pi foundation in the United States created a line of affordable, compact single-board computers called Raspberry Pis. Despite being designed for specific applications like robotics, the initial model ended up selling a lot more than expected. Not included are cases and accessories like keyboards and mouse. Nevertheless, a number of official and unauthorised packages have incorporated certain accessories. There are two parts to the Raspberry Pi organisation. The Raspberry Pi Foundation created the first two versions. Following the success of the Pi Model B, the Foundation appointed ebenupton as CEO of Raspberry Pi Trading to create the B+, the third model in the series. The technology behind Raspberry Pi is developed by Raspberry Pi Trading, while the Foundation is an educational foundation that aims to encourage the teaching of fundamental computer science in schools, particularly in poor nations. Depending on your needs, you may choose from a number of Raspberry Pi variants. The latest versions all store the operating system and files on a micro SD card. They include a 40-pin GPIO connection, one HDMI port, one audio/video jack socket, and are powered by a micro-USB port. The most recent addition to the Raspberry Pi 3 family, the Model B+, has a 64-bit four core CPU clocking in at 1.4GHz, along with dual-band 2.4GHz and 5GHz wireless LAN, Bluetooth 4.2/BLE, quicker Ethernet, and Power over Ethernet (PoE) functionality with a dedicated PoEHAT.Due to the modular compliance certification that comes with the dual-band wireless LAN, the board may be integrated into finished products with much reduced wireless LAN compliance testing, which improves both the cost and the time to market.

With this improved model, the Raspberry Pi's general-purpose input/output (GPIO) pin count jumps from 26 to 40. The Model B only had two USB 2.0 ports, while this new model has four. A micro SD slot of the push-push kind has replaced the older SD card slot. With a neater design, somewhat lower power consumption, and improved audio quality, it's hard to beat. In order to begin, you will need a Raspberry Pi 3 Model B, a micro SD card that already has the operating system loaded, an HDMI cable, a USB power source that is at least 2 amps, a standard USB keyboard and mouse, and a micro SD card. When starting off, it's best to use the NOOBS operating system.GPU: The GPU can decode 1080p30 H.264 at high profile, has a throughput of

1Gpixel/s, 1.5Gtexel/s, or 24 GFLOPs of general purpose computing, and it has Open GL ES 2.0, hardware-accelerated Open VG, and other features. What exactly does it imply? What this implies is that you can view Blu-ray quality video at 40MBits/s using H.264 when you connect the Raspberry Pi 3 to your HDTV. An update to a next-generation core CPU and enhanced connection with built-in Bluetooth Low Energy (BLE) and BCM43143 Wi-Fi are the most noticeable changes in the Raspberry Pi 3. In order to accommodate more powerful external USB devices, the Raspberry Pi 3 includes enhanced power management and a better switching power supply that can handle up to 2.5 Amps. There are four USB ports on the Raspberry Pi 3 itself, so you may attach a keyboard, mouse, or whatever else you think the RPi requires. However, a USB hub can be used if you need even more connections. To avoid overloading the on-board voltage regulator, it is advised to use a powered hub. You may use any power source with a micro-USB connector to charge the Raspberry Pi 3. The Pi boots up automatically when power is connected; to turn it off, just remove the electricity. No power button is provided. If you have a 2Amp micro USB power supply, you can connect devices that need more power than the four built-in USB ports can handle. On top of everything else, hardware hacking is a breeze on the Pi because to its low-level peripherals. You may access 27 GPIO, UART, I 2C, SPI, 3.3 and 5V sources, and more using the 0.1" spaced 40-pin GPIO header on the Pi. Just like the Model B+ before it, this board's GPIO header has all the same pins.

SoC:

Designed with the new Pi 3 in mind, the Broadcom BCM2837 SoC incorporates a 1GB LPDDR2 memory module on the back, a VideoCore IV graphics processor, and four 1.2GHz ARM Cortex-A53 processing cores with 32kB Level 1 and 512kB Level 2 cache memory.

GPIO:

Similar to previous Pi models (Model B+ and Model A+), the Raspberry Pi 3 has a 40-pin general-purpose input-output (GPIO) header. No modification is necessary for any current GPIO hardware; the only thing that has to be done is to alter which UART is exposed on the GPIO pins, but the operating system takes care of that internally.

USB chip:

The Raspberry Pi 3 is an upgrade over its 2nd generation sibling, using the same SMSC LAN9514 processor but with the addition of four USB ports and 10/100 Ethernet. The SMSC chip, like before, functions as an Ethernet adapter and USB hub, connecting to the system on a chip (SoC) over a single USB channel.

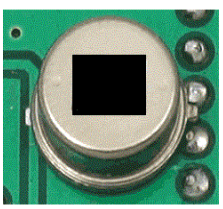
Antenna:

The Raspberry Pi 3 does not need an extra antenna. The device's radios are linked to this chip antenna that is attached directly to the board in order to minimise its size. This antenna may be little, but it ought to be able to pick up Bluetooth and wireless LAN signals with ease, even when they're blocked by walls. The primary distinctions are the built-in Wi-Fi and Bluetooth and the quad-core 64-bit processor. The 1 GB of RAM is still there, and neither the USB nor the Ethernet connectors have been altered. But now that power management is better, the Pi 3 should be able to handle USB devices with higher power consumption. With their latest system on a chip (SoC), BCM2837, Broadcom has backed Raspberry Pi 3.All the projects and guides that depend on the specific specifics of the Raspberry Pi hardware will still operate since this

maintains the same core design as BCM2835 and BCM2836. A 1.2GHz 64-bit quad-core ARM Cortex-A53 has superseded the previous generation's 900MHz 32-bit quad-core ARM CortexA7 CPU complex. When compared in size to the B+ and Pi 2, it is spot on. Although the power and activity LEDs have been relocated to accommodate the WiFi antenna, all previously installed add-ons, HATs, and cases should still fit well due to the consistent placement of all connections and mounting holes. With a performance boost of 50-60% over the Pi 2, the Pi 3 easily outperforms its predecessor by a factor of 10. No changes have been made to the location or function of any of the connections, and the board may still be powered via a 5V micro-USB adaptor. When it comes to connecting power-hungry USB devices, we now advise using a 2.5A converter.A system known as the "Smart Lock System" was created to bolster the protection of vital areas and data. The technology was created with the intention of granting access only to authorised staff by remotely opening the door using a mobile device. The foundational components include an embedded system, a graphical user interface (GUI) monitoring system, Bluetooth-radio connection, and serial communication. Two HC-06 Bluetooth-to-UART modules are used; one is linked to the embedded system that operates the lock, and the other is linked to the serial port of the host PC. This allows the host PC to receive data and display essential personnel information based on that data. A solenoid, a couple of transistors, and an Atmega32L microcontroller make up the embedded system that opens the door. In order to keep tabs on the employees, the monitoring system employs a graphical user interface (GUI) program developed in Microsoft Visual C++. The client side and the server side are the two main components. An embedded system is linked to the client side by a Bluetooth module. The server-side program, installed on the PCs of the security workers, receives the legitimate and transmits the data to it. Someone has to build a database to hold all the personal information about the individuals. You may quickly edit this database using the program. You may find all the necessary functionalities on the client side of the program, such as settings for Serial Communication, networks, processing in the idle state, and personnel data. An exhaustive record of all employee actions is recorded in a log file. Client data is the only data that will ever reach the server side of the application. The personnel's data possibilities are also included in it. The system's third component is the mobile app. There will be a dedicated app for every authorised member of the Academy's mobile devices. Due to the development of a unique data format for this connection, the embedded system will only allow this program to communicate with it. We remove an applicant's application if they are no longer a member of the Academy.

PIR Sensor?

The acronym "PIR" refers to a passive infrared sensor or pyroelectic infrared radial sensor. As soon as it senses a change in infrared light across a certain distance, a passive infrared (PIR) electronic sensor will release an electrical signal. If it's inside range, travels out of range, or stays within range, it can identify any infrared-emitting item, including people and animals. The infrared sensitive crystal and the processing circuit are the two main components of the PIR

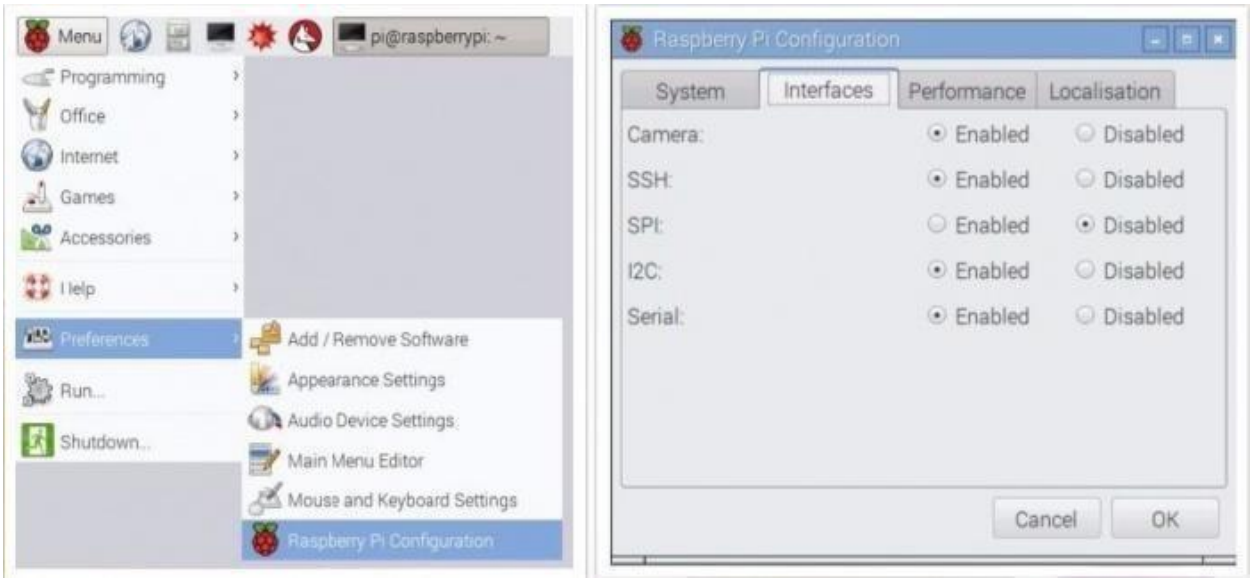


sensor module.

Inside the metal's shadow is an infrared-sensitive crystal; this crystal can measure the ambient infrared light intensity. It has two pyroelectic sensors that can detect things in motion. In order to activate the output, it is necessary for one of the sensitive crystals to detect an infrared change (increment or decrement) before the other sensitive crystal does.
In order to concentrate the infrared light on the sensors, a plastic dome is often put over this sensitive crystal.

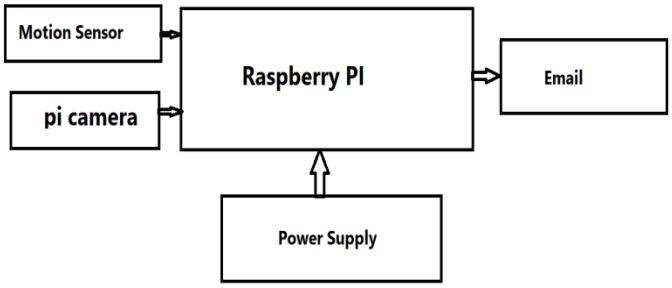
3. Proposed Method

Configuring the Raspberry Pi Camera Module
It is recommended to connect the Raspberry Pi Camera to the Raspberry Pi as Be careful to turn off the Raspberry Pi before attaching the camera module. Next, link the camera to the Pi's camera port. Turn on the Pi and connect the keyboard, SD card, and HDMI wire. Turn on the camera by going to the Raspberry Pi settings.

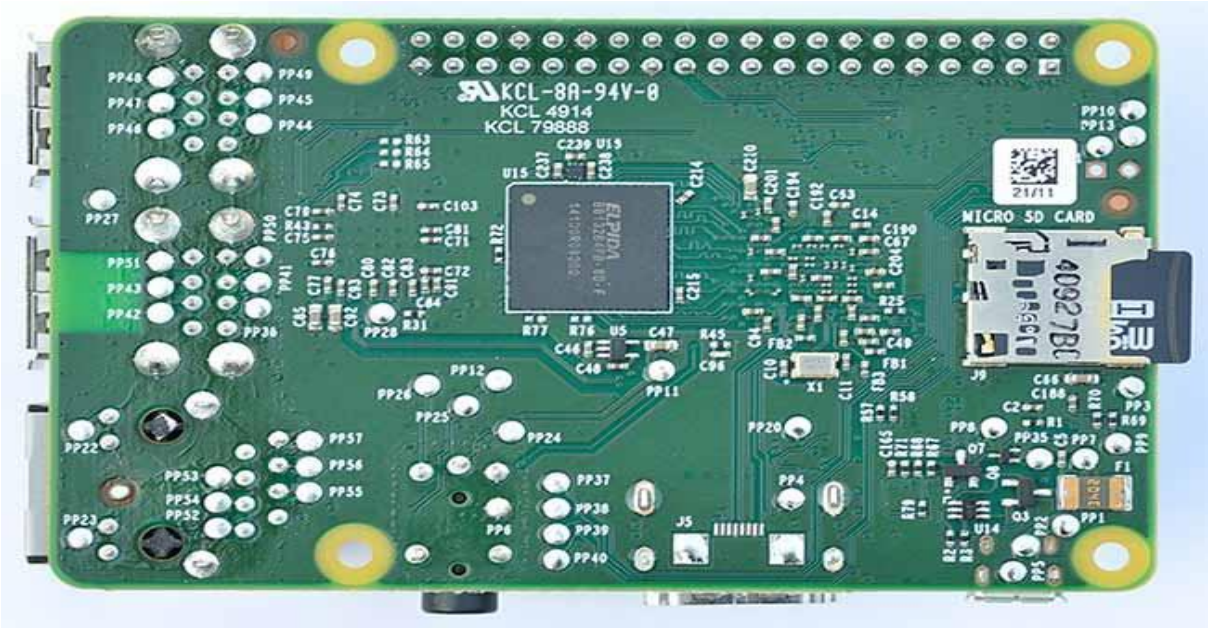


raspberry pi setup

To save your work, create a new file and add the.py suffix, like camera.py. Avoid saving it as pi camera py, user. To start, make sure it is enabled and then reboot your Pi.



In this paper, an Internet of Things device is constructed using Raspberry Pi 3. Its operation is straightforward and easy. As soon as the device's PIR sensor senses motion, it begins to capture photographs. The photos are delivered to the user's registered email address from the MicroSD card. The Raspbian Operating System is used to handle all of this by means of a python script. Installing an operating system and any necessary libraries, such as OpenCV, on the Pi 3 is a prerequisite to executing the python script. A display monitor should be connected to the Raspberry Pi via an HDMI connection while you install the operating system, libraries, and the python script. To install Raspbian on a microSD card, get the most recent image of the operating system from the Raspberry Pi website (here is the link:) - Linux Distribution Raspbian Put the most recent Raspbian OS image on the MicroSD card. Prior to transferring the image, ensure that the MicroSD card is formatted to FAT32 (file system) if it is 32 GB or less, or to exFAT if it is more than 32 GB. Before copying the OS Zip file to the MicroSD card, extract it. To transfer the picture to the card, all you need is a MicroSD card reader and a computer. After you've copied the picture, put the card into the MicroSD slot like this:



Include an HDMI cable, a monitor, a keyboard, and a mouse when you connect the Raspberry Pi to a display. Connect the board to a power adapter to turn it on. After the board's red LED begins flashing, the operating system will begin booting from the MicroSD card. After the Raspberry Pi's boot procedure is over, you can see it on the screen as the green LED lights up. It is advised to update software after successfully installing Raspbian OS on Raspberry Pi. You may do this by entering the following commands into the Linux Terminal:
execute "sudo apt-get update"
execute "sudo apt-get upgrade"
Installing the OpenCV library is the next step. Installing OpenCV is made easy with a variety of options.

The OpenCV website provides the easiest way to install OpenCV on Linux. Take a look at this link -
Linux Installation of OpenCV
Start up the Linux terminal on Raspbian and enter these commands:
1. Execute the following command to install the compiler:
The command "sudo apt-get install build-essential" gets the necessary packages installed.
2. Run $ sudo apt-get install cmake to install the necessary programs. package-config libavcodec-dev libavformat-dev libswscale-dev git libgtk2.0-dev
3. After that, use the following command to install any optional packages:
execute "sudo apt-get install" development packages for python, numpy, libtbb2, libjpeg, libpng, libtiff, libjasper, and libdc1394-22
Run the following commands to install OpenCV to any directory: $

4. "Choose the directory where you created the directory."
use git clone Download the OpenCV library from the following URL:
https://github.com/opencv/opencv.git
5. Then, to store the make files, project files, object files, and output binaries, construct a temporary directory (). To do this, type $ cd opencv into a terminal.
execute "$ mkdir build"
sudo cd build
Command: $cmake -D CMAKE_BUILD_TYPE=RELEASE -D CMAKE_INSTALL_PREFIX=/usr/local..
After creating the () in the previous step, go to step

6. to install OpenCV by performing the following commands: $ make.

A shell command to install

After installing the Raspbian and OpenCV, it's time to write and run the python script on Raspbian. Raspbian users have the option of utilising GNU Leafpad or another text editor to write Python scripts.

Nano. Another option is to use the built-in Python IDE, such as IDLE for Python 2 or IDLE for Python 3. Select Python 3 IDLE from the menu that appears, then go to the Programming menu. The Python 3.4.2 Shell window will pop up. Create a directory and save the python script.

When the Pi 3 is turned on, the python script that was built for this project should execute automatically. The script never terminates since it runs in an endless loop. You can set up your Raspberry Pi to launch a Python script every time it boots up using a few different approaches. A variety of approaches are available:changing rc.local - When the Raspberry Pi starts up, you may launch programs or commands by adding them to the file /etc/rc.local. If the Pi has to be powered without a head, this will allow it to execute programs without any setup or manual startup, which is a huge time saver. To modify the file as root, open the Linux Terminal and execute the following commands: - Run nano in the /etc/rc.local directory... Next, include the necessary instructions to start the Python script. Make sure to include the full path to the file and terminate each command with an ampersand. This will ensure that the script runs in its own process while booting continues. #/etc/init.d/sample.py in the file system **PROVIDES** sample.py **BEGIN INIT INFO ** # Starting with $remote_fs and $syslog is mandatory. End-Requirement: $remote_fs $syslog The default start value is #. As a default, the stop value is 0. Summary: Launch daemon when computer starts up. Description: Turn on the daemon's service. FINISH INIT INFOTo make the python script in the init directory executable, execute the command "sudo chmod +x securitysystem.py" to change its permissions. After that, execute the following command: sudo update-rc.d securitysystem.py The next step is to restart the Pi by typing sudo reboot into the terminal. You may make the python script execute on startup using any of the ways mentioned above. At this point, the Pi 3 may be unplugged from the screen, keyboard, and mouse. Finishing off the gadget circuit requires connecting the web camera and PIR sensor. This time around, the python script now runs concurrently with boot.The Linux environment, running on the Raspberry Pi development board, enables SMTP (Simple Mail Transfer Protocol), TCP/IP, and HTTP, which are essential components of the email system. Data produced from hardware resources may be dynamically included in files created by the web server's Flash File System. An embedded server page (ESP) is the name given to this kind of file. A digital HIGH is outputted by the PIR sensor whenever it senses motion near the entrance. The script in Python is designed to trigger the camera attached to the Raspberry Pi to capture a picture of the entry and send it as an attachment to an email as soon as GPIO 4 goes high.

4. **Working and Result** The project's central processing unit (CPU) is a Raspberry Pi 3B+. Intelligent and self-sufficient, the suggested technology does away with the need for constant human intervention. As a result, everything that requires human intervention is out of the question. Using in-store sensors, this system constantly verifies whether customers are coming in or leaving. And then it uses the revolving camera to give the owner an alert message with live photos from various perspectives. The PIZO sensor is used in this security system to detect human bodies.Banking institutions and jewellery stores would be the primary beneficiaries of this project's automated security system. In this project, a Raspberry Pi is used in conjunction

with a camera and sensor. There it is, the whole system. The technology is programmed to collect live photographs and send them via email the moment it detects someone in the bank or business.

5. **Conclusion** To address security issues and put a stop to theft, this thesis will conduct research with the primary goal of creating an anti-theft device—a motion detection surveillance system—that is both efficient and user-friendly. Small personal area surveillance is a good fit for this system. example: a private office suite, a locker room at a bank, or the entrance to a parking lot. At each time when motion is sensed... The project's key benefit is that it is easy to deploy, cheap, and of high quality.

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