RASPBERRY PI HOME SECURITY SYSTEM WITH CAMERA AND PIR SENSOR

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Abstract-- In this report, we proposed a solution to reduce a problem that suffer a lot of people nowadays, using the concepts IOT and real temp, our project can help people with the fire inside their home by contacting the firefighter on email with images proving the situation of the danger. It can also send an email to the owner in case of detection of movement when there is nobody at home.

I. Introduction

IoT security includes both physical device security and network security, encompassing the processes, technologies, and measures necessary to protect IoT devices as well as the networks they're connected to. It spans industrial machines, smart energy grids, building automation systems, employees' personal IoT devices, and more, including devices that often aren't designed for network security. IoT device security must protect systems, networks, and data from a broad spectrum of IoT security attacks, which target four types of vulnerabilities:

- Communication attacks, which put the data transmitted between IoT devices and servers at risk.
- Lifecycle attacks, which put the integrity of the IoT device as it changes hands from user to maintenance.
- Attacks on the device software.
- Physical attacks, which target the chip in the device directly.

A robust IoT security portfolio allows developers to protect their devices from all types of vulnerabilities while deploying the security level that best matches their application needs. Cryptography technologies are used to combat communication attacks. Security services are offered for protecting against lifecycle attacks. Isolation measures can be implemented to fend off software attacks. And, finally, IoT security should include tamper mitigation and side-channel attack mitigation technologies for fighting physical attacks of the chip.[1]

I. The project's function

There are many types of alarms that allow you to protect your home. However, before choosing it, you must clearly define your needs. The alarm for this project is a connected alarm against theft and fire. You therefore receive an email with a photo taken by the RPI camera of the situation of the house at the time of detection using the PIR sensor. So, when the sensor detects, we will have a "Motion " display on the RPI terminal, after 2s the camera takes a photo after 10s the photo will be sent from the project account to the recipient's account.

II. Hardware components

1. Raspberry Pi 3 Model 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. [2]

2. Raspberry Pi Camera Module

Modèle	Caméra Raspberry Rev 1.3	Caméra Raspberry Rev 2.1 Marque OFFICIELLE	Longruner Camera pour Raspberry Vision de nuit	Caméra Fish-Eye pour Raspberry Photo 'ronde', grand angle
Résolution	5 Megapixels 2592 x 1944 pixels	8 Megapixels 3280 × 2464 pixels	5 Megapixels 2592 x 1944 pixels	5 Megapixels 2592 x 1944 pixels
Capteur	Omnivision 5647	Sony IMX219	Omnivision 5647	Omnivision 5647
Résolution Vidéo max	1080p @30fps | 720p @60fps 640*480 @90fps	1080p @30fps | 720p @60fps 640*480 @90fps	1080p @30fps | 720p @60fps 640*480 @90fps	1080p @30fps | 720p @60fps 640*480 @90fps
Note Amazon	3.9	4	4	3
Prix	~12€	~25€	~24€	~25€
Plus d'infos	Voir sur Amazon.fr	Voir sur Amazon.fr	Voir sur Amazon.fr	Voir sur Amazon.fr

La caméra qu'on a utilisée est rev 1.3[3].

3. PIR Motion Sensor (generic)

A passive infrared sensor is an electronic sensor that measures infrared light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. PIR sensors are commonly used in security alarms and automatic lighting applications.

Technically, PIR is made of a pyroelectric sensor, which is able to detect different levels of infrared radiation. For example, everything emits varied level radiation and the level of radiation will increase with the increase of the object's temperature. Actually, the motion detector is separated by two parts since motion change is what we want, rather than IR level. The output will swing high or low if one half see different IR radiation than the other.

As we all know that PIR sensors can be also refer to PID, which is short for passive infrared detectors. As you have learned about the technical term in the first part, PIR sensor can detect infrared radiation which is emitted by particles.

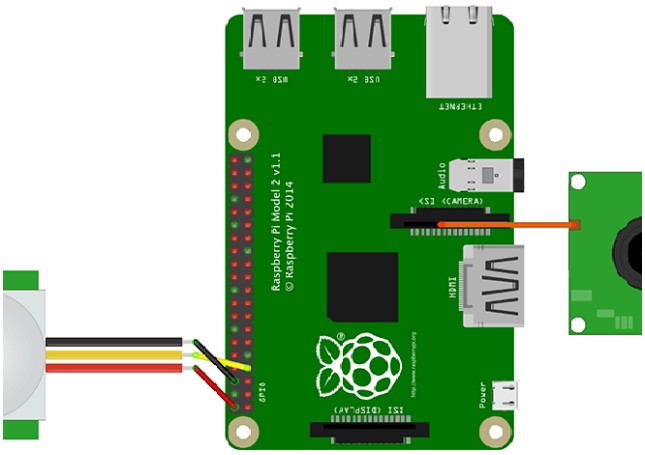
Generally, PIR can detect animal/human movement in a requirement range, which is determined by the spec of the specific sensor. The detector itself does not emit any energy but passively receives it, detects infrared radiation from the environment. Once there is infrared radiation from the human body/ particle with temperature, focusing on the optical system causes the pyroelectric device to generate a sudden electrical signal and an alarm is issued.

The passive infrared alarm does not radiate energy to space but relies on receiving infrared radiation from the human body to make an alarm. Any object with temperature is constantly radiating infrared rays to the outside world. The surface temperature of the human body is 36-27 ° C, and most of its radiant energy is concentrated in the wavelength range of 8-12 um.

Passive infrared alarms can be classified into infrared detectors (infrared probes) and alarm control sections. The most widely used infrared detector is a pyroelectric detector, which is used as a sensor for converting human infrared radiation into electricity. If the human infrared radiation is directly irradiated on the detector, it will, of course, cause a temperature change to output a signal, but in doing so, the detection distance will not be far. In order to lengthen the detection distance of the detector, an optical system must be added to collect the infrared radiation, usually using a plastic optical reflection system or a Fresnel lens made of plastic as a focusing system for infrared radiation.

In the detection area, the infrared radiation energy of the human body through the clothing is received by the lens of the detector and focused on the pyroelectric sensor. When the human body (intruder) moves in this surveillance mode, it enters a certain field of view in sequence and then walks out of the field of view. The pyroelectric sensor sees the moving human body for a while and then does not see it, so the human body the infrared radiation constantly changes the temperature of the pyroelectric material so that it outputs a corresponding signal, which is the alarm signal.**[4]**

4. Schematic



- Connect Pin 3 of Raspberry Pi (5V Power) to the Power pin of the sensor.
- Pin 5 of Raspberry Pi (GND) to the GND of the Sensor
- And Pin GPIO23 of Raspberry Pi to the output Pin of the sensor (of course one can use different GPIO but then one should change to Python code)

5. Software apps and online services

1. Gmail account

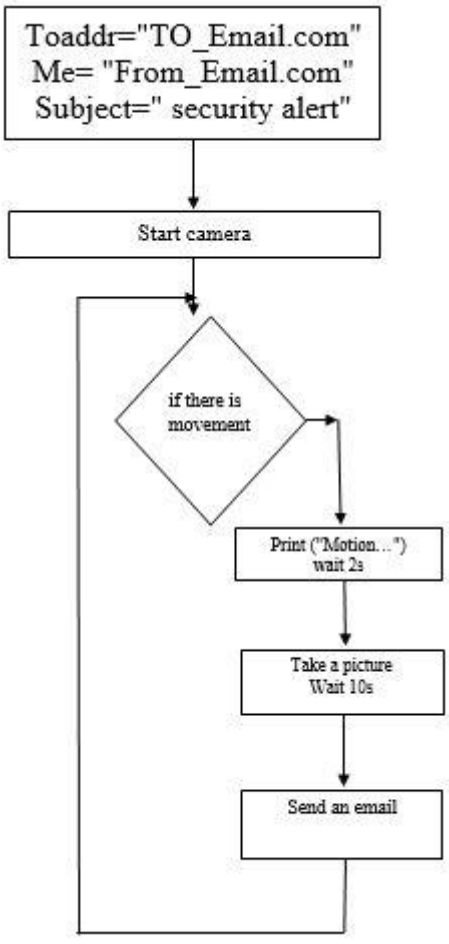
In order for this script to work, you must also enable "less secure apps" to access your Gmail account. As a warning, this is not ideal, and Google does indeed warn against enabling this feature. Be forewarned!

https://myaccount.google.com/lesssecureapps

2. SSH connection

SSH, or Secure Shell, is a remote administration protocol that allows users to control and modify their remote servers over the Internet. The service was created as a secure replacement for the unencrypted Telnet and uses cryptographic techniques to ensure that all communication to and from the remote server happens in an encrypted manner. It provides a mechanism for authenticating a remote user, transferring inputs from the client to the host, and relaying the output back to the client.

6. Algorithm



III. Conclusion

This project aim to help people inside the fire, to reduce stealing from houses by sending an email to a person from the house or for firefighters in case of fire at home with the home address.This email contains a picture of the moment when the PIR captor detect a

mouvement. Real temp and IOT were the mains and the basics concepts of our project. We used raspberry Pi and its camera as well as the PIR captor. After detecting a movement, the camera takes a picture and send it by email. Morocco is poor with these kinds of projects, hopefully it can be used to help people. And hopefully that this project can be developed to the point that we can have a message without internet connection

IV. REFERENCES

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[5]:https://www.hackster.io/ujur007/raspberry-pi-home-security-system-with-camera-and-pir-sensor-6154f3