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IOT Based Theft Detection using Raspberry Pi

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Abstract: ***Security and safety have always become a basic necessity for the urban population. To Monitor and to detect we use CCTV cameras. In surveillance, CCTV camera is costly because of the use of a computer. It reserves too much space for continues recording and also requires manpower to detect the unauthorized Activity. To overcome, we came across with Raspberry PI using IOT. Compare to Existing System Raspberry Pi is much cheaper with better resolution and low power consumption features. This Project "IOT based theft detection project using Raspberry Pi" where we use image processing on live video to detect theft using motion and also highlight the area where motion occurred. In this system, we use a camera along with raspberry pi along with a circuit with LCD display IR for night vision and USB drive for storage. As soon as camera motion is detected in camera, the system uses image processing to detect an exact area of motion occurrence and highlights it accordingly. The system now transmits the images of the occurrence over IOT to be viewed by the user online. Also, it stores the footage in a USB drive for further reference. The user can now decode the data sent online using IOT, IOT system to view the images of the motion occurrence live remotely over the internet. Thus, the system provides an innovative approach to Theft Detection using IOT.***

Keyword: IOT (Internet of Thing), IR Sensor, Raspberry PI, USB, UVC Driver

1. INTRODUCTION

Theft prevention would become a godsend in this increasingly technology conscious world. Many of the theft detection systems are available to catch the thief, which can be further improved. By using these technologies, in some scenarios, the thief cannot be caught. Even if the thief is caught, the victim cannot get back his/her valuable belongings. "Prevention is better than cure". If the theft is being prevented from happening, the person will be at no loss.

The project is aimed at evaluating the performance of an operating system on an embedded system. Before delving into its implementation, an introduction is needed to the parts involved in the project. Here, we propose "IOT based theft detection project using Raspberry Pi". Internet of (IOT) has been governing the electronics era with cloud services dominating the ever-increasing electronics product segment. This system secures offices/homes from theft by instantly detecting theft as well as allowing the user to view the theft details thereby highlighting the theft details and saving the video on a usb drive. In this system, we use a camera along with raspberry pi along with a circuit with LCD display IR for night vision and USB drive for storage. The system is powered by a 12V power supply. As soon as camera motion is detected in camera footage the system uses image processing to detect an exact area of motion occurrence and highlights it accordingly. The system now transmits the images of the occurrence over IOT to be viewed by the user online. We here use IOT Gecko to develop the online system. Also, it stores the footage in a USB drive for further reference. The user can now decode the data sent online using IOT Gecko IOT system to view the images of the motion occurrence live remotely over the internet. Thus, the system provides an innovative approach to theft detection using IOT.

2. LITERATURE SURVEY

With embedded systems fast expanding its reach, subject matter related to this field is available in abundance. While working on this project we have studied matter from various sources such as books, online articles, and reference manuals. The knowledge gained from this activity has been of great help to us in understanding the basic concepts related to our project and has ignited further interest in this topic.

"Linux for Embedded and Real Time Applications", by Doug Abbott has been of great help in providing an introduction to the process of building embedded systems in Linux. It has helped us understand the process of configuring and building the Linux kernel and installing tool chains.

We understood the preponderance of the ARM processors in the field of embedded systems and the features of ARM processors from the document "The ARM Architecture" by Leonid Ryzhyk. The ARM architecture is a confluence of many useful features that make it better than other peer processors. Being small in size and requiring less power, they prove useful in providing an efficient performance in embedded applications.

3. PROPOSED SYSTEM

The block diagram of IOT Based Theft Detection using Raspberry PI shown in fig.1, in this system whenever, IR sensor senses motion and gives sensed signal to raspberry pi to take detected camera footage, the system uses image processing to detect an exact area of motion occurrence and highlights it accordingly. The system now transmits the images of the occurrence over IOT to be viewed by the user online.

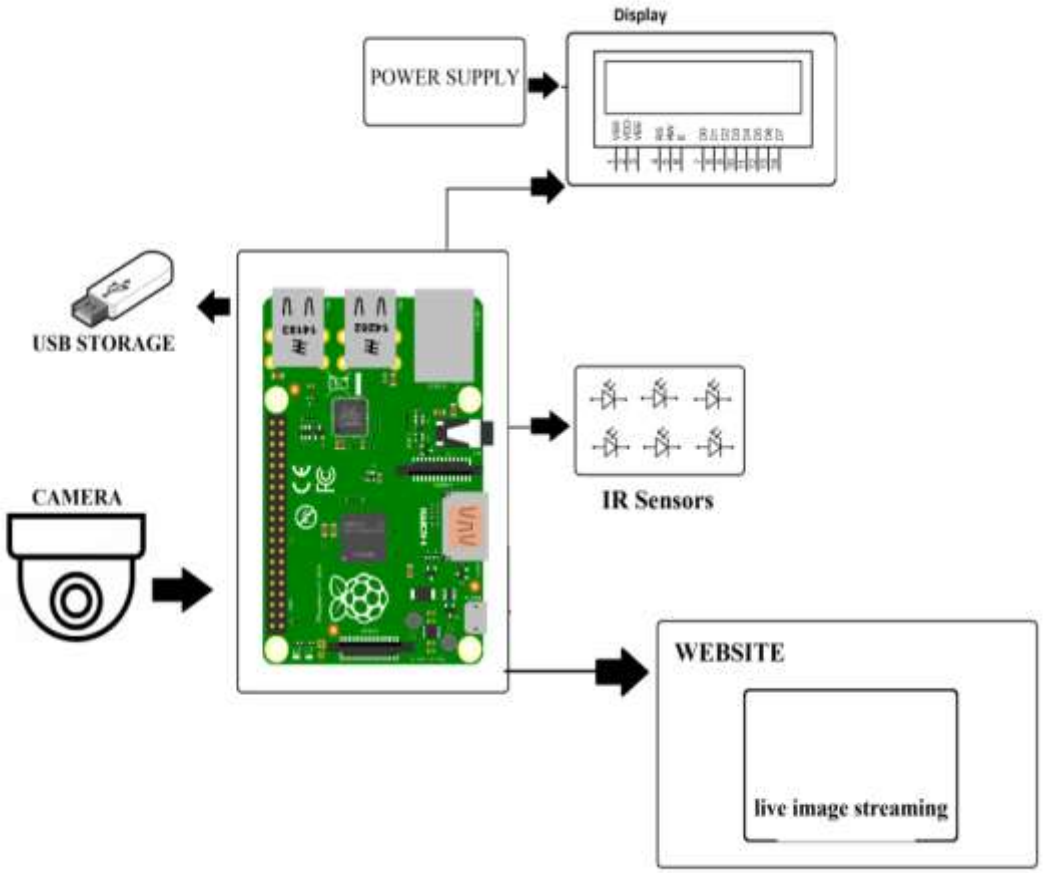

Fig. 1 Block diagram of proposed work

3.1 Hardware Material

For implementing this project, we are using the following

1. Raspberry Pi Development Board
2. UVC (Universal Video Class) Driver Camera
3. IR Sensor

3.1.1 Raspberry Pi 3 Model B

The Raspberry Pi is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in schools. The Raspberry Pi has a Broadcom BCM2837 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded (Model B & Model B+) to 512 MB. It does not include a built-in hard disk or solid-state drive but uses an SD card for booting and persistent storage.

Model B is the higher-spec variant of the Raspberry Pi, with 512 MB of RAM, two USB ports, and a 100mb Ethernet port. It's our most popular model: you can use it to learn about computing; to power real-world projects (like home breweries, arcade machines, musical root vegetables, robot tanks and much more); as a web server; a bitcoin miner; or you can just use it to play Minecraft.

The Raspberry Pi board contains a processor and graphics chip, program memory (RAM) and various interfaces and connectors for external devices. Some of these devices are essential, others are optional. It operates in the same way as a standard PC, requiring a keyboard for command entry, a display unit, and a power supply. Since raspberry Pi board operates like PC it requires 'mass-storage', but a hard disk drive of the type found in a typical PC is not really in keeping with the miniature size of RPi. Instead, we will use an SD Flash memory card normally used in digital cameras, configured in such a way to 'look like' a hard drive to RPi's processor. RPi will 'boot' (load the Operating System into RAM) from this card in the same way as a PC 'boots up' into Windows from its hard disk.

Fig. 2 Raspberry Pi 3 Model B

3.1.2 UVC (Universal Video Class) Driver Camera

A UVC (or Universal Video Class) driver is a USB-category driver. A driver enables a device, such as your webcam, to communicate with your computer's operating system. And USB (or Universal Serial Bus) is a common type of connection that allows for high-speed data transfer. Devices that are equipped with a UVC driver, such as the Logitech QuickCam Pro 9000 for Business, are capable of streaming data. In other words, with a UVC driver, you can simply plug your webcam into your computer and it'll be ready to use.

It is the UVC driver that enables the webcam to be plug and play. A webcam with a UVC driver does not need any additional software to work.

Once you plug your webcam in, it can work with a video-calling application, such as Skype, Windows Live Messenger, or Microsoft Office Communicator.

3.1.3 IR Sensor:

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion.

This sensor is great for sensing objects up to 5 feet away! An infrared sensor circuit is one of the basic and popular sensor modules in an electronic device. This sensor is analogous to human's visionary senses, which can be used to detect obstacles and it is one of the common applications in real time.

3.2 Software Material

For implementing this project, we are using the following concepts

1. Linux Operating system
2. C++ & Qt for Embedded Linux
3. Open CV

3.2.1 Linux Operating System

Linux is one of the popular version of UNIX Operating System. Linux or GNU/Linux is a free and open source software (FOSS) operating system for computers. Since Linux is free software it means that none of the software will put any license restrictions on users.

3.2.2 C++ & Qt for Embedded Linux

QT is Cross platform application framework. The 'QT' is a widely used platform for creating GUIs in Linux environment. Qt is an application which helps in developing the UI framework using the Qt IDE. Qt uses standard C++ but it also supports support many compilers, including the GCC C++ compiler and the Visual Studio suite.

3.2.3 Open CV

Open CV (Open Source Computer Vision) is a library of programming functions for real time computer vision. Open CV is an open source c/c++ library for Image processing and Computer Vision developed by Intel. The library is written in C and C++ and runs under Linux, Windows and Mac OS X. It now supported by Willow Garage, which is also the organization behind the famous Robot Operating System (ROS). It is free for both commercial and non-commercial use.

4. ARCHITECTURAL FLOW OF SYSTEM

Following Figures shows the architectural flow of system installation process and working of the proposed system which will lead to prevention of Theft.

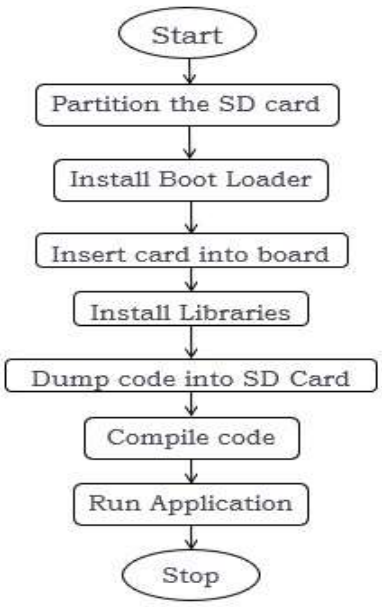

Fig.3 Installation Process

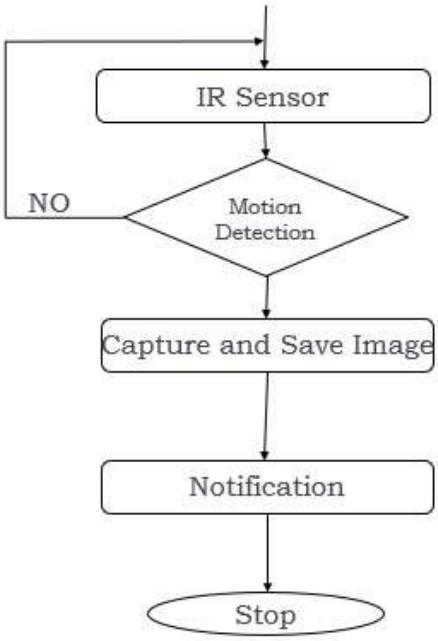

Fig.4 Proposed System Working

CONCLUSION

The project "IOT Based Theft Detection Using Raspberry PI" has demonstrated how to get a fully functional embedded product developed from scratch. This included the cross compilation and deployment of essential libraries, the configuration of embedded Linux and cloud computing technology. This system is suitable for small personal area surveillance. i.e. personal office cabin, bank locker room, parking entrance. Whenever the motion is detected through. The main Advantage of the project is Easy to implement, Low cost with High quality.

FUTURE SCOPE

This final section of the report outlines some features that could potentially be implemented in future releases. The current set of features implement is a minimum to what a consumer would expect.

In future, we can store the images with help database and we can also increase the processing speed with help of advanced board.

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