IOT Based Theft Detection using Raspberry Pi

Gaurav Sable[1], Gaurav Sharma[2,] Manish Bhalerao[3], Yash Ramugade[4,] S.S.Repal[5]
[1,2,3,4]*Student, Department of Electronics and Telecommunication, Rajiv Gandhi Institute of Technology*
[5]*Faculty, Department of Electronics and Telecommunication, Rajiv Gandhi Institute of Technology*

***Abstract*— For the urban inhabitants, security and safety have always been a must. CCTV cameras are used to monitor and detect things. Because of the usage of a computer, CCTV cameras are expensive for surveillance. It takes up far too much space for continuous recording, and it also necessitates the use of labor to detect illicit activity. To solve the problem, we used Raspberry PI and IoT. In comparison to existing systems, the Raspberry Pi is significantly less expensive, has a higher resolution, and uses less power. We use image processing on live video to detect theft using motion and also highlight the area where motion occurred in this project "IOT based theft detection project using Raspberry Pi," in which we use image processing on live video to detect theft using motion and also highlight the area where motion occurred. We use a camera, a Raspberry Pi, and a circuit with an LCD display with infrared for night vision and a USB drive for storage in this system. When a camera detects motion, the system employs image processing to pinpoint the exact location of the motion and highlights it. The technology now sends photographs of the occurrence to the user's computer via IoT, where they may be seen online. It also saves the video to a USB device for later use. The user can now decode data transmitted over the internet via IoT, and use the IoT system to view photographs of motion occurrences live over the internet. As a result, the system offers a novel method for IoT-based Theft Detection.**

Index Terms: **IoT (Internet of Things), IR Sensor, Raspberry PI, USB, UVC Driver**

I.INTRODUCTION

In our more technologically aware society, theft prevention would be a godsend. Many theft detection systems are available to catch the thief, and they can be improved even more. In some cases, the thief cannot be apprehended using this technology. Even if the thief is apprehended, the victim will lose access to his or her valuables. "It is better to prevent than to cure." The person will not suffer any harm if the theft is avoided. The goal of the research is to evaluate an operating system's performance on an embedded system. Before diving into the implementation, a brief overview of the project's components is required. "IoT-based theft detection project utilizing Raspberry Pi" is what we suggest here. With cloud services dominating the ever-increasing electronics product market, the Internet of Things (IoT) has ruled the electronics era. This technology protects offices and residences against theft by detecting theft instantaneously and allows the user to examine the details of the theft, highlighting the details and recording the video to a USB drive. We use a camera, a Raspberry Pi, and a circuit with an LCD display with infrared for night vision and a USB drive for storage in this system. A 12V power supply is used to run the system. When camera motion is detected in the video, the system employs image processing to pinpoint the precise location of the motion and highlights it. The technology now sends photographs of the occurrence to the user's computer via IoT, where they may be seen online. The online system is built with IoT Gecko here. It also saves the video to a USB device for later use. The user can now use the IoT Gecko IoT system to decode the data supplied online and examine the images of the motion event live over the internet. As a result, the system uses IoT to deliver a novel method for theft detection.

II.LITERATURE SURVEY

Subject matter linked to embedded systems is abundant, as the industry expands rapidly. We researched information from books, web publications, and reference manuals while working on this project. The knowledge we got from this exercise has greatly aided us in grasping the fundamental principles relevant to our project and has piqued our interest in the subject. Doug Abbott's book "Linux for Embedded and Real-Time Applications" has been quite helpful in offering an

introduction to the process of developing embedded systems with Linux. It has aided us in comprehending the process of customizing and creating the Linux kernel, as well as the installation of toolchains. The document "The ARM Architecture" by Leonid Ryzhyk helped us understand the importance of ARM processors in embedded systems and their characteristics. The ARM architecture combines a number of important features that distinguish it from other peer processors. They are valuable in embedded applications because of their tiny size and low power consumption.

III.PROPOSED SYSTEM

The block diagram of IOT Based Theft Detection with Raspberry PI is shown in fig.1. In this system, whenever an IR sensor detects motion and sends a signal to a Raspberry Pi, the system uses image processing to recognize an exact location of motion occurrence and highlights it appropriately. The technology now sends photographs of the occurrence over IoT for the user to examine online

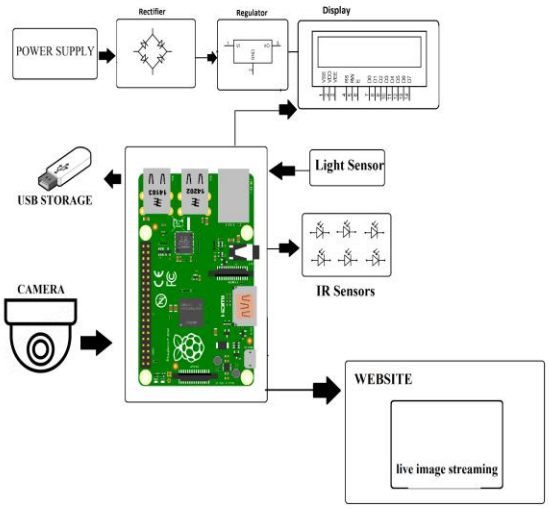

Fig. 1 Block diagram of proposed work

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 4 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 is powered by a Broadcom BCM2837 system on a chip (SoC), which features an ARM1176JZF-S 700 MHz processor, Video Core IV GPU, and 256 MB of RAM, which was later updated to 512 MB (Model B & Model B+). It doesn't have a hard disc or solid-state drive built-in, instead of relying on an SD card for booting and permanent storage. With 512 MB of RAM, two USB ports, and a 100 Mbps Ethernet connector, the Raspberry Pi Model B is the higher-end model. A processor and graphics chip, as well as RAM and other interfaces and ports for external devices, are all found on the Raspberry Pi board. Some of these gadgets are required, while others aren't. It functions similarly to a regular computer, requiring a keyboard, a display unit, and a power source. Because the Raspberry Pi board functions like a PC, it requires mass storage,' yet a conventional PC hard disc drive is too large for the RPi's small size. Instead, we'll use an SD Flash memory card similar to those found in digital cameras, which will be configured to appear to the RPi's processor as a hard drive. The Raspberry Pi will 'boot' (load the Operating System into RAM) from this card in the same way as a PC does from its hard drive.

Fig. 2 Raspberry Pi 4 Model B

3.1.2 UVC (Universal Video Class) Driver Camera

A USB-category driver is a UVC (Universal Video Class) driver. A driver enables a device, such as your webcam, to connect with the operating system on your computer. And USB (Universal Serial Bus) is a popular type of connection that enables high-speed

data transfer. Streaming data is possible with devices that include a UVC driver, such as the Logitech QuickCam Pro 9000 for Business. The UVC driver is responsible for the webcam's plug-and-play functionality. A webcam that uses the UVC driver does not require any additional software to function. Once you've connected your webcam, you may use it with video-calling software like Skype, Windows Live Messenger, or Microsoft Office Communicator.

3.1.3 IR Sensor

An infrared sensor is an electronic gadget that produces infrared light to detect certain features of its environment. An infrared sensor detects motion as well as measures the heat of an object.

This sensor can detect objects up to 5 feet away! One of the most common and fundamental sensor modules in electronic devices is the infrared sensor circuit. This sensor is similar to a human's visionary senses, and it may be used to detect obstructions 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

One of the most widely used UNIX operating systems is Linux. Linux, sometimes known as GNU/Linux, is a computer operating system that is based on free and open-source software (FOSS). Due to the fact that Linux is free software, no license limitations will be imposed on users.

3.2.2 C++ & Qt for Embedded Linux

QT stands for "QuickTime" and is a cross-platform application framework. In the Linux environment, the 'QT' platform is commonly used for designing GUIs. Qt is a program that aids in the development of UI frameworks using the Qt IDE. Qt employs conventional C++, but it also works with a variety of compilers, including GCC and the Visual Studio suite.

3.2.3 Open CV

Open CV (Open Source Computer Vision) is a real-time computer vision library made up of programming functions. Intel's Open CV library for image processing and computer vision is an open-source c/c++ library. The library operates on Linux, Windows, and Mac OS X, and is developed in C and C++. Willow Garage, the company behind the well-known Robot Operating System, is now supporting the project (ROS). It can be used for both commercial and non-commercial purposes and is completely free.

IV.ARCHITECTURAL FLOW OF SYSTEM

The architectural flow of the system installation procedure and the operation of the proposed system, which would lead to theft prevention, are depicted in the following figures.

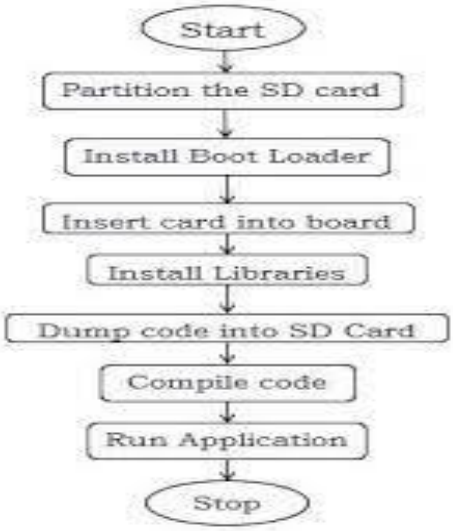

Fig.3 Installation Process

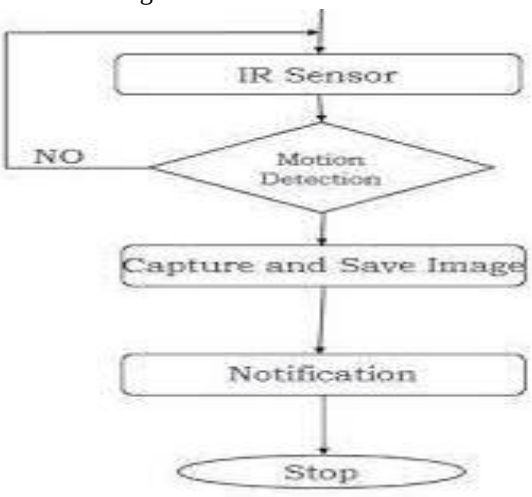

Fig.4 Proposed System Working

V.CONCLUSION

The project "IoT Based Theft Detection Using Raspberry PI" showed how to construct a completely functional embedded solution from the ground up. This includes cross-compiling and deploying key libraries, as well as setting up embedded Linux and cloud computing. This system is ideal for surveillance of tiny personal areas, such as a personal office cabin, a bank locker room, or a parking entrance. Whenever movement is detected. The project's key benefit is that it is simple to implement and has a low cost while maintaining a high level of quality.

VI.FUTURE SCOPE

The report's final part describes several enhancements that could be included in future editions. The existing set of features is the absolute minimum that a customer would anticipate. We will be able to save photos in the future using databases, and we will be able to boost processing speed using modern boards.

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