VIDEO SURVEILLANCE USING RASPBERRY PI

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Abstract: This paper proposes a method for controlling a wireless robot for surveillance using an application built on Android platform. The Android application will open a web-page which has video screen for surveillance and buttons to control robot and camera. Android Smartphone and Raspberry pi board is connected to Wi-Fi. An Android Smartphone sends a wireless command which is received by Raspberry pi board and accordingly robot moves. The Video Streaming is done using MJPG streamer program that gets MJPG data and sends it through a HTTP session. The Raspberry pi programming is done in python language.

Keywords: Raspberry pi, servomotor, PIR sensor, pi camera.

I. INTRODUCTION:

Starting from small houses to huge industries, surveillance plays very vital role to fulfill our safety aspects as Burglary and theft have always been a problem. In big industries personal security means monitoring the people's changing information like activities, behavior for the purpose of protecting, managing and influencing confidential details. Surveillance means watching over from a distance by means of electronic equipment such as CCTV cameras but it is costly for normal residents to set up such kind of system and also it does not inform the user immediately when the burglary happens.

Robots are being used in variety of industrial applications for various activities like pick and place, painting, assembling of subsystems and in hazardous places for material handling etc. Robots are becoming more and more intelligent as technology advances in the areas of CPU speed, sensors, memories etc. And there is ever demanding applications even in defence With the rapid growth of the Internet, more and more intelligent devices or systems have been embedded into it for service, security and entertainment, including distributed computer systems, surveillance cameras , telescopes, manipulators and mobile robots. Although the motion of Internet robotics or web-based robotics is relatively new and still in its infancy, it has captured the huge interest of many researchers worldwide.

II. PROPOSED SYSTEM:

The aim is to make a video surveillance system which can be monitored by people remotely through android application. As it is connected with the system with IOT, system will send the push notification to android device when an intrusion is detected inside the room. It is required to develop and implement and affordable low cost web-camera based surveillance system for remote security monitoring. Authorized user can access to their monitoring system remotely via internet with the use a mobile phone and pc or laptop and monitor the situation on application. This entire work is done on raspberry pi with Raspbian operating system ported on it.

Surveillance System consists of mainly two parts:

A. Hard-wired surveillance systems: These systems use wires to connect the cameras, motion detectors, power supply and LAN cable with the pi.

B. Remote Access Systems: These systems have the capability to monitor and control a security system from a location away from the surveillance area through android device.

III. IMPLEMENTATION

In this proposed system control of robotic unit is fro m remote end with the use of Internet and also we are able to get the videos from the robot end for the purpose of surveillance. At the user PC, we will have videos on the web browser and also we are able to control the robotic movement and also the camera movement in horizontal direction. DC motors are being used for the movement of robotic wheels. The PIR sensor on the robotic unit gives us the information about the Moving bodies. Motors and PIR sensor are being interfaced to Raspberry pi 3. Raspberry Pi is used for video processing and sending the processed video to user PC with the help Internet. The use of Internet does not bring the limitation of range into consideration as if we have the internet access, we can control the robot from anywhere. The images captured by the camera should be

processed very fast to provide real time visualization of environment to the user. For this purpose along with low cost we think to use ARM based Processors.

3.1 Hardware Requirements

Raspberry pi is used to control and monitor the robotic unit. A webcam is connected to one of its USB ports. A Wi-Fi dongle is provided so as raspberry can communicate over Wi-Fi. Internet can be provided to the raspberry through this.

The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote the teaching of basic computer science in schools and in developing countries. The original model became far more popular than anticipated, selling outside its target market for uses such as robotics.

It does not include peripherals (such as keyboards, mice and cases). However, some accessories have been included in several official and unofficial bundles.

According to the Raspberry Pi Foundation, over 5 million Raspberry Pi's were sold by February 2015, making it the best-selling British computer. By November 2016 they had sold 11 million units, and 12.5m by March 2017, making it the third best-selling "general purpose computer".[11] In July 2017, sales reached nearly 15 million.

Fig 1:Hardware components

3.1.1 Pi processors:

The first-generation boards used the Broadcom BCM2835 SoC consisting of a 700 MHz ARM1176JZF-S processor, VideoCore IV graphics processing unit (GPU), and RAM. Cache is sized at 16 KB for L1 and 128 KB for L2. L2 cache is primarily used by the GPU. The pi 2 uses the BCM2836 SoC with a 32-bit quad-core ARM Cortex-A7 processor clocked at 900 MHz, with 256 KB shared L2 cache.

3.1.2 Peripherals:

The Raspberry Pi may be operated with any generic USB computer keyboard and mouse. It may also be used with USB storage, USB to MIDI converters, and *virtually* any other device/component with USB capabilities.

Other peripherals can be attached through the various pins and connectors on the surface of the Raspberry Pi.

3.1.3 RASPBERRY PI:

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They are made in a Sony factory in Pencoed, Wales

Fig 2: Raspberry Pi 3 model B

IV. Technical Specifications:

- Broadcom BCM2837 Arm7 Quad Core Processor powered Single Board Computer running at 900MHz
- 1GB RAM
- 40pin extended GPIO
- 4 x USB 2 ports
- 4 pole Stereo output and Composite video port
- Full size HDMI
- CSI camera port for connecting the Raspberry Pi camera
- DSI display port for connecting the Raspberry Pi touch screen display
- Micro SD port for loading your operating system and storing data
- Micro USB power source

4.1 Power Supply

The linear regulator is the basic building block of nearly every power supply used in electronics. The IC linear regulator is so easy to use that it is virtually foolproof, and so inexpensive that it is usually one of the cheapest components in an electronic assembly.

4.2 Processor:

The Broadcom BCM2835 SOC used in the first generation Raspberry Pi is somewhat equivalent to the chip used in first modern generation smart phones (its CPU is an older ARMv6 architecture), which includes a 700 MHz ARM1176JZF-S processor, Video Core IV graphics processing unit (GPU), and RAM. It has a level 1 (L1) cache of 16 KB and a level 2 (L2) cache of 128 KB. The level 2 cache is used primarily by the GPU. The SOC is stacked underneath the RAM chip, so only its edge is visible.

4.3 General purpose input-output (GPIO) connector:

Raspberry Pi 1 Models A+ and B+, Pi 2 Model B, Pi 3 Model B and Pi Zero (and Zero W) GPIO J8 have a 40-pin pin out. Raspberry Pi 1 Models A and B have only the first 26 pins.

GPIO#	2nd func.	Pin#	Pin#	2nd func.	GPIO#
	+3.3 V	1	2	+5 V	
2	SDA1 (I²C)	3	4	+5 V	
3	SCL1 (I²C)	5	6	GND	
4	GCLK	7	8	TXD0 (UART)	14
	GND	9	10	RXD0 (UART)	15
17	GEN0	11	12	GEN1	18
27	GEN2	13	14	GND	
22	GEN3	15	16	GEN4	23
	+3.3 V	17	18	GEN5	24
10	MOSI (SPI)	19	20	GND	
9	MISO (SPI)	21	22	GEN6	25
11	SCLK (SPI)	23	24	CE0_N (SPI)	8
	GND	25	26	CE1_N (SPI)	7
(Pi 1 Models A and B stop here)					
EEPROM	ID_SD	27	28	ID_SC	EEPROM
5	N/A	29	30	GND	
6	N/A	31	32		12
13	N/A	33	34	GND	
19	N/A	35	36	N/A	16
26	N/A	37	38	Digital IN	20
	GND	39	40	Digital OUT	21

Fig3: Model B rev. 2 also has a pad (called P5 on the board and P6 on the schematics) of 8 pins offering access to an additional 4 GPIO connections.

4.4 PI CAMERA

Fig : Pi Camera

High definition camera module compatible with the Raspberry Pi model A and model B. Provides high sensitivity, low crosstalk and low noise image capture in an ultra small and lightweight design. The camera module connects to the Raspberry Pi board via the CSI connector designed specifically for interfacing to cameras. The CSI bus is capable of extremely high data rates, and it exclusively carries pixel data to the BCM2837 processor.

V. Performance Characteristics Curves:

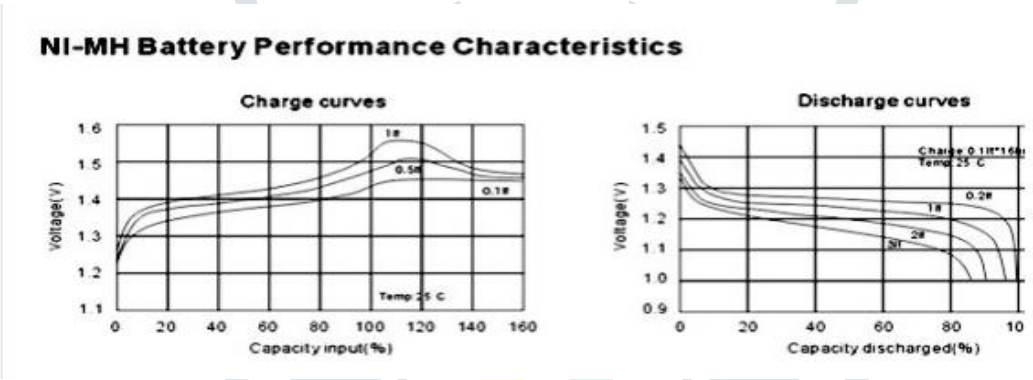

Fig 4: Performance Characteristics

VI. Results:

VIDEO ON LIVE PAGE OR VLC

Fig 5: Video on webpage or vlc

We develop program for live video streaming on webpage or vlc player with help of the VNC server. First of all we open web browser and we are going to call raspberry pi IP address finally figure appears live video demonstration.

VII. Conclusion & Future Scope:

Thus we have designed a smart, compact, cost effective surveillance system capable of capturing video/image and transmit over the internet. It is most important to have reliability privacy and security on both ends, which is achieved in this project. It is provided authentication at the receiver side, hence it can access by the concern person only. Also some addition options like camera angle control, to view in 3600. If necessary changes will be done in future, so that it can be also use in drone, international boarder surveillance system or any other military applications. Using digital image processing in this we can develop this same system for various applications.

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