SMART SURVEILLANCE MONITORING SYSTEM USING RASPBERRY PI

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Abstract- *The main objective behind this paper is to develop a cost effective easy to control surveillance vehicle through remote desktop for the implementation of military purpose. The risk factor in military border is causing threats to the lives of soldiers. It provides essential security for control applications. The surveillance vehicle that comprises the Raspberry Pi, pi camera and sensors. Raspberry pi operates and controls motion detectors and video cameras for remote sensing and surveillance, streams live video and records it for future playback.*

Keywords: Raspberry Pi, PIR sensor, IR Sensor, PI Camera.

I. INTRODUCTION

Robots can be classified into different types based on their environment and mechanism of interaction such as mobile and fixed robot. This project's main functionality is to deal with tough situations where human beings cannot handle situations like darkness, entering narrow and small places and detecting hidden bombs etc. Robots in the use of surveillance is emerging because of their miniature size allowing them to enter in tunnels, mines and small holes in building and also have capability to survive in harsh and difficult climatic conditions for life long time without any defect and causing no harm. This system is consisting of both hardware and software requirements. The hardware requirement is raspberry pi model b, webcam, pir sensor, power cable, keyboard, mouse, SD card. The software requirements Raspbian OS, Python programming language, Win 32 Disk imager, SD Formatter. In these types of surveillance systems, the person who is stationary and is located in that area can view what is happening in that place. Raspberry-pi works only on the Raspbian operating system, Linux, Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. An operating system is the set of basic programs and utilities that make your Raspberry Pi run. Putty

configuration and VNC viewer are needed to install Raspbian OS. Putty configuration is SSH and Telnet client. It is open source software that is available with source code.

II. FUNCTIONAL DESCRIPTION

The functions of the various components are given below:

A. USB CAMERA

USB Camera captures the image and sends it to the USB port of the Raspberry Pi board. The camera model used here is USB Camera model 2.0.

B. RASPBERRY PI

Fig.1.Raspberry pi 3

The Raspberry Pi 3 Model B is the third generation Raspberry Pi. This powerful credit card sized single board computer can be used for many applications and supersedes the original Raspberry Pi Model B+ and Raspberry Pi 2 Model B. It adds wireless LAN & Bluetooth connectivity making it the ideal solution for powerful connected designs. It capable of

performing various functionalities such as in surveillance systems, military applications, etc. The various functionalities of the components are given below The various components of Raspberry- Pi are

- SD Card Slot is used to install OS/booting/long term storage. The total memory of the SD card is about 8GB.
- Micro USB Power Port provides 700mA at 5A.
- RCA Video Out is connected to display if HDMI output is not used. It is mainly used to carry audio and video signals. They are otherwise called as A/V jacks.
- Audio Out Digital audio is obtained if HDMI is used to obtain stereo audio. Here analogue RCA connection is used.
- Ethernet Port is used to connect to the Internet. It also plays a role in updating, getting new software easier.
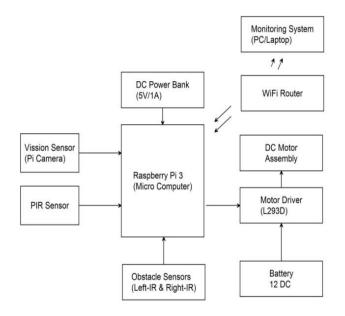

Fig.2. Block diagram of the entire system

- HDMI OUT (High Definition Multimedia Interface) is used with HDTVs and monitors with HDMI input. Also HDMI-HDMI is used here.
- BROADCOM BCM 2835: It is otherwise defined as System on chip. It is a 700 MHz Processor. It has a Video core IV GPU.
- GPIO allows us to control and interact with real world.

C. PIR SENSOR

Fig 3.PIR Sensor

This sensor is used to detect the movement of human beings in and around it. This emits the radiation and detects the heat and temperature of the body and finds the object before it

D. IR SENSOR

Fig.4. Infrared Sensor

This sensor is also used to detect the obstacles coming on the both sides of the device and detects the motion of the object. It does not emit the radiation but it measures the radiation of the object before it.

E. MOTOR DRIVER

Fig 5. Motor Driver

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously

in any direction. It means that you can control two DC motor with a single L293D IC. It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence H-bridge IC are ideal for driving a DC motor. In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently.

F. MOTOR

500 RPM 12V DC Geared Motor is high quality low cost DC geared motor. It has steel gears and pinions to ensure longer life and better wear and tear properties. The gears are fixed on hardened steel spindles polished to a mirror finish. output shaft rotates in a plastic bushing. The whole assembly is covered with a plastic ring. Gearbox is sealed and lubricated with lithium grease and require no maintenance.

III. HARDWARE ARCHITECTURE

Raspberry Pi is connected to the USB camera with the help of USB port. In the PC, Raspbian operating system is installed. Raspberry-pi works only on Raspbian operating system, Linux. Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. An operating system is the set of basic programs and utilities that make your Raspberry Pi run. However, Raspbian provides more than a pure OS: it comes with over 35,000 packages, pre-compiled software bundled in a nice format for easy installation on your Raspberry Pi.

Fig 6. Connection

Putty configuration and VNC viewer are needed to install Raspbian OS. Putty configuration is SSH and Telnet client. It is an open source software that is available with source code. Virtual network computing is a Graphical desktop sharing system that allows us to remotely control the desktop interface of one computer from another.

IV. SOFTWARE OF THE SYSTEM

i. STEPS FOR THE PuTTY CONFIGURATION

1. Obtain a copy of PuTTY pre-configured for use at Columbia from the PuTTY download page.
2. Save the installer file to your download directory or desktop.
    Important: Exit all applications before you begin the installation process.
3. Double-click on the file PuTTY-install.exe to begin the installation.
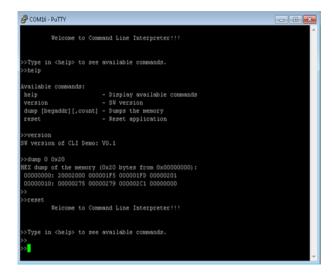

Fig 7. PuTTY configuration

4. At the Choose Destination screen, Click Next to accept the recommended default destination location for installing PuTTY.
5. Click Next on the Select Program Folder screen to select PuTTY as the recommended Program Folder name (PuTTY should already be displayed in the Program Folders text box).
6. Click Finish on the final screen to complete the installation.
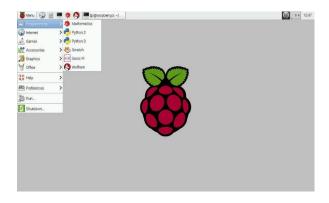
ii. STEPS TO INSTALL RASPBIAN OS

Fig 8. Raspbian OS

1. First step is to allocate the drive for installing OS.
2. SD adaptor can also be used for this purpose.
3. Download WINDISK 32 utilities from source forge project which is a zip file.
4. Extract and run the zip file.
5. Select the file and click run as administrator.
6. Select the image file which was extracted above.
7. Select the drive letter of the SD card in the device box.
8. Click write and wait for write process to complete.
9. Exit the image and eject the SD card

iii. INSTALLATION OF VNC VIEWER

Fig 9. VNC Viewer Installed

1. Open LX terminal
2. In LX terminal type in "sudo apt-get update" to update the operating system to the latest version.
3. When prompted to update type in "y" and press enter.
4. After updating is complete type in "sudo install tight VNC server". Press "y" and hit enter when prompted
5. Once tight VNC server has completed installation you can start it by typing in "vncserver:1"
6. It will prompt you to create a password. Keep in mind passwords can be at MOST 8 characters
7. Enter a password. The VNC server is now running in the background of your Raspberry Pi's operating system. We use any computer on your network with a VNC client to remotely access the Raspberry Pi

V. RESULTS AND DISCUSSION

Raspberry Pi has enough power for HD video and image manipulation, and can be connected to the Arduino board. Connected to Raspberry Pi. Raspberry Pi features include Bluetooth and Wi-Fi wireless technologies and this is the shortcut to display images directly on the smart device.

Video images are displayed at high FPS and are in colours.

The entire system is based on a Raspbian operating system like Linux platform. The Raspbian OS is based on Debian that optimizes the Raspberry Pi

hardware. The programming language which is utilized for coding is Python. Python referred to as a widely used high-level programming language for general-purpose programming. It handles and controls the raspberry pi hardware performance
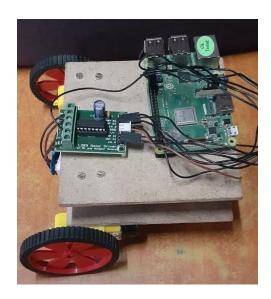
VI. CONCLUSION AND FUTURE WORK

Fig 10. view of robot

This paper presents an overview of the design, implementation, testing, and performance of an innovative robotic surveillance vehicle controlled wirelessly by a remote user, developed for the purpose of directing the movement and detection of the living, non-living and metal objects and displaying status feedback to the operator through a web application. Since these robots implemented at the border region they should be designed to be water proof and should be able to loco mote in the rugged surface as they replace humans at the battle region it is necessary that the robot will be defence himself and protect our nation from the enemy. To make robot self-defence they can be designed to be equipped with a robot laser gun. Being a bomb disposal robot, it requires very fast movement. This is required as the bomb disposal squad have very less time to defuse the bomb and save the life of the human's. Therefore, a fast robot is shall to be successful to dispose the bomb.

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