



OPEN ACCESS INTERNATIONAL JOURNAL OF SCIENCE & ENGINEERING

WI-FI BASED HOME SURVEILLANCE BOT USING PI CAMERA & ACCESSING LIVE STREAMING USING YOUTUBE

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Abstract: This project presents a modern approach for surveillance at remote and border areas using multifunctional robots based on current IOT used in defense and military applications. This robotic vehicle has the ability to substitute the soldier at the border area to provide surveillance. The robotic vehicle works both as autonomous and manually controlled vehicle using internet communication medium. This multisensory robot used to detect presence of enemy capture it in camera and give the live streaming to the authorized person Surveillance is major role while we working on border area for this there is robot for surveillance purpose. This paper presents a smart surveillance robot for military application by using Raspberry Pi for security purpose. An field Raspberry pi sends a wireless command which is received by an Authorized person on the web Page and accordingly the robot moves. The Video Streaming is done using a Raspberry pi camera. The Raspberry pi programming is done in python language. The experimental result shows that the video streamed up to 15 frames per second.

Keywords: Raspberry pi 3, Ultrasonic sensor, Raspberry pi camera, Gas Sensor MQ6, Servo motor, DC motor.

I INTRODUCTION

There are various surveillance systems such as cameras, CCTV etc. In these systems, the person who is located in that particular area can only view what is happening in that place. The main advantage of our proposed system is to use it for security purposes. The other advantage is that it is a very simple circuit. The operating system used here is Raspbian Operating System. Gas leakage is one of the most frequently observed parameters, and it is extremely harmful. So, proposed a system capable of monitoring this value indefinitely without any delay and without putting any harm's way. Our proposed system is implemented on Raspberry Pi and interfaced with a gas sensor and with controlling the device also live video streaming is implemented for quick actions. The Raspberry pi and all the devices are mounted on the robot. The camera is mounted to the front side of the robot to capture the video. We are using an android app to change the direction of the robot from anywhere as well as to monitor the live stream. For that we will require the internet connection to both the Raspberry pi and mobile. Through the app we will change the firebase database, which is continuously monitored by the Raspberry pi. According to the database the robot will change its direction. The pi camera is used to capture the live video. For accessing the video we are using the YouTube live stream. The YouTube live stream is accessed through the app to monitor the video.

II HARDWARE DESIGN:

2.1 BLOCK DIAGRAM

According to the survey, majority of the people of security force are using IP based installation rather than The analog This is because IP based system prove ideas better picture quality, and it is also beneficial in terms of mobility, scalability and flexibility. Due to the cost, people are less interested in taking advantage of IP based systems. So, it is very much clear that IP based system overcome some of the limitation over the analog but still the camera, complex operation and expensive sensors are still a drawback of these system[2]. This paper contains the information for controlling the robotic system through internet web browser or android apps. This is only possible when the raspberry pi connects with internet connection Other sensor like Ultrasonic sensor are used to enhance the performance of the smart spy system. The circuit diagram shows the component are interfaced to the raspberry pi and L293D driver is use to interface DC motor. Motor, Ultrasonic sensor and camera are the main interfacing devices for security point of view because the camera is able to send continuous picture or video information.

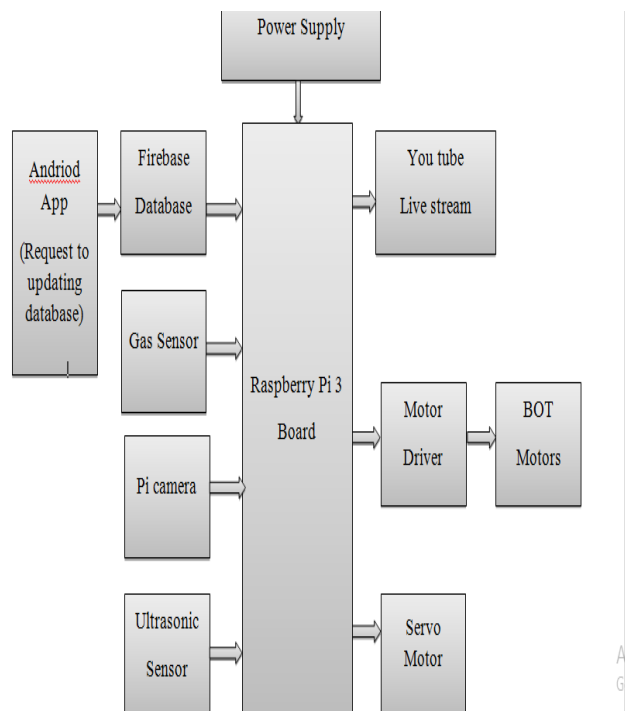


Figure 1: Block diagram of System

2.1: Raspberry pi3

[1]The Raspberry Pi 3 Model B is a third-generation Raspberry pi. This powerful, low cost and small size single board computer can be used for many major and minor applications. Raspberry pi 3 has the most powerful processor and it is 10 times faster than the previous generation. This third generation pi has additional wireless LAN and Bluetooth connectivity which is making it the ideal solution for powerful application.[2] The Raspberry pi 3 contains many ports like camera connector, Ethernet port, GPIO pins which is mainly used for interfacing sensors and switches, USB port for external I/O devices, HDMI ports for monitor and audio jack port.



Figure 2 Raspberry pi

Raspberry Pi specifications:



Raspberry Pi 3B+ vs Raspberry Pi 3B			
No	Specification	Raspberry Pi 3B+	Raspberry Pi 3B
1	Release Date	14th March 2018	29th Feb 2016
2	SOC Type (Processor)	Broadcom BCM2837B0 (with metal cover)	Broadcom BCM2837
3	Core Type	Cortex-A53 64-bit	
4	No. of Cores	4 Cores	
5	GPU	VideoCore IV	
6	CPU Clock	1.4 GHz	1.2 GHz
7	Memory	microSD	
8	RAM	1 GB LPDDR2	
9	Ethernet	Gigabit over USB 2.0 (Max 300Mbps)	Megabit (Max 100Mbps)
10	USB Port	4 x USB 2.0	
11	HDMI	1 x full size HDMI	
12	WiFi	802.11 b/g/n/ac (Shielded)	802.11 n
13	Bluetooth	4.2 (Shielded)	4.1 LE
14	Antenna	PCB Antenna (Similar to Rpi Zero W)	Chip Antenna
15	GPIO	40 pins	
16	Operating System	Latest Raspbian (> March 2018)	Backward compatible
17	Dimension	85mm x 56mm	
18	POE	Yes, with PoE HAT	No
19	Power Rating	1.13A @ 5V	1.34A @ 5V

2.2 Ultrasonic Sensor

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance between sending out a sound wave a specific frequency and listening for that sound wave to bounce back by recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.

Feature	Ultrasonic sensors	IR Sensors
Detection Range	Suitable to detect object which are more than 1 meter away. Capable to place objects within 5 mm more accurately. Some ultrasonic sensors detect objects with max. range of 20 meters. The object detection depends on shape, size and orientation.	More appropriate for targets which are closer than 10 mm
Ability to measure distance to soft objects	Not easily detected	• Easily detected
Interference from light sources (e.g. sunlight, fluorescent tubes etc.)	• Unaffected	• affected
Frequency range	• Ultrasonic/ultrasound devices operate from 20 kHz upto several GHz.	• 430 THz down to 300 GHz

Figure 3. Selection of Sensors

2.3 Gas Sensor MQ6

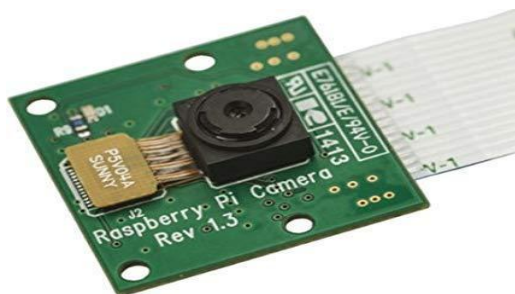
[3]Module is used in gas leakage detecting equipment in family industry, This module has high sensitivity to LPG, iso-butane, propane and LNG. It can also be used to detect the presence of alcohol, cooking fumes, and cigarette MQ-6 smoke.

Sensor Contrast Table

Symbol	MQ-3	MQ-5	MQ-6
Gas Detected	Alcohol vapor	LPG ,Natural Gas, Town Gas	LPG, Butane, alcohol smoke &cooking fumes etc.
Detect Concentration	0.04-4mg/L Alcohol	300-10000 ppm	100 - 10,000 ppm

Figure 4: Sensors Contrast Table

2.4 Raspberry pi camera



[1]Raspberry Pi NoIR Camera Module is a custom designed add-on for Raspberry Pi that does not have an IR cut filter installed. Like the regular Pi camera, it attaches to Raspberry Pi by way of one of the two small sockets on the board upper surface. The sensor itself has anative resolution of 5 megapixel, and has a fixed focus lens on board. In terms of still images, the camera is capable of 2592 x 1944-pixel static images, and supports 1080p 30, 720p 60 and 640x480p 60/90 video recording.

Selection of module

	Camera Module v1	Camera Module v2
Net price	\$25	\$25
Size	Around 25 × 24 × 9 mm	
Weight	3g	3g
Still resolution	5 Megapixels	8 Megapixels
Video modes	1080p30, 720p60 and 640 × 480p60/90	1080p30, 720p60 and 640 × 480p60/90
Linux integration	V4L2 driver available	V4L2 driver available
C programming API	OpenMAX IL and others available	OpenMAX IL and others available
Sensor	OmniVision OV5647	Sony IMX219
Sensor resolution	2592 × 1944 pixels	3280 × 2464 pixels
Sensor image area	3.76 × 2.74 mm	3.68 × 2.76 mm (4.6 mm diagonal)
Pixel size	1.4 μm × 1.4 μm	1.12 μm x 1.12 μm
Optical size	1/4"	1/4"
Full-frame SLR lens	35 mm	

Figure 5: Selection of Module

2.5 Servo Motor

A unique design for servo motors are proposed in controlling and for control applications. They are basically used to adjust the speed control at high torques and accurate positioning. Parts required are a motor position sensor and a highly developed controller. These Servo motors are available in power ratings from fraction of a watt to 100 watts.

DC motor

The motor is used to drive the robot. We use a 500 rpm 4 dc motor. The speed of the motor is dependent on the diameter of the wheel and Rpm (Resolution per minute) of the motor. Rpm is inversely proportional to torque. If the speed of the motor is gradually increased, the torque of the motor will decrease.

➤ Features:

- Runs on DC power or AC line voltage with a rectifier.
- Operating speeds of 1,000 to 5,000 rpm.
- 60-75% efficiency rate.
- High starting torque.
- Low no-load speeds.

III IMPLEMENTATION

Step1: Testing of all modules and sensor

[4]The mounting of all the sensors, first we want to tear test it individually. Testing a module like ultrasonic, raspberry pi camera, dc motor with L2 L293D driver and servo motor with their respective programs.

Step2: Designing on software: To implement this project we make base of that robot for that purpose with the help of cad software we done design of chasi. The dimension of chasi is 17 x 15cm.

Step 3: Steps For Interfacing Pi Camera:

- Install the raspberry pi OS to the SD Card.
- Connect the Pi camera to the raspberry pi board and switch on the supply.
- Login the raspberry pi board.
- Check the network setting
- Enable the camera and capture the image.
- Run the code in python.

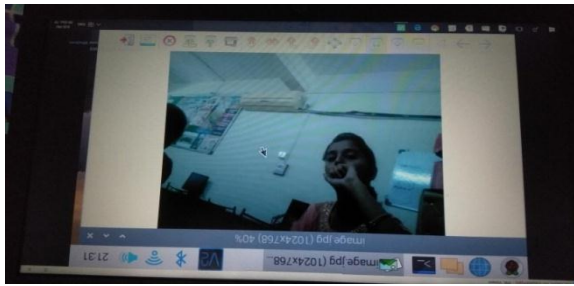


Figure 6: Interfacing of Pi camera

3.1 Twilio API

Twilio's APIs (Application Programming Interfaces)[5] power its platform for communications. Behind these APIs is a software layer connecting and optimizing communications networks around the world to allow your users to call and message anyone, globally.

3.2 CREATING THE YOUTUBE CHANNEL:

[5]Now that you have everything installed on the Raspberry Pi, you are almost ready to launch a live stream to YouTube. You will initially be required to sign up to a YouTube account if you haven't done so already and you will also be required to enable and verify your account for live streaming.

From the YouTube homepage, you will need to navigate to the following:

My Channel > Video Manager > Live Streaming

[5]From this point on you may be prompted to verify your YouTube account using either with a verification code. From the Live streaming page on your YouTube account you can retrieve your 'Stream name/key' under 'ENCODER SETUP', click reveal and this will show your unique streaming key which you will need to make a note of, enable to stream from your Raspberry Pi to the YouTube account.

3.3 DEVELOPING THE ANDROID APP

How to Create an Android App Step by Step ?

- Step 1: Start with Android Studio.
- Step 2: Installation of Java Development Kit (JDK) ...
- Step 3: Start Your Project. ...
- Step 4: Select Activity. ...
- Step 6: Edit the Welcome Message.
- Step 7: Adding Button to your Activity.
- Step 8: Test your App



Figure 7: Android App

Step 5: Flow chart

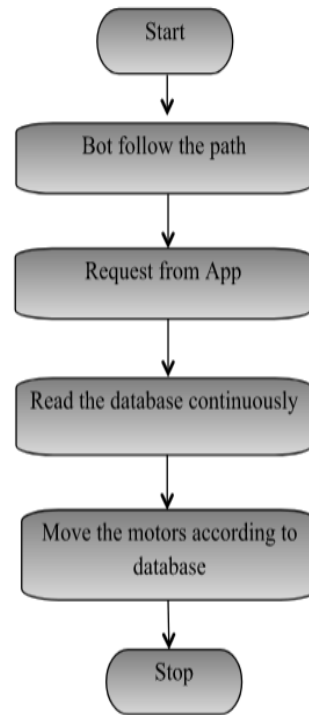


Figure 8: Flowchart of motor drive

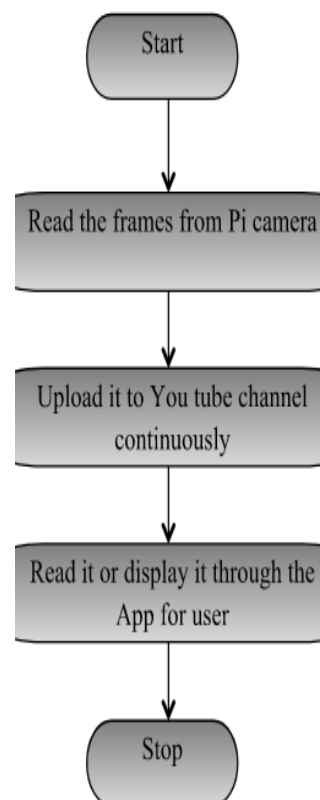


Figure 9: Flowchart of Pi-Camera

IV SOFTWARE USED:

■ Raspbian Os for Raspberry Pi3

Raspbian Is the Best All-Around Operating System.

■ Raspbian is the “official” operating system of the Raspberry Pi3 and because of that, it’s the one most people will want to start with.

■ Raspbian is a version of Linux built specifically for the Raspberry; it comes packed with all the software you’ll need for every basic task with a computer.

■ You’ll get LibreOffice as an office suite, a web browser, email program, and some tools to teach programming to kids and adults alike. Heck, it even includes a special (no longer in development) version of Minecraft.

■ VNC Viewer

[4]Virtual network computing (VNC) is a type of remote-control software that makes it possible to control another computer over a network connection. ... It also interprets commands coming from the viewer and Carries them out on the remote computer. VNC is platform independent and is compatible with any operating system.

ADVANTAGES:

- Wifi-based surveillance camera bot system is cost effective.
- Wifi-based surveillance could be used for a public surveillance system (Surveillance of a locality street, traffic, junctions etc.)
- Using this Wifi bot we can see live streaming on Youtube anytime anywhere.
- The Wifi bot arrives with all utilities and software required for live streaming and surveillance without any hesitation.
- Usage of the same hotspot and Wi-fi link.

LIMITATIONS:

- The Wifi-bot shows live streaming on you-tube but it cannot record the video.
- Requires strong internet access for watching the live stream.

V RESULT:

The fig 8 shows a pictorial representation of a complete robot which is ready for surveillance purpose in the area. This robot will be the replacement instead of humans. To implement this robot we use software as well as hardware tools. Instead of border areas we also use this robot in which human beings are not reached. We also use this robot for medical purposes to monitor the movement of patients which are not being able to move from their bed and give its information to doctors and their relatives which are not near to the patient. The purpose of designing the android app is to control the direction of the robot.

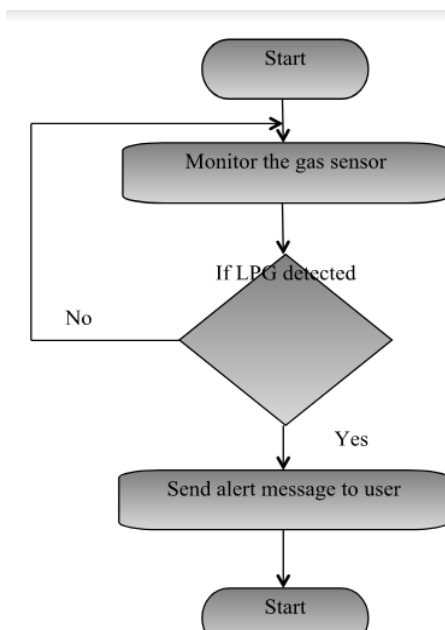


Figure 10 :Flowchart of Gas Sensor

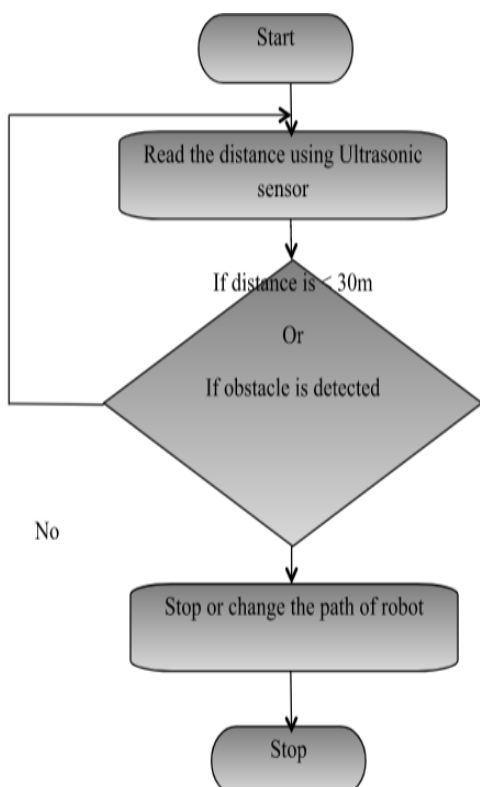


Fig.11: Flowchart of Ultrasonic Sensor

Now head back to your Raspberry Pi terminal window and enter the following command to stream live video feed from your Raspberry Pi camera to YouTube, adding your key to the URL:

```

raspivid -o - -t 0 -vf -hf -fps 10 -b 500000 | ffmpeg -re -ar 44100 -ac 2 -acodec pcm_s16le -f s16le -ac 2 -i /dev/zero -f h264 -i -vcodec copy -acodec aac -ab 128k -g 50 -strict experimental -f flv rtmp://a.rtmp.youtube.com/live2/STREAM-KEY
  
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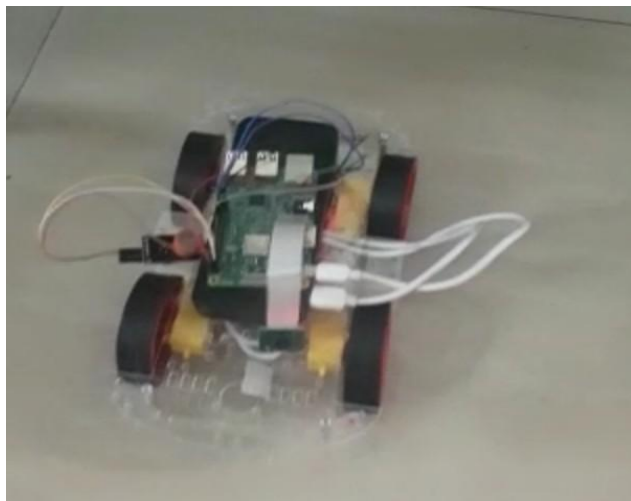


Figure 8: Wi-Fi Bot Robot

VI CONCLUSION:

In this proposed research work and presented paper we have implement a smart surveillance robot for home or office application .With the help of this robot we can about know the real time condition of the area without using any human source. The surveillance robot gives us live streaming video according to the command.The present research work we upgraded with laser gun.

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