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Surveillance Robot for Military Application

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Abstract:
This project presents a modern approach for surveillance at remote and border areas using multifunctional robot based on current IOT used in defense and military applications. This robotic vehicle has ability to substitute the solider at border area t 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 workin 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 Raspberr pi sends a wireless command which is received by Authorized person on web Page and accordingly robot moves. The Video Streaming is done using 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, Servo motor, **DC motor**

1. Introduction

Surveillance is major thing when we are going to secure any thing as it is tedious job peoples are getting boarded because of that it will might risky to observing all this things we are going to make a robot which is continuously monitor thing. This robot continuously watch and sending a live streaming of it to a authorized person. Because of that monitoring the work will be some what easy and it will be make accurate because of technology.

The implementation of this project to resolve the problem of replacing human to surveillance robot, because of this we reduce harm of human resource. Robot are usually miniature in size so they are enough capable 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 causing any harm. Military robots were designed from last few decades.

Nowadays, most of the system uses a mobile robot with a camera for surveillance. The camera mounted on the robot can move to different locations. These types of robots are more flexible than the fixed cameras. In it is given that mostly used surveillance robots are wheel robot. The wheel based robots are more suitable for flat platform. With the development in wireless communication and internet, the videos captured by wheel robot can be seen remotely on computer or laptop.

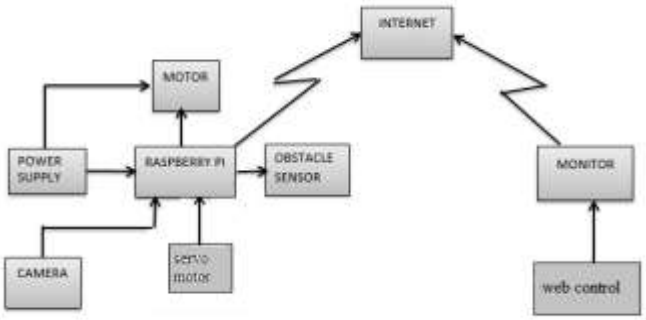

Fig: Block diagram of system

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 provides better picture quality, and it also beneficial in term of mobility, scalability and flexibility. Due to the costing people are less interested to take the advantages of IP based system. 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.This pape contains the information for controlling th 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 device for security point of view because camera can able to send continuous picture or video information.

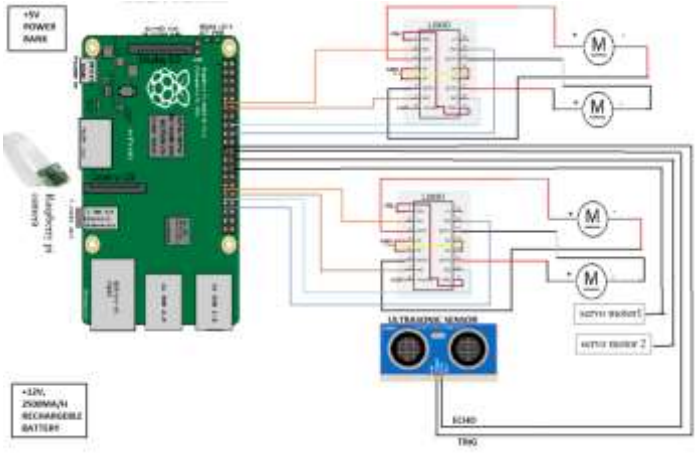

Fig : circuit diagram of system

2. Hardware

2.1Raspberry pi3

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 most powerful processor and it is 10 times faster than previous generation. This third generation pi has additional wireless LAN and Bluetooth connectivity which is making it the ideal solution for powerful application. 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. These all are attached with a single board. It does not have any internal storage or own operation system, but we can insert an SD card with Linux based OS.

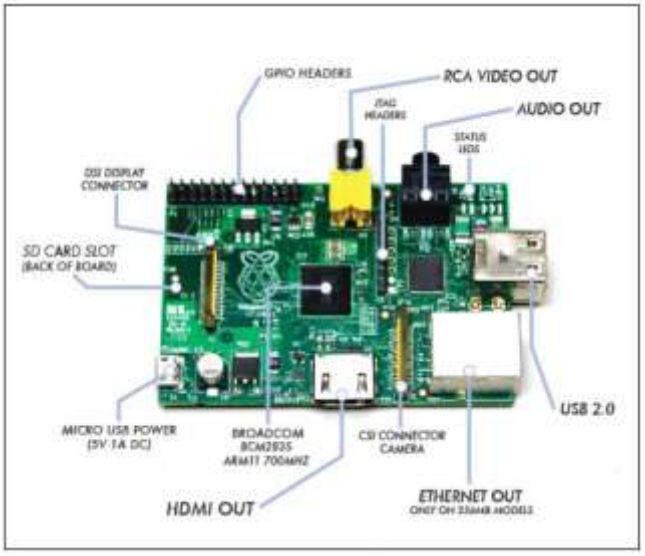

Fig 2.1: Raspberry pi

2.1.1 **specification**

Raspberry pi	Model 3B
Processor	BCM2837 64 bit
Wi-fi module	BCM43143
Bluetooth module	Version 4.1
Total pins	40(26 GPIO, 6 GND, 6 Vcc, 2 I2C)
Operating voltage	5v
Operating current	2A
USB	4 Port
Operating frequency	1.2GHz
RAM	1GB

2.2Ultrasonic 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 Since it is known that sound travels through air at about 344 m/s (1129 ft./s) you can take the time for the sound wave to return and multiply it by 344 meters (or 1129 feet) to find the total round-trip distance of the sound wave. Round-trip means that the sound wave travelled 2 times the distance to the object before it was detected by the sensor. Distance= (speed of sound × time taken) / 2. It is important to understand that some objects might not be detected by ultrasonic sensors. This is
Because some objects are shaped or positioned in such a way that the sound wave bounces off the object, but are deflected away from the Ultrasonic sensor. It is also possible for the object to be too small to reflect enough of the sound wave back to the sensor to be detected. Other objects can absorb the sound wave all together (cloth, carpeting, etc.), which means that there is no way for the sensor to detect them accurately. These are important factors to consider when designing

Fig2.2: Ultrasonic Sensor

2.3Raspberry pi camera

Fig2.3:Raspberry pi camera

The 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. This interface uses the dedicated CSI interface, which was designed especially for interfacing to cameras. The CSI bus is capable of extremely high data rates, and it exclusively carries pixel data. 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.

2.4 Servo motor

Fig 2.3: 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 motor position sensor and a highly developed controller. These motors can be categorized according the servo motor controlled by servomechanism. If DC motor is controlled using this mechanism, then it is named as a DC servo motor. Servo motors are available in power ratings from fraction of a watt to 100 watts. The rotor of a servo motor is designed longer in length and smaller in diameter so that it has low inertia.

2.4.1Servo motor Rotation

Motor 1

Position	**Angle**	**PWM**
Left most	**180**	0.25
Left	**135**	0.20
Center	**90**	0.15
Right	**45**	0.10
Right most	**0**	0.5

Motor 2

Position	**Angle**	**PWM**
Up	**180**	0.25
Up tilt	**135**	0.10
Center	**90**	0.15
Down tilt	**45**	0.10
Down	**0**	0.5

2.5 DC motor

Dc motor is use to drive the robot for that we Use 500 rpm 4 dc motor. The speed of motor is depend on diameter of wheel and Rpm (Resolutio per minute) of motor . Rpm is inversely proportional to torque . If the speed of motor is gradually increase torque of motor will be decrease. Suppose the diameter of motor is 8cm then distance travelled per rotation is = Wheel diameter X 3.14 =8 X 3.14=25.12cm Speed of robot/ Sec= (Distance travelled per rotation *RPM of motor)/60sec =(25.12*500)/60=209.33cm/secL293D motor driver is interface to drive the motor The L293 and L293D are quadruple high current half - H drivers. The L293 is designed to provide bidirectional drive currents of up to 1A at voltages from 4.5V to 36V.The L293D is designed to provide bidirectional drive currents of up to 600mA at voltages from 4.5V to 36V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-
supply applications.

Fig2.5: DC motor

3. Implementation

Step1: Testing of all modules and sensor

The mounting of all the sensor, first we want to test It individually. Testing a module like ultrasonic, raspberry pi camera, dc motor with L293D driver and servo motor with their respective programs

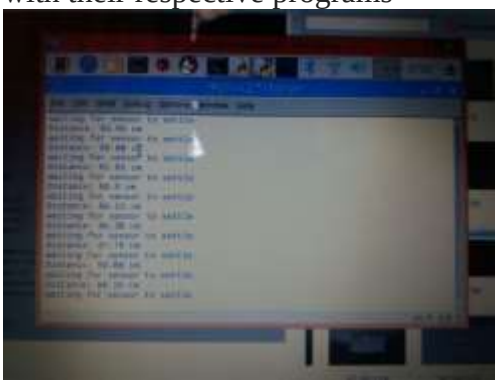

Fig 3.1: Testing of ultrasonic sensor

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

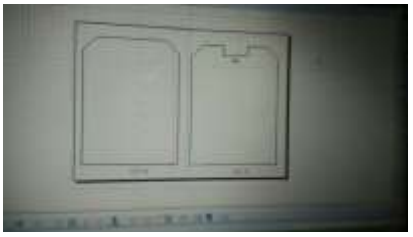

Fig3.2: Design on cad software

Step 3: Installation of all the software

The MJPG steamer is used to see live video which is installed in Raspberry pi. The VNC software is installed on the local computer and connects to the raspberry pi which must be installed on the remote computer. The server transmits a duplicate of the remote computer's display screen to the viewer.

Step 4: Designing a web page and creating cloud

The web page designing is main part of our project to control robot from any remote area. It will be necessary that to make one platform from there we will access our robot. From the web page we control the direction of motor and position of camera as well as monitor the video feed. It will be necessary that make our web page secure from anyone. To make it secure we will keep IP address highly confidencial. When authorized person want to get access on the robot he will be login that page and enter the static IP address of raspberry pi and authorized user get the access of that robot.

To make our own site we use 000web host. We design our own site and we put the all information about our robot on our web page and give our contact details when there any one who visit the page we get the information about it and they will comment on our site. All the data base will be store in server.

https://pupil-tracker.000webhostapp.com/pupil-tracker.000webhostapp.com. This is the site of our server to controlling the robot whenever it is on field

Step 5: Overall flow chart

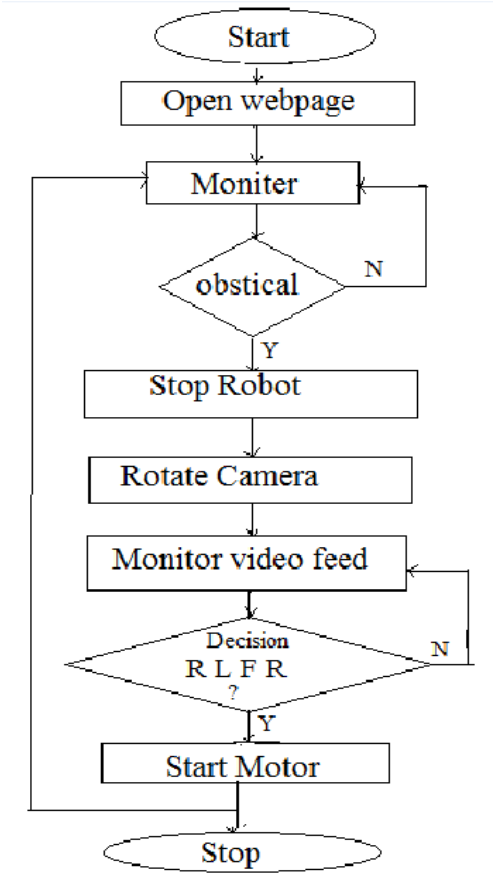

Fig3.3: System flowchart

System flow chart is the graphical representation of over All system. This flow chart shows how the robot can behave when he is in the on field for surveillance.

4. Result

fig4.1: robot

The fig 4.1 shows a pictorial representation of complete robot which is ready to a surveillance purpose in the border area. This robot will be the replacement instead of human soldier there is a surveillance robot. To implement this robot we use software as well as hardware tool. Instead of border area we also use this robot in which human beings are not reached. We also use this robot in medical purpose to monitor the movement of patient which are not be able to move from their bed and give its information to doctor and the their relative which are not near to the patient.

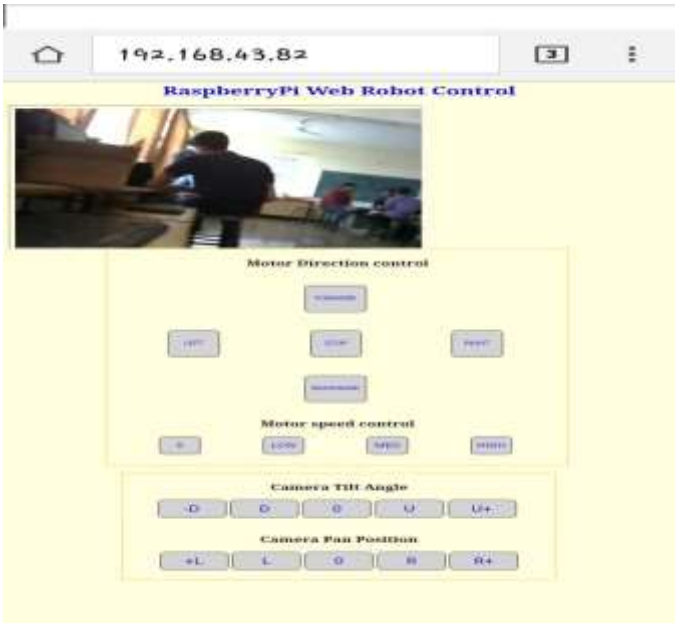

Fig:4.2 Screenshort of web page

The purpose of designing web page is to control robot .

5. Future Scope

5.1Open CV

Open CV is computer vision library to perform the Face detection and recognition. Robot with the help Of camera get face recognisation and according to That manually we give the command tothe robot Unfortunately the current binary version of OpenCV Available to install in the Raspbian operating system through apt-get (version 2.3.x) is too old to contain the face recognition algorithms used by this project. However you can download, compile, and install a later version of OpenCV to access the face recognition algorithms

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5.2 Laser Gun

As we place robot instead of human soilder it is necessary that the robot will be defence himself and protect our nation from the enemy. To make robot self defence we give the robot laser gun. The laser gun with the help of open cv and raspberry pi camera will detect the enemy and shoot according to mode of operation i.e automatic and mannual mode. It will be a good application of surveillance robot to protect the nation from enemy.

To build a DIY motion tracking airsoft (or nerf gun) turret with a raspberry pi 3. The airsoft turret is autonomous so it moves and the gun when it detects motion. There is also an

interactive mode so that you can control it manually from your keyboard. We used an airsoft gun for this project, but you can easily change modify this build to use a Nerf instead. This project is small, lightweight and entirely battery operated. . Motion Detection uses openCV and computer vision to track moving targets in front of the camera.

6. Conclusion

In this paper we implement a smart surveillance robot for military application with the help of this robot we know the real time condition of border area without using a any human source. The surveillance robot gives us live streaming video according to that we give the command

7. Acknowledgmemt

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