RASPBERRY PI BASED INTELLIGENT ROBOT FOR MILITARY APPLICATIONS

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Abstract: - In this project, we are presenting a proposed system for IoT Based Wireless multifunctional robot for military application with Raspberry pi 3 using MQTT protocol and it is done by integrating the help of various sensors, Cameras and actuators into web application using MQTT and HTTP protocol. To develop and design we are using Raspberry pi3 embedded board with python programming & MQTT protocol. Using this system one can monitor and control the military robot from anywhere in the world. And it has various sensors like motion sensor to sense the existence of human, Inductive proximity sensor to detect landmines (metal), temperature sensor to sense the temperature and various gas sensors to detect hazardous gaseous in the environment. Whenever sensors detect, the raspberry pi will start publishing the data using the MQTT protocol and display on Web application and start streaming video using motion service. Surveillance in remote areas along the border is an important aspect in military, the solution proposed here is an autonomous robotic platform mounted with a camera for remote surveillance over internet and a web page. The system is designed for surveillance and also for reconnaissance circumstances.

I.INTRODUCTION

At present, human work is greatly reduced by machines in each doable method. Mostly, computers and robots play a serious role in our day to day life. In recent times, most the military organizations take the assistance of military robots to hold several risky jobs. In general, a mechanism could be a combination of mechanical and physics model designed by humans to perform a particular task. Robots have immense applications in military and industrial space, such as, for lifting significant weights and playing same task many times with efficiency with none committing any errors in contrast to humans. In recent years, the Indian border military forces face a large destruction because of the attacks of neighboring countries. In several things, our troopers got to venture into enemy's base that could be a risky job. Such dangerous jobs can be avoided by mistreatment robots.

Robots with high resolution cameras will monitor over long distances. mechanism loaded with totally different sensors performs numerous tasks. they'll even find hidden chemical objects with the assistance of gas sensing element that cannot be done by humans. Generally, air is associate odorless one that consists of compounds made from 2 main components - carbon and element referred to as hydrocarbons. If the harmful level exceeds the traditional level, the sensing element detects it. the most part used is Raspberry pi and like several alternative laptop, it also can settle for several programming languages as well as Python. It supports several in operation systems like Raspbian, Fedora, Debian, Windows IOT Core, Kali UNIX and Arch UNIX ARM and that we use Raspbian OS.

We have created a borderline military mechanism that stops the large destruction of human lives. This mechanism also can be used for spying enemy territories throughout vital things within the border and it also can monitor the movements of enemies coming into our country. Since the mechanism is extremely tiny in size it will send to the enemy's camp to watch their movements.
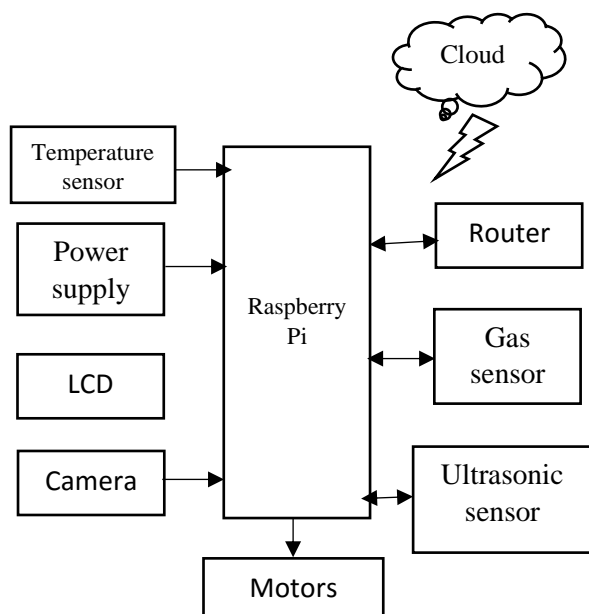
SOFTWARE REQUIRMENTS:
- Keil uvision 5 IDE

HARDWARE REQUIRMENTS:
- STM32F103 Microcontroller
- 16 x 2 LCD display
- Ultrasonic sensor
- Power Supply

- Camera
- Gas sensor
- Motors

II.BLOCK DIAGRAM

III.RASPBERRY PI

Raspberry Pi could be a credit-card sized pc factory-made and designed within the uk by the Raspberry Pi foundation with the intention of teaching basic engineering science to highschool students and each different person inquisitive about hardware, programming and DIY-Do-it Yourself comes.

The Raspberry Pi is factory-made in 3 board configurations through licenced producing deals with Newark element14 (Premier Farnell), RS elements and Egoman. These companies sell the Raspberry Pi on-line. Ego man produces a version for distribution entirely in China and Taiwan, which can be distinguished from totally different Pis by their red coloring and lack of FCC/CE marks. The hardware is that identical across all manufacturers.

The Raspberry Pi incorporates a Broadcom BCM2835 system on a chip (SOC), that has associate ARM1176JZF-S 700 rate processor, Video Core IV GPU and was originally shipped with 256 megabytes of RAM, later upgraded (Model B & Model B+) to 512 MB. It does not embrace integral magnetic disc or solid-state drive, but it uses associate Mt. Rushmore State card for booting and long storage, with the Model B+ using a little Mt. Rushmore State.

The inspiration provides Debian and Arch Linux ARM distributions for transfer. Tools unit of measurement out there for Python as a result of the most linguistic communication, with support for BBC BASIC (via the reduced instruction set pc OS image or the spirits Basic clone for Linux), C, Java and Perl.

IV. LIQUID CRYSTAL DISPLAY (LCD)

LCD (Liquid Crystal Display) screen is used to electronic operations are shows module and notice a good of applications. A 16x2 display is extremely basic module and is extremely usually utilized in varied devices and circuits. The explanations being: LCDs ar economical; simply programmable; haven't any limitation of displaying special & even custom characters (unlike in seven segments), animations so on.

A 16x2suggests that it will display 16 characters and 2 lines. During this liquid crystal display every character is displayed in 5x7 component matrix. This liquid crystal display has 2 registers, namely, Command and knowledge.

The command register stores the command directions given to the liquid crystal display. A command is associate instruction given to liquid crystal display to try to to a predefined task like initializing it, clearing its screen, setting the pointer position, dominant show etc. the information register stores the information to be displayed on the liquid crystal display.

IV. TEMPERATURE SENSOR

The temperature sensor is used to measure the coolness associated hotness of associate object. The sensor is measuring the temperature supported the voltage across the diode. Whenever voltage can increase, the temperature rises. The sensor measures the autumn between the semiconductor conductor and base. The device generates analog signals that area unit proportional to the temperature, once the excellence in voltage amplified. The temperature sensor uses four measure scales for measures the temperature. The metric scale of measurement is beginning at zero. The scientist temperature sensing uses leader scale that's Kelvin scale. In politician scale temperature thought-about as 492 degrees. The measure is another temperature measurement scale. The zero in scale of measurement set to temperature. very cheap temperature price is known as as temperature.

V. GAS SENSOR

A gas sensor is a tool that detects the presence of gas in a district. This sensing element interacts with a gas to live its concentration. Every gas incorporates a distinctive breakdown voltage i.e. the electrical field at that it's ionized. Sensing element identifies gases by measurement these voltages. The concentration of the gas will be determined by measurement the present discharge within the device. The MQ5 gas sensor detects the presence of varied gases such as hydrogen, CO, alkane series and Pranging from 100ppm to 3,000ppm.

When a gas interacts with this sensing element, it's initial ionized into its constituents and is then absorbable by the detector. This sorption creates a possible distinction on the part that is sent to the processor unit through output pins in variety of current. The gas sensing element module consists of a steel system skeletal below that a detector is housed. This detector is subjected to current through connecting leads. This current is thought as heating current through it, the gases returning getting ready to the detector get ionized and ar absorbed by the detector. This changes the resistance of the detector that alters the worth of the present going out of it.

VI. ULTRASONIC SENSOR

An unhealable sensing element is academic degree instrument that measures the gap to academic degree object exploitation silent sound waves.

A silent device uses a device to send associate degreed receive silent pulses that relay back information regarding an object's proximity. High-frequency sound waves mirror from boundaries to produce distinct echo patterns.

Ultrasonic sensors work by emitting sound waves at a frequency too high for humans to concentrate to. They then sit up for the sound to be reflected back, shrewd distance supported the time required. usually often like but measuring device measures the time it takes an electromagnetic wave to come back once hit an object.

While some sensors use a separate sound conductor and receiver, it's to boot potential to combine these into one package device, having academic degree silent element alternate between emitting and receiving signals. this type of device area unit typically boughten throughout a smaller package than with separate elements, that's convenient for applications where size is at a premium.

While microwave radar and silent sensors area unit typically used for many of constant functions, sound-based sensors unit of measurement promptly available—they area unit typically had for merely one or 2 dollars in some cases—and in sure things, they're going to discover objects extra effectively than microwave radar.

For instance, whereas microwave radar, or even light-based sensors, have a hard time properly method clear plastic, silent sensors have no draw back with this. In fact, they're unaffected by the color of the material they are sensing.

VII. USB CAMERA

A webcam is a video camera that feeds or streams its image in real time to or through a computer to a computer network. once "captured" by the pc, the video stream is also saved, viewed or sent on to alternative networks motion through systems like the web, associated e-mailed as an attachment. once sent to a far-off location, the video stream is also saved, viewed or on sent there. not like an IP camera (which connects using Ethernet or Wi-Fi), a digital camera is mostly connected by a USB cable, or similar cable, or engineered into element, like laptops.

The term "webcam" (a clipped compound) may also be used in its original sense of a video camera connected to the Web continuously for an indefinite time, rather than for a particular session, generally supplying a view for anyone who visits its web page over the Internet. Some of them, for example, those used as online traffic cameras, are expensive.

VIII. WORKINING

We are using four motors in this project with help two driver modules. Raspberry pi is controlling the direction of robot with help of motors. Which is having four directions like forward, reverse, left and right sides.

The Ultrasonic sensor is used to detects the object. When the object is detected then the robot will move backwards and take right side with help of Ultrasonic sensor. Temperature sensor is sensing the temperature in the present weather conditions and shows temperature on the LCD display and

cloud. The Gas sensor is sensing the pollution of weather and send that information to LCD and cloud. The Camera is used to record images and send to the cloud.

IX. RESULT

INTERFACING FOUR MOTORS WITH RASPBERRY PI:

The interfacing 4 motors with Raspberry pi as show in fig. The four motors are connected to the pin 7, pin 11, pin 13 and pin 15 of the Raspberry pi through the L298N driver module. The four pins are control the movement of robot. The movement of robot as some directions like forward, Backward, Left-side and Right-side.

The circuit as need continues power supply. So, we can use **12V** Rechargeable Battery. And also use 12V to 5V converter module.
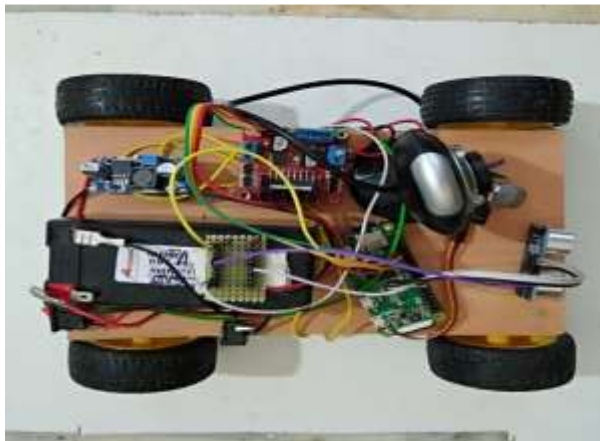

Fig interfacing motors with Raspberry Pi

INTERFACING CAMERA AND SENSORS WITH RASPBERRY PI:

The camera is interface with Raspberry Pi by the USB. The Ultrasonic sensor trigger and echo pins are connected to the pin 16 and pin 18 of the raspberry pi. The Gas sensor is not connected to the directly with the Raspberry Pi because, sensor is produce Analog out So, we can use ADC module. The temperature sensor is used to measure the temperature of the nature and that data send to the Cloud server.
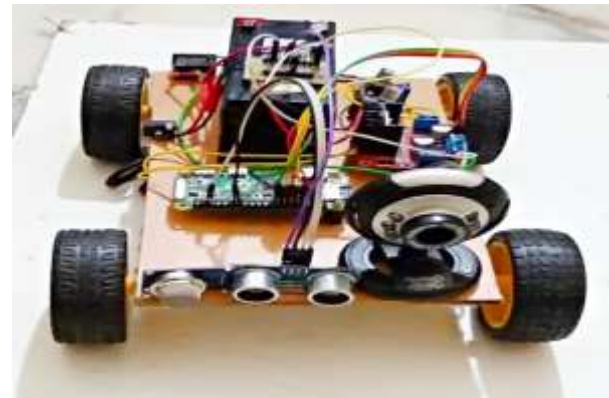

Fig. Interfacing camera, Ultrasonic and Gas sensor with Raspberry pi

X. CONCLUSION

The moving object in the path of the robot is determined applying the SAD algorithm. The robot takes its path by avoiding the object position to reach the target. The path planning is depending on the image processing and microcontroller based embedded system. The surveillance robot gives us live streaming video according to that we give the command.

XI. REFERENCES

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