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Raspberry Pi4 Based Intelligent Robot for Military Applications using Cloud Computing and OV5642camera

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ABSTRACT

In this design, we're presenting a proposed system for IoT Grounded Wireless multifunctional robot for military operation with Raspberry pi4 using MQTT protocol and it is done by integrating the help of various wearable sensors, OV5642Camera and selectors into web operation using MQTT and HTTP protocol. To develop and design we are using Raspberry pi4 embedded board with python programming and MQTT protocol. Using this system one can cover and control the military robot from anywhere in the world. And it has colorful detectors like stir detector to sense the actuality of mortal, Inductive propinquity detector to descry landmines(essence), temperature detector to sense the temperature and colorful gas detectors to descry dangerous gassy in the environment. The moving object in the path of the robot is determined applying the SAD algorithm. Whenever sensors detect, the Raspberry pi4 will start publishing the data using the MQTT protocol and display on Web operation then start streaming videotape using stir service. Surveillance in remote areas along the border is an important aspect in service, the result proposed then independent robotic platform mounted with a high resolution camera for remote surveillance over internet and a web runner. The system is designed for surveillance and also for surveillance circumstances. Whenever intruder is found ,GSM900 will send the message to military control room then buzzer is ON.

Keywords *- Raspberry pi4,MQTT and HTTP protocol ,Relay, OV5642 camera,cloud*

I. INTRODUCTION

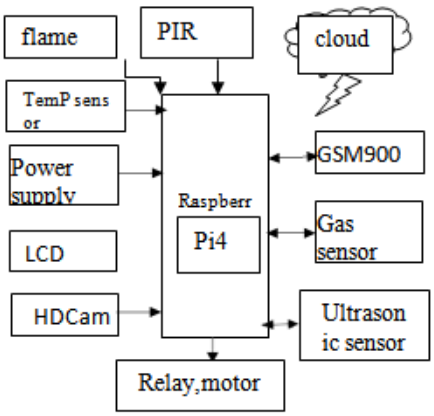
At present, mortal work is greatly reduced by machines in each realizable system. substantially, computers and robots play a serious part in our day to day life. In recent times, utmost the military associations take the backing of military robots to hold several parlous jobs. In general, a medium could be a combination of mechanical and drugs model designed by humans to perform a particular task. Robots have immense operations in military and artificial space, similar as, for lifting significant weights and playing same task numerous times with effectiveness with none committing any crimes in discrepancy to humans. In recent times, the Indian border service forces face a large destruction because of the attacks of neighboring countries. In several effects, our soldiers got to venture into adversary's base

that could be a parlous job. similar dangerous jobs can be avoided by mistreatment robots. Intelligent Robots with high resolution cameras will monitor over long distances. Mechanism loaded with completely different detectors performs multitudinous tasks they'll indeed find retired chemical objects with the backing of gas seeing element that cannot bed one by humans. Generally, air is associate odorless bone that consists of composites made from 2 main factors- carbon and element appertained to shydrocarbons.However, the seeing element detects it, If the dangerous position exceeds the traditional position. The utmost part used is Raspberry pi4 and like several indispensable 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 ArchUNIX ARM and that we use Raspbian OS. We've created a frame military mechanism that stops the large destruction of human lives. This medium also can be used for observing adversary homes throughout vital effects within the border and it also can cover the movements of adversaries coming into our country. Since the medium is extremely bitsy in size it'll shoot to the adversary's camp to watch their movements.

SOFTWARE REQUIRMENTS:
Keil vision 5 IDE

HARDWARE REQUIRMENTS:
STM32F103 Microcontroller
16 x 2 LCD display
Ultrasonic sensor
Power Supply
OV5642 Camera
Gas sensor
Relay,Motors-4nos

II.BLOCK DIAGRAM



a.LIQUID CRYSTAL DISPLAY (16x2)

A 16x2 display is extremely introductory module and is extremely generally employed in varied bias and circuits. The explanations being LCD is provident ,simply programmable have not any limitation of displaying special & indeed custom-made characters(unlike in seven parts), robustness so on.

A 16x2 suggests that it'll display 16 characters and 2 lines. During this liquid demitasse display every character is displayed in 5x7 element matrix. This liquid demitasse display has 2 registers, videlicet, Command and knowledge. The command register stores the command directions given to the liquid demitasse display. A command is associate instruction given to liquid demitasse 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 demitasse display.

b. RASPBERRY PI 4:

Raspberry Pi 4 is credit- card sized pc plant- made and designed within the uk by the Raspberry Pi foundation with the intention of tutoring introductory engineering wisdom to high school scholars and each different person curious about tackle, programming and DIY- Do- it Yourself comes. The tackle is that identical across all manufacturers. The Raspberry Pi4 incorporates a Broadcom PI4 system on a chip(SOC), 8GB RAM,With the Pi 4 being faster, able to decode 4K video, benefiting from faster storage via USB 3.0, and faster network connections via true Gigabit Ethernet, the door is open to many new uses. It's also the first Pi that supports two screens at one up to dual 4K in 30 displays which boon for creatives who want more desktop space.

c. TEMPERATURE SENSOR DHT11:

The temperature detector DHT11 is used to measure the coolness associated voguishness of associate object. The detector is measuring the temperature supported the voltage across the diode. Whenever voltage can increase,the temperature rises.The sensor measures the afterlife between the semiconductor captain and base. The device generates analog signals that area unit commensurable to the temperature, once the excellence in voltage amplified. The temperature detector uses four measure scales for measures the temperature. The metric scale of dimension is beginning at zero. The scientist temperature sensing uses leader scale that is Kelvin scale. In politician scale temperature thought-about as 492degrees.The measure is another temperature dimension scale. The DHT11 is a introductory, low-cost digital temperature and humidity sensor. It gives out digital value and hence we can give its affair directly to data leg rather of ADC.It has a capacitive sensor for measuring humidity. The only real failing of this detector is that one can only get new data from it only after every 2seconds.

d. GAS SENSOR MQ5:

A gas detector is a tool that detects the presence of gas in a quarter. This seeing element interacts with a gas to live its attention. Every gas incorporates a distinctive breakdown voltage i.e. the electrical field at that it's ionized. seeing element identifies feasts by dimension these voltages. The attention of the gas will be determined by dimension the present discharge within the device. The MQ5 gas detector detects the presence of varied feasts similar as hydrogen, CO, alkane series and P ranging from 100ppm to 3,000 ppm. When a gas interacts with this seeing element, it's original ionized into its ingredients and is also absorbable by the sensor. This sorption creates a possible distinction on the part that's transferred to the processor unit through affair legs in variety of current.The gas sensing element module consists of a sword system cadaverous below that a sensor is housed.This detector is subjected to current through connecting leads. This current is allowed as hotting current through it, the feasts returning getting ready to the sensor get ionized and absorbed by the sensor. This changes the resistance of the sensor that alters the worth of the present going out of it.

ULTRASONIC SENSOR HC-SR04

A nunhealable sensing element is academic degree instrument that measures the gap to academic degree object exploitation silent sound waves. The HC-SR04 is an affordable and easy to use distance measuring sensor which has a range from 2cm to 400cm (about an inch to 13 feet).

The sensor is composed of two ultrasonic transducers. One is transmitter which outputs ultrasonic sound pulses and the other is receiver which listens for reflected waves. It's basically a SONAR which is used in submarines for detecting underwater objects. A silent device uses a device to shoot associate degreed admit silent beats that bear aft information regarding an object's propinquity. High frequence sound swells image from boundaries to produce distinct echo patterns. Ultrasonic detectors work by emitting sound swells at a frequence too high for humans to concentrate to. They also sit up for the sound to be reflected back, shrewd distance supported the time needed. generally frequently like but measuring device measures the time it takes an electromagnetic surge to come back formerly hit an object. While some detectors use a separate sound captain and receiver, it's to bobble implicit to combine these into one package device, having academic degree silent element alternate between emitting and entering signals. this type of device

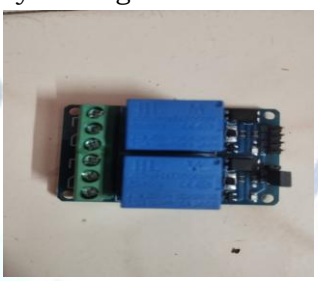
area unit generally boughten throughout a lower package than with separate rudiments, that is accessible for operations where size is at a decoration. While microwave oven radar and silent detectors area unit generally used for numerous of constant- based sensors unit of measurement instantly available they area unit generally had for simply one or 2 bones.

CAMERA OV5642:

A webcam is a videotape 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 indispensable networks stir through systems like the web, associated mailed as an attachment. formerly transferred to a far- out position, the videotape sluice is also saved, viewed or on transferred there not like an IP camera(which connects using Ethernet or Wi- Fi), a digital camera is substantially connected by a USB string, or analogous string, or finagled into element, like laptops. The term" webcam"(a cropped emulsion) may also be used in its original sense of a videotape 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 runner over the Internet. Some of them, for illustration, those used as online business cameras, are precious. This is 5MP image sensor OV5642,M12 mount or CS-mount lens holder with changeable lens options,IR sensitive with proper lens combination,I2C interface for the sensor configuration ,SPI interface for camera commands and data stream.

g. Relay:

Relay is an electrically operated switch. Multitudinous relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, analogous as solid- state relays. Relays are used where it's necessary to control a circuit or load by a separate low- power signal, or where several circuits must be controlled by one signal.



III. WORKING

We're using four motors in this design with help two motor modules. Raspberry pi4 is controlling the direction of robot with help of motors which is having four directions like forward, rear, left and right sides. The Ultrasonic sensor is used to detects the object. When the object is detected also the robot will move backwards and take right side with help of Ultrasonic detector. Temperature detector is seeing the temperature in the present rainfall conditions and shows temperature on the LCD display and pall. The Gas detector is seeing the pollution of rainfall and shoot that information to LCD and cloud.The OV5642camera is used to record images and send to the pall.

IV. RESULT

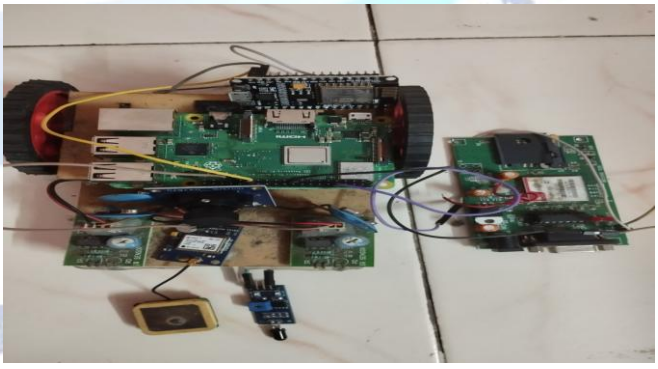
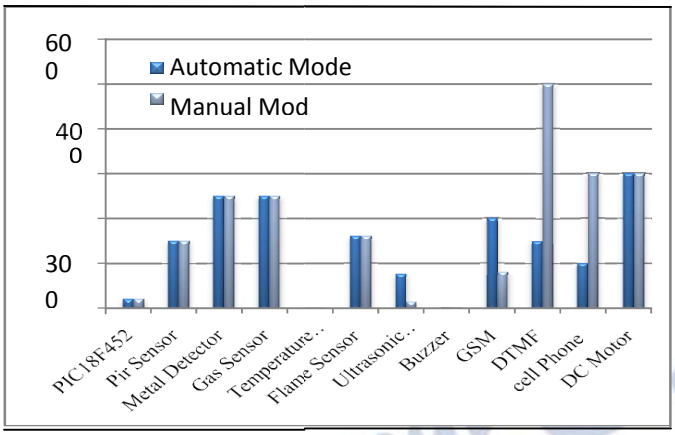
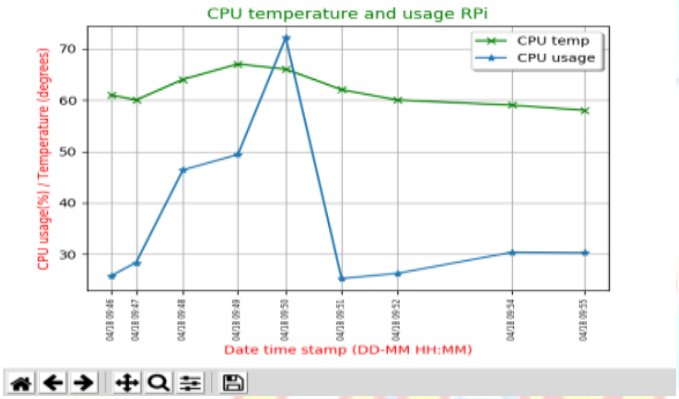


Fig 4.1 INTERFACING MOTORS WITH RASPBERRYPI 4





The interfacing 4motors with Raspberry pi 4 as shown in fig 4.1. The four motors are connected to the leg 7, leg 11, leg 13 and leg 15 of the Raspberry pi4 through the L298N motor 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 force. So, we can use 12V Rechargeable Battery and also use 12V to 5V motor module.

V. 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 grounded bedded system. The surveillance robot gives us live streaming videotape according to that we give the command. interfacing camera and Detectors with Raspberry pi4 .The camera is interface with Raspberry pi4 by the USB. The Ultrasonic detector detector and echo legs are connected to the leg 16 and leg 18 of the Raspberry pi4 . The Gas detector isn't connected to the directly with the Raspberry pi4 because, detector is produce Analog out So, we can use ADC module.

The temperature detector is used to measure the temperature of the nature and that data shoot to the Cloud.

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