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PROBLEM SOLVING SURVEILLANCE MILITARY ROBOTS – A GIST

R. Arvind*, Dr. R. Maguteeswaran & N. Vijayakumar*****
* Assistant Professor & Head, Department of Electronics and Communication Engineering, Suguna College of Engineering, Coimbatore, Tamilnadu
** Principal, Department of Mechanical Engineering, Suguna College of Engineering, Coimbatore, Tamilnadu
*** Assistant Professor, Department of Mechanical Engineering, Suguna College of Engineering, Coimbatore, Tamilnadu

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Abstract:

IOT based wireless multi-purpose Robot used in the core of military in which the application with Raspberry pi and integrated with camera and various sensors, like IR to sense the object, metal sensor to find landmines in the atmosphere and whereas the guns are utilised to shoot. This paper highlights recent techniques for surveillance at urban and rural areas using multifunctional robot based on current IOT used in guard and armed applications. This robotic vehicle substitutes in each and every aspect for proving surveillance at borders. It can be used as both independent and manually controlled vehicle using IOT. Live streaming and detecting the presence of enemies is captured in the camera inside the multisensory robot. This paper presents elegant surveillance robot for military application by using Raspberry Pi for safety purpose.

Key Words: Path Planning, Raspberry pi, Surveillance & Soldiers losses evade

Introduction:

Surveillance is major thing when considering the security purpose. The robot continuously watches and sends a live streaming of an authorized person. The main aim of this project is 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. Nowadays, most of the system uses a mobile robot with a camera for surveillance. The camera placed on the robot can move to various locations. These types of robots are more flexible than the fixed cameras. Robots can be used for various applications in military and industrial space for lifting significant weights and without any errors compared to human. 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 identify the movements whoever entering our border. Robots with high resolution cameras will monitor over long distances. They will 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, it also can settle for several programming languages as well as Python. It supports various in operation systems like Raspbian, Windows IOT Core, Kali UNIX and Arch UNIX ARM and that we use Raspbian OS.

The Raspberry Pi Zero: Technical Specifications:

- CPU: Broadcom BCM2835, which can run at up to 1GHz.
- RAM: 512MB
- Power: 5V, supplied via micro USB connector, drawing 160mA (even when connected to an HD display).
- Dimensions: 65mm x 30mm x 5mm
- Video & Audio: 1080P HD video output. Audio output via mini-HDMI connector.
- Storage: MicroSD card.
- Operating System: Linux, installed via NOOBS.

The Raspberry Pi Zero: Inputs and Outputs:

- MicroSD Card Slot: The Pi Zero gets its storage space from a MicroSD card, which you'll need to install the operating system on.
- Mini HDMI: Video output for the Pi Zero is by way of a mini-HDMI connector. In terms of their operation, these connectors perform identically to their larger versions. N.B. A mini-HDMI to standard HDMI adapter is included with the Pi Zero from element14.

- Micro USB: You'll notice there are two micro USB connectors on the Pi Zero. One is for data (the connector on the left, if the MicroSD card slot is on the left), and one is for power. Don't get them mixed up. A micro USB "On the Go" to USB adapter is included with the Pi Zero from element14 so you can connect a USB hub, and therefore all your peripherals (keyboard, mouse etc).

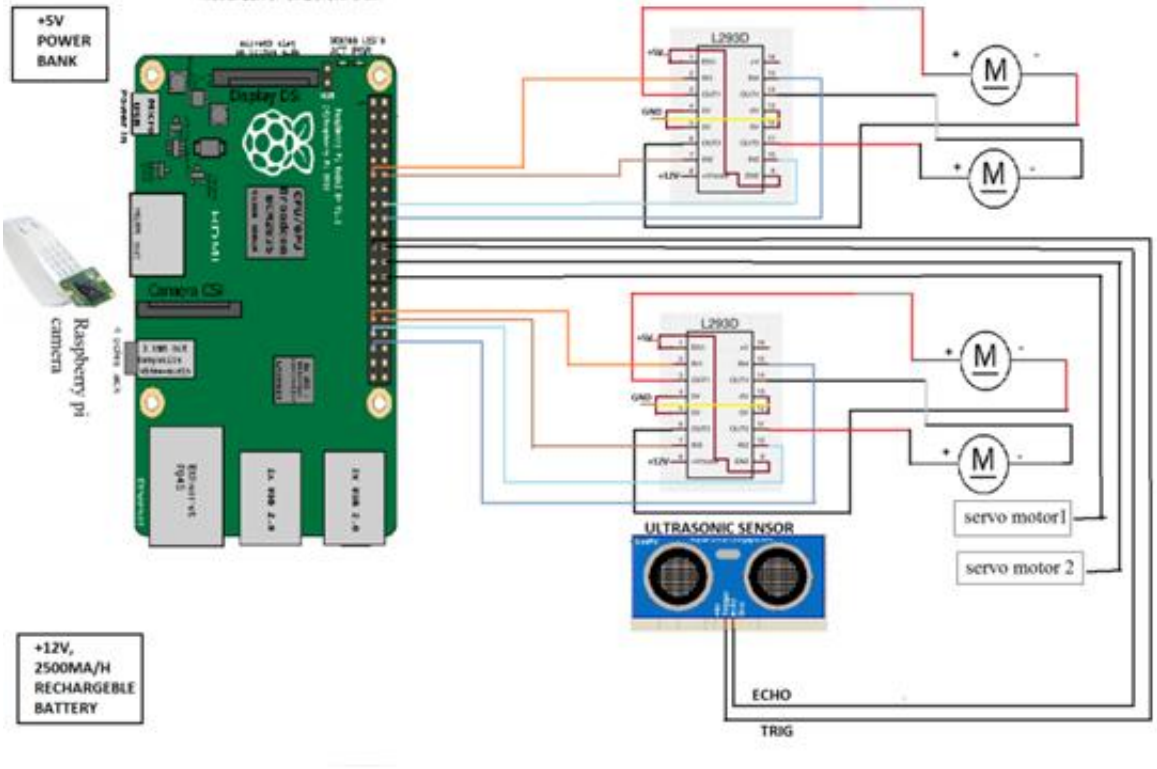

Figure 1: Rasberry pi and Driver Interface

- GPIO: The Pi Zero has the same 40 pin General Purpose Input/Output connections as the Model A+, B+ and RPi2, but the connector pins are unpopulated. So if you want to use the GPIO, you'll either have to solder the required pins in place, or solder your connections directly to the Pi Zero.
- RUN Mode Pins: There are two unpopulated RUN mode pins, which can be used to connect a reset button to the Pi Zero. Again, you'll either have to add the pins yourself, or solder a button straight to the board.
- Composite Video: Here's an interesting one. There's an RCA composited video output via two (unpopulated) pins, so you can hook the Pi Zero up to older display equipment that accepts a phono plug as an input.

Figure 2: Raspberry pi zero

Table 1: Specifications

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 I^2C)
Operating voltage	5V
Operating current	2A
USB	4 Port
Operating frequency	1.2GHz
RAM	1GB

Ultrasonic Sensor:

An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. High-frequency sound waves reflect from boundaries to produce distinct echo patterns. 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. 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.

Figure 3: Ultrasonic Sensor

Raspberry Pi Camera:

Figure 4: Rasberry Pi Camera

The Raspberry Pi No IR 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 has resolution of 5 megapixel, and has a fixed focus lens on board.

Servo Motor:

A unique design for servo motors is 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.

Figure 5: Servo Motor

DC Motor:

DC motor is use to drive the robot, for that we use 500 rpm 4 dc motor. The speed of motor depends on diameter of wheel and Rpm (Resolution per minute) of motor. Rpm is inversely proportional to torque. If the speed of motor is gradually increase torque of motor will be decrease. 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.

Liquid Crystal Display (LCD):

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smart phones, televisions, computer monitors and instrument panels.LCD CD is also known as a thin film transistor (TFT) display. The passive matrix LCD has a grid of conductors with pixels located at each intersection in the grid. A current is sent across two conductors on the grid to control the light for any pixel. An active matrix has a transistor located at each pixel intersection, requiring less current to control the luminance of a pixel. For this reason, the current in an active matrix display can be switched on and off more frequently, improving the screen refresh time. 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 are economical; simply programmable; haven't any limitation of displaying special & even custom characters (unlike in seven segments), animations so on.

Infrared Sensor:

IR sensor is a simple electronic device which emits and detects IR radiation in order to find out certain objects/obstacles in its range. Some of its features are heat and motion sensing.

IR sensors use infrared radiation of wavelength between 0.75 to 1000µm which falls between visible and microwave regions of electromagnetic spectrum. IR region is not visible to human eyes. Infrared spectrum is categorized into three regions based on its wavelength i.e. Near Infrared, Mid Infrared, Far Infrared.

IR Transmitter:

IR Transmitter acts as source for IR radiation. According to Plank's Radiation Law, every object is a source of IR radiation at temp T above 0 Kelvin. In most cases black body radiators, tungsten lamps, silicon carbide, infrared lasers, LEDs of infrared wavelength are used as sources.

Transmission Medium:

Transmission Medium provides passage for the radiation to reach from IR Transmitter to IR Receiver. Vacuum, atmosphere and optical fibers are used as medium.

IR Receiver:

Generally IR receivers are photo diode and photo transistors. They are capable of detecting infrared radiation. Hence IR receiver is also called as IR detector. Varieties of receivers are available based on wavelength, voltage and package. IR Transmitter and Receivers are selected with matching parameters. Some of deciding specifications of receivers are photosensitivity or responsively, noise equivalent power. Incidence in an IR Detection System may be direct or indirect. In case of Direct Incidence, there is no hindrance in between transmitter and receiver. Whereas, in Indirect Incidence IR Transmitter and Receiver are kept side by side and the object is in front of them.

Working Principle:

We are using four motors in this project with two driver modules. Raspberry pi is controlling the direction of robot with help of motors. This is having four directions like forward, reverse, left and right sides. Temperature sensor is sensing the temperature in the present weather conditions and shows temperature on the LCD display and cloud. Metal sensor sense the metals in the environment, the Gas sensor is sensing the pollution of weather and send that information to LCD and cloud. The IR sensor is used to detect the object. When the object is detected then the buzzer will on and the robot will record images and send to the cloud with help of camera. As per the instructions, the robot will shoot down the enemies**.**

Implementation and Results:

The real-time set-up of the wireless video transmission/reception system is as shown in the figure 6. The video is further processed for the real robot path planning applications. The transmitter and receiver section of the RF communication robot are as given in the figure 7. This module is fixed on the robot and connected to the microcontroller unit to receive the video from the surveillance area.

Figure 6: The video transceiver system

Prototype of the robot with a wireless camera and RF receiver is as illustrated in figure below 7.

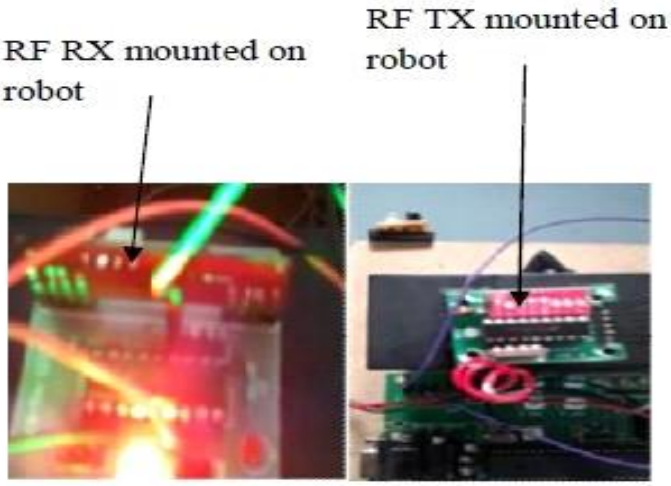

Figure 7: The RF transceiver module.

Figure 8: The final robot prototype and its movement by avoiding the obstacle (red color)

Conclusion:

The moving object in the path of the robot is determined applying the Artificial intelligence 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.

Future Work:

The most notable use of robots in the military over the past few decades is also the first thing that will spring to mind for most: the usage of Unmanned Aerial Vehicles, or UAVs, more commonly called drones. These drones have been deployed in combat situations throughout the Middle East. Piloted by personnel in secure locations hundreds - if not thousands - of miles away, these small aircraft carry out all manner of missions, from reconnaissance to strategic strikes. There are over 7,000 of them in service, and the next generation of robot aircraft will only expand on the task. The Future Vertical Lift (FVL) program will have drones that will operate even more independently - and with greater mission parameters - than present-day drones. The possibilities are endless; robotic tanks, artillery vehicles, and reconnaissance vehicles may replace the tried-and-true technologies of today's armies.

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