

Raspberry Pi 3 B+ Based War Field Spying Robot Using Wireless Camera

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Abstract: As an essential constituent of many associations' security and safety precedence, surveillance has established its importance and benefits numerous times by providing immediate supervising of possessions, people, environment and property. This project deals with the design approach of an Embedded Real-Time Security System Based on Raspberry Pi for intruder observation that reinforces surveillance technology to provide essential security to our life and associated control. The proposed robotic unit is used for video surveillance of remote place as well as remotely control of the unit using Bluetooth as a medium. Raspberry pi serves a server as well as the microprocessor for the system. An embedded web server creates an easy way for monitoring & controlling any device which is in a remote place. The proposed security solution hinges on our novel integration of cameras and obstacle detector into the web application. Raspberry Pi operates and controls obstacle detector and pi camera for remote sensing and surveillance, streams live video and records it for future playback. This research is focused on developing a surveillance system that helps the property owners to monitor the place to avoid intruders by using pi camera and wireless Bluetooth technology for remote control.

Keywords: Android, Bluetooth, IP camera, Raspberry Pi, Robot, Sensors, Spy.

INTRODUCTION

Due to increased need of security most especially in homes, places of work, borders, and military base, there has been an increasing demand for security systems that can protect man, property, boundaries of nations, and with the improvement of sensors and devices for human-robot interaction, robotic manipulators are increasingly used in a less controlled environment for **surveillance**. A robot is a mechanical or virtual artificial agent, usually an electro-mechanical machine that is guided by a computer program or electronic circuitry. Robots can be autonomous or semi-autonomous, they have replaced human in performing repetitive and dangerous tasks which humans prefer not to do, or are unable to do because of size limitations, or which take place in extreme environments such as outer space or the bottom of the sea. THIS PROJECT DESCRIBES THE design and implementation of spy robot systems with the spy camera and obstacle avoidance technology.

This project acts as an early warning system that constantly monitors a hostile environment using a high-resolution camera and feeding the information to the connected raspberry pi device that controls the robot. Ultrasonic sensors HC-SR04 are used for long-range obstacle detection and avoidance. The robot has four wheels which provide its balance as it moves on the terrain and it's controlled remotely using a Bluetooth App to navigate its movement.

SYSTEM DESCRIPTION

This project is a mechatronics system consisting of components like Ultrasonic sensor, Raspberry Pi, PI

camera, four DC Motors, DC motor driver IC, blue tooth module and android phone.

The Raspberry Pi which is powered by a 5V DC Supply is a Linux based microcomputer based on ARM architecture and it is the main control device of this project. The PI camera is used for continuously taking images and recording video of the area being surveillance. Ultrasonic sensors HC-SR04 are used for long-range obstacle detection and avoidance. **Four 5volts DC motors attached to the wheels are used to provide balance and movement since it is easy to control their speed in a wide range and their torque-speed characteristic historically has been easier to tailor than that of all AC motor categories, Motor Driver IC (L298N) is used for forward and reverse function with speed control of the DC motor and an Android Smart Phone with installing MKR Bot controller application which helps to drive the robot in four directions i.e. front, reverse, left and right is connected to the robot wirelessly using Bluetooth.**



Picture: 1: Spy Robot System Implementation

ELECTRONIC CONTROL CIRCUIT DIAGRAM IS SHOWN BELOW

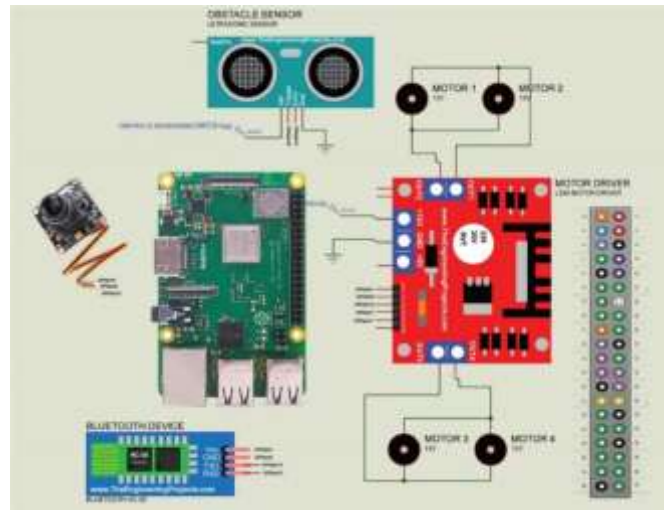


Figure 2: Electronic Control Circuit Diagram

A Basic Block Diagram of the Project is shown below

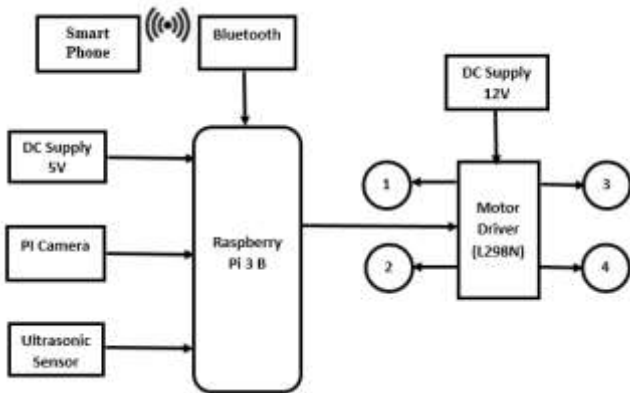


Figure 1: Block Diagram of a spy robot system

FLOW CHART OF THE SPY ROBOT SECURITY SYSTEM

The flow chart below was used to design and thus document the spy robot security system project. It illustrates the series of events starting from intrusion event up to the point when the concerned personnel intervenes after capturing the pictures of the suspect. This algorithm was implemented using a Python script.

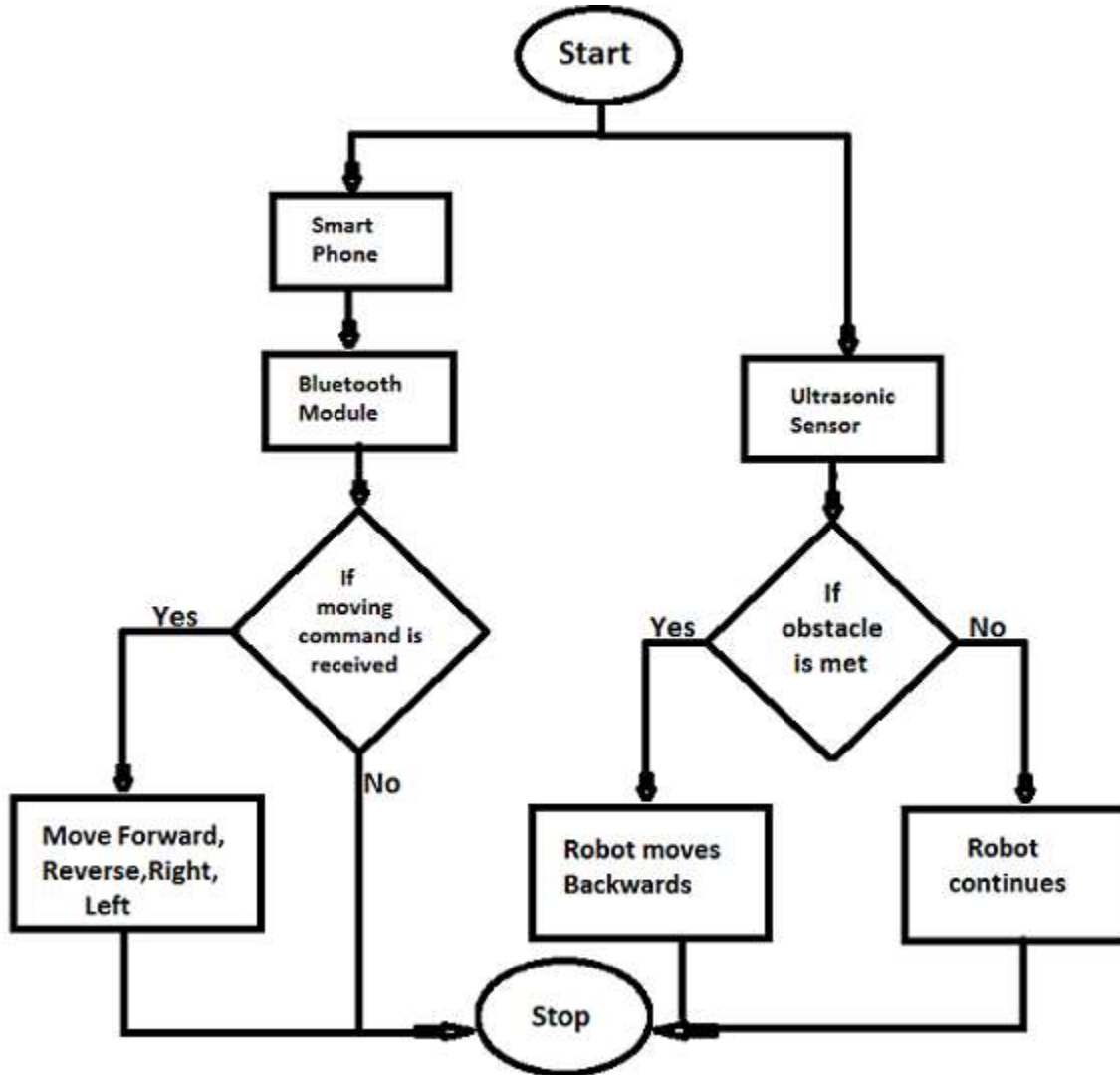
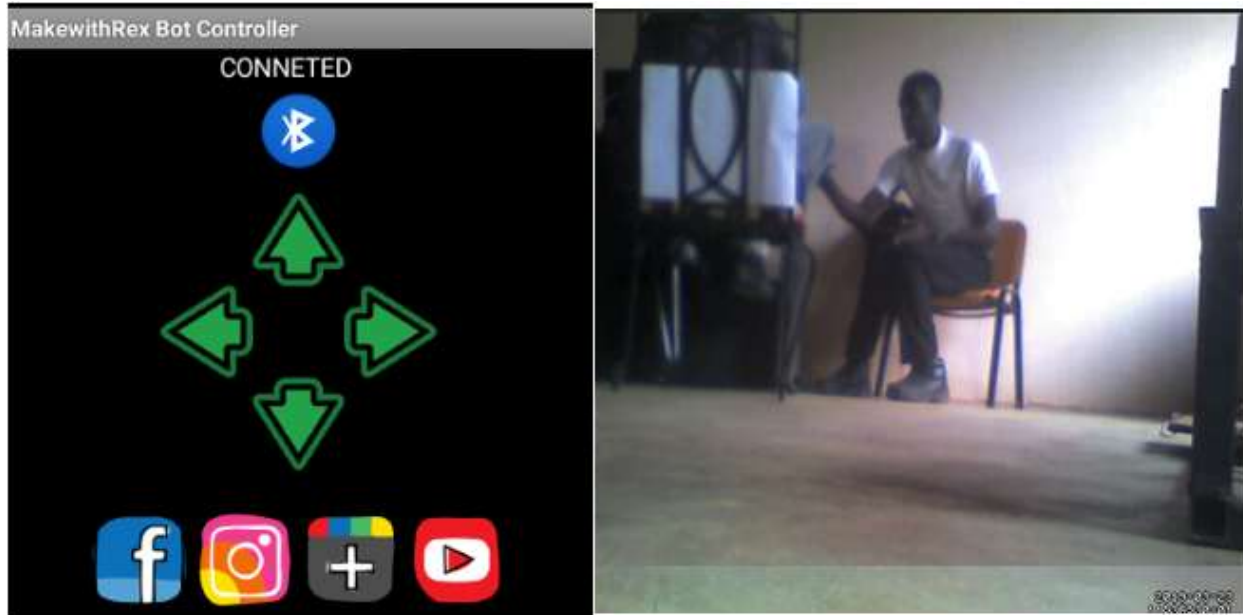


Figure 3: Shows a Flow chart of a spy robot system

TESTS AND RESULTS

The project is basically designed for military surveillance of war fields that are dangerous for humans by keeping an eye on such area, hence giving soldiers an indication about the dangers and situation of the war field. The PI camera module, ultrasonic sensor, and the Bluetooth module were integrated together with the microprocessor as the input modules while the motor driver and the laptop were connected to the microprocessor as the output modules. And the android smartphone was connected wirelessly to the Bluetooth module using Bluetooth technology.

The robot was moved by sending an input signal to the Raspberry PI from the smartphone via Bluetooth module, the microprocessor scans the input according to the stored program and the output is given to the motor driver to move the DC motors either forward or reverse, right or left. As the robot moved, its area of coverage was monitored on the laptop by the help of the PI camera and the photos and video were captured and stored in the laptop to be used as the evidence. The image below was captured as the spy robot was tested by moving it around.



Picture: 2: An image captured using a spy robot in real-time video

APPLICATION

- **Military war mission**
This can be used to monitor the area which is under attack by sending the robot to capture images.
- **Search and Rescue operation**
Spy robot can be used in rescue operation since such are dangerous for humans to access hence saving people's lives during the process

CONCLUSION

The project is basically designed for military surveillance of war fields that are dangerous for humans by keeping an eye on such area, hence giving the military (soldiers) an indication about the dangers and situation of war field, such that action is taken immediately by the concerned personnel to prevent any kinds of surprise attack by an enemy. For project demo concerns, the prototype was developed, test and proved to be working by integrating all the hardware components and software used. This Idea can be further implemented to develop a real product in the future.

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