SPYING ROBOT WITH MULTIPURPOSES IN SECURITY APPLICATIONS

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Abstract: *A Spy robot is a machine which can be controlled by the remote such as Android Phone. The maximum controllable range is 15 meters. The remote has four switches to control the robot in four directions. The robot senses the surroundings through the camera and sends to the receiver through the Radio Frequency wireless communication. Remote operated spy robot has mainly two sections, one is remote control section used to control the robot and other one is video transmission section used to transmit audio and video information. The spy robot is controlled by mobile phone via moving the robot upward, backward, left and right side by the android application such as Arduino(Nano) Microcontroller, Bluetooth module.*

Keywords: Android Phone, Camera, Arduino Microcontroller, Bluetooth

1. Introduction

A Robot is usually an electro-mechanical machine which is guided by wireless remote or laptop. Spy robot can capture audio and video information from the surroundings and send to a remote station through RF signal. By the use of remote controller (Android phone), the spy robot will move to desired destination and spy images around the robot in this project. This robot consists of mainly two sections: Remote control section and Video transmission section.

The project aims in designing a Robot that can be operated using Android mobile phone. Here Arduino microcontroller is used which is a low-power high-performance CMOS 8-bit microcontroller with 32K bytes of in-system programmable Flash memory, Bluetooth module (HC-05). We interface the Bluetooth module with the system to control the system by smart phone application. This project is more necessary to the modern society in context of spying and surveillance. The controlling of the Robot is done wirelessly through Android smart phone using the Bluetooth feature present in it. Here in the project the Android smart phone is used as a remote control for operating the Robot. The controlling device of the whole system is a Microcontroller. Bluetooth module, gear motors, and servo motor are interfaced to the Microcontroller. The data received by the Bluetooth module from Android smart phone is fed as input to the controller. The controller acts accordingly on the gear motors of the Robot. In achieving the task the controller is loaded with a program written using Embedded „C" language. Spy robots are made so small and compact enough to easily transport. The radio Frequency modules signals are used in wireless remote control system for transmitting and receiving wireless logic signals to control the motors of the Spy robot control system [1].

2. System Overview

In this paper, a mobile robot is presented which can work on any surface and thus, replaces the human involvement in demining operations. The flexible design of the robot enables it to move in any direction at any moment without changing the position of the body. This system replaces the human involvement in the determining operations. The block diagram of remote operated spy robot and RF communication block diagram are shown in figure 1and 2.
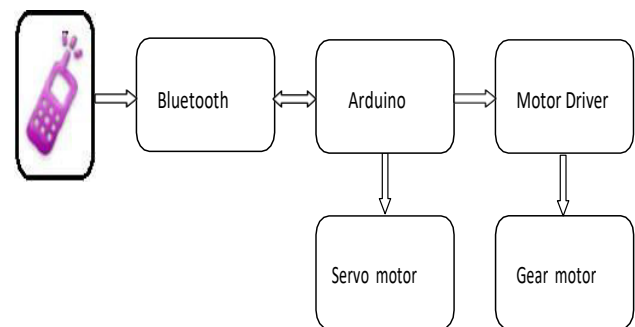

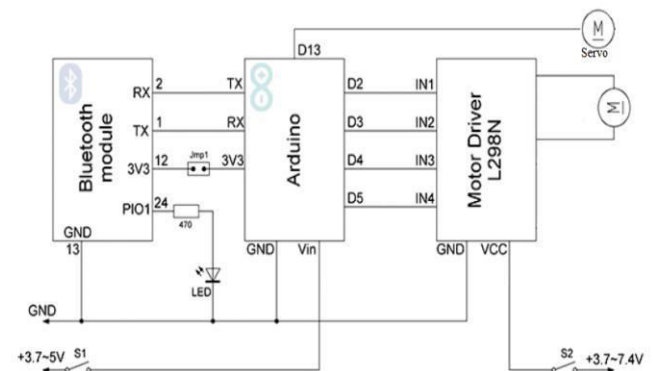**Figure 1**.Block diagram of remote operated spy robot

Figure 2.RF communication block diagram

The presented prototype here is an advanced Robotic System which can be controlled via GSM Network & GSM Mobile equipment. As shown in the Block Diagram, the project consists of a set of GSM equipment via; GSM Mobile Handset & GSM Mobile Infrastructure. Though a mobile handset one can press a button for that particular Robotic Vehicle and after the reception of acknowledgement signal, one can send the Control Signals in the system via handset for a specific activity of the Robotic Vehicle and accordingly the Robotic Vehicle generates the actions. These actions can be either movement of the Robotic Vehicle [2].

The project is designed to develop a robotic vehicle using RF technology for remote operation attached with GSM camera for monitoring purpose. The robot along with camera can wirelessly transmit real time video with night vision capabilities. At the transmitting end using push buttons, commands are sent to the receiver to control the movement of the robot. At the receiving end gear motor and servo motor are interfaced to the microcontroller where they are used for the movement of the vehicle in any direction. The RF transmitter acts as a RF remote control that has the advantage of adequate range (up to 15 meters with interrupting), while the receiver decodes before feeding it to another microcontroller to drive gear motors via motor driver IC for necessary work. A GSM camera is mounted on the robot body for spying purpose.

3. Circuit Diagram and Materials

A **robot** is an electro-mechanical machine which is controlled by computer or programming to able to do tasks on itself. A robot is a reprogrammable, multifunctional manipulator designed to move material, parts, tools or specialized devices through variable programmed motions for the performance of a variety of tasks.

The main aim of this project is to control the robot with wireless technology. For this purpose we designed two separate boards .One is transmitter and another is receiver which is placed on the robot. Here we are using RF technology (wireless communication). In the transmitter, if we press the buttons according to that some predefined data will be transferred through RF communication and the receiver will receive the data. According to the command, the robot will do the specific task i.e. FORWARD, BACKWARD, LEFT and RIGHT. And through the camera, the receiver receives that information. For this purpose we designed programs in embedded C .In order to fulfill this application there are few steps that has been performed. The circuit diagram of the constructed spy robot is shown below.
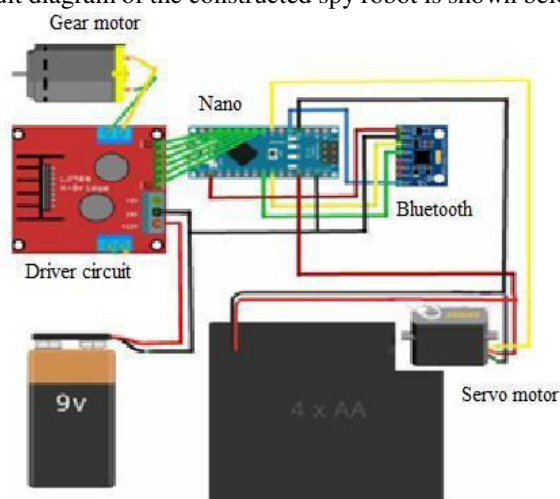

Figure 3: Circuit diagram of Spy robot

The system consists of following parts:
a) Arduino Nano (ATMEGA 328P)
b) Bluetooth module (HC-05)
c) Smart phone

d) Motor driver (L298)
e) Arduino software

3.1 Arduino Nano

The Nano is inbuilt with the ATmega328P microcontroller. Nano is available in TQFP (plastic quad flat pack) with 32 pins. The extra 2 pins of Arduino Nano serve for the ADC functionalities and Nano has 8 ADC ports.
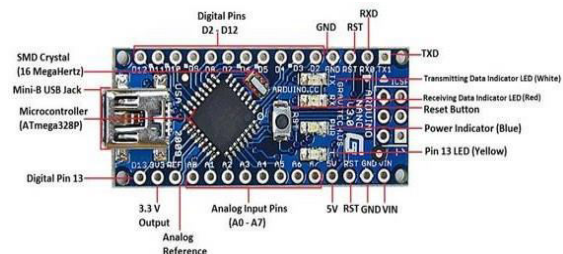

Figure 4: Arduino Nano

The Nano board doesn't have a DC power jack as other Arduino boards, but instead has a mini-USB port. This port is used for both programming and serial monitoring. The fascinating feature in Nano is that it will choose the strongest power source with its potential difference, and the power source selecting jumper is invalid [1].

3.2 Bluetooth Module (HC-05)

The Bluetooth module will act as an interface between Smartphone and microcontroller. We will be using HC-05 Bluetooth module for the system, which can be used as either receiver or transmitter. Generally our transmitter will be smart-phone and receiver will be Bluetooth module. Bluetooth module will give the commands given by smart-phone to the microcontroller [1].
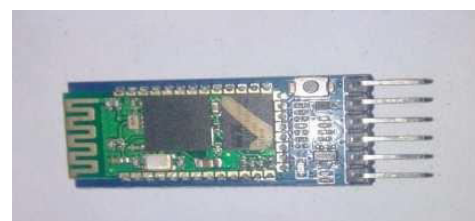

Figure 5: Bluetooth Module (HC-05)

3.3 The Smart Phone

The smart phone is the transmitter of this circuit. It sends the data to microcontroller through Bluetooth module. It also helps to send the instruction of forward, backward, left, and right to the microcontroller. Actually, the smart phone is used as a remote of this system. Here we the Bluetooth RC Controller application as the operating remote of this system. The advantage of this project is that the application software designed for android phones is kept simple but attractive with all necessary built-in functions. The novelty lies in the simplicity of the design and functioning [2].

3.4 Motor driver

Motor Driver L298D, the device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads and switching power transistors. To simplify use as two bridges each pair of channels is equipped with an enable input. A separate supply input is provided for the logic. This device is suitable for use in switching applications at frequencies up to 25 kHz. The L298D is assembled in a 16 lead plastic package which has 4 center pins connected together and used for heat sinking. The chip is designed to control 2 gear motors. There are 2 Input and 2 output pins for each motor [3, 4].

3.5 Arduino software (C Language)

It provides simple, direct access to any addressable object (for example, memory-mapped device control registers), and its source-code expressions can be translated in a straightforward manner to primitive machine operations in the executable code. The Use of higher-level programming languages, such as C, resolves these problems. Programs written in C are very portable, since they can generally work on any CPU type without modification. They are also easier to write and read, since they are more compact and use a much more descriptive set [5].

3.6 Remote control Section

An Arduino Nano card is connected to an android phone via Bluetooth. In this case Android terminal emulator applies to a signal digit (zero or one) from phone to a Bluetooth module to the Arduino Nano via a serial connection. The Arduino will read the data and turn an LED on or off accordingly. After that it will send a status message back, which will be display on the phone‟s screen. This will essentially confirm a two way communication between Arduino and the Android phone over Bluetooth. Then it can be used to interact with servo motor connected to the spy robot for direction [6].

4. Operation of the System

An android smart-phone and the technology of android are vast and can be used to interact with embedded system. Mobile, robot and Bluetooth are the on-going technologies which can be used for the benefit of mankind. Hardware of this project consists of Arduino Nano, Bluetooth module and a motor driver IC. The Bluetooth module is connected with the Arduino Nano board for the connection with the user. Through the Bluetooth module for monitoring and controlling the particular motor reaches the board and process accordingly and the output of the Arduino goes to the motor driver IC and it controls the particular motor.

In our android application base Bluetooth controlled robotic car, the user interacts with the system with a smart phone. In this method user must be present within in range (< 15 meters) to control the system. Here in this project the user (android application) is the input section. This device is connected with the Arduino board (microcontroller section) by the means wirelessly i.e. Bluetooth module. The system

can now be connected with the motors (output section) to be controlled via wireless connectivity.

Then through the data cable we insert the commands in the microcontroller ATMEGA 328P. These commands help the microcontroller to interface with the Bluetooth module HC-05 and also with the motor driver IC L298D. Here the Bluetooth module acts as a receiver which receives the instruction from the smart phone (remote or transmitter). Then the microcontroller decides the operation for the instruction which is coming from the smart phone. The functions of the given instructions are operated by the microcontroller. The instructions are sent by the smart phone. We can easily control the movements of the dc motor. In any electric motor, operation is based on simple electromagnetism. A current carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. F.

In order to control the motion, for directional (LEFT or RIGHT) movement, Servo motor is used and for the movement (FORWADR or BACKWARD) of our robot, we are using gear motors. It is operated by 12VDC power supply. The bidirectional movement of the servo gear enables movement in either direction when desired. The servo motor under consideration should be able to produce enough torque to rotate the motor mount quickly.

A DC power supply is required to run the system. The DC power supple feeds the Microcontroller and the Bluetooth module. For the whole system, the required power is supplied by Lead acid batteries which connected the voltage regulator. The Bluetooth module receives the signal sent from an android smart-phone, where the application software coded in C language is installed. The microcontroller, thereby, sends instructions, which when executed, helps in functioning of the motor driver. The movement and functioning of the motor can be control Arduino Nano led by using the android based application software.
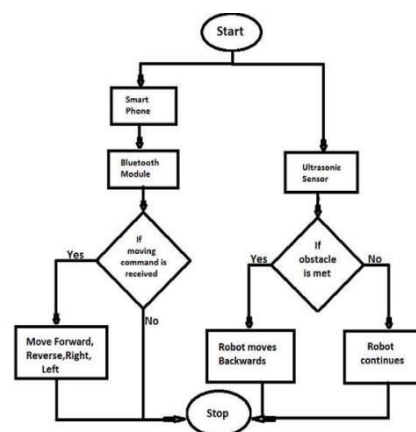
5. Conclusion

This Spy robot is used to transmit both audio and video to the receiver station. From the remote the movement of both camera and robot is controlled from the Android Phone.

Because of the wireless camera is installed in spy robots, it can be used remotely to enter and exit dangerous place that human cannot. When the user controls by remote controller, the spy robot will move to desired destination and spy images around the robot. The user can check and recommend from computer with the wireless remote controller.

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