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IMPLEMENTATION OF AGRICULTURE ROBOTIC VEHICLE BASED PESTICIDE SPRAYER WITH EFFICIENCY OPTIMIZATION

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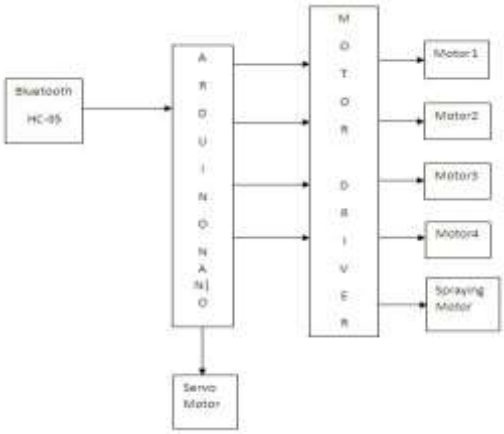
ABSTRACT
Compared to spraying pesticides manually outdoors, the environment is more closed, and has a high temperature, humidity and so on for operating the spray work in the greenhouse. In order to protect labour and reduce labour intensity, we develop a prototype of pesticide spraying robot specially used in the greenhouse. Designing of the latest inverted robot which can be controlling using an app for android mobile.

INTRODUCTION
Aim of project is designing a Robot that can be operated using Android mobile phone. 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.

Android is a software stack for mobile devices that includes an operating system, middleware and key applications. Android boasts a healthy array of connectivity options, including Wi-Fi, Bluetooth, and wireless data over a cellular connection (for example, GPRS, EDGE (Enhanced Data rates for GSM Evolution), and 3G). Bluetooth is an open standard specification for a radio frequency (RF)-based, short range connectivity technology that promises to change the face of computing and wireless communication. It is designed to be an inexpensive, wireless networking system for all classes of portable devices, such as laptops, PDAs (personal digital assistants), and mobile phones. It also will enable wireless connections for desktop computers, making connections between monitors, printers, keyboards, and the CPU cable-free. The controlling device of the whole system is a Microcontroller. Bluetooth module, DC motors 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 DC motors of the Robot. The robot in the project can be made to move in all the four directions using the Android phone. LED indicators shows the direction of the robot.In achieving the task, the controller is loaded with a program written using Embedded “C” language.

BLOCK DIAGRAM
Here at this robot I have used a Bluetooth module to control the robot via 2 BO motors at 300RPM appox the robot is control by an android phone application Microcontroller used is AT89S51 from 8051 family to work in a serial communication UART mode the communication is configured on 9800bps to communicate it with the Bluetooth module. The Bluetooth module used is a HC-05 in smd package which works on a 3.3v and have a serial communication with any device connected to it the communication speed can be configured on various speed via AT Command. The BT module is a SPP supported profile so it can be connected easily to any module or phone. In this profile the data can be sent and receive to module. The BT module is connected to the RX pin of microcontroller. The L293D is a motor driver IC to operate the motors in any direction required dependent on the logic applied to the logic pins. A readymade compact size chassis I have used to avoid the chassis assembly the chassis contains 2 decks the lower is used for BO motors fitting the upper is used as a battery stack. on top the plate the board is mounted by screw fitting. A smart phone Android operated robot. Now here is a simple to control your robot/robo car using Bluetooth module HC-06 and 89c2051 microcontroller with your android Smartphone device.

The controlling devices of the whole system are a microcontroller. Bluetooth module, DC motors are interfaced to the microcontroller. The data receive by the Bluetooth module from android smart phone is fed as input to the controller. The controller acts accordingly on the DC motor of the robot. The robot in the project can be made to move in all the four directions using the android phone. The direction of the robot is indicators using LED indicators of the Robot system. In achieving the task, the controller is loaded with program written using Embedded "C" Languages. Android smart phone controller Bluetooth robot using microcontroller.



Block Diagram

ARDUINO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

The Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board – you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program.

Arduino Nano

The Arduino Nano can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

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BLUETOOTH MODULE

Bluetooth Module

HC Serial Bluetooth product consists of Bluetooth serial interface module and Bluetooth adapter. Bluetooth serial module is used for converting serial port to Bluetooth.

This module has two modes: master and slaver device. The device named after even number is defined to be master or slaver when out of factory and can't change to the other mode. But for the device named after odd number, users can set the work mode (master or slaver) of the device by AT commands.

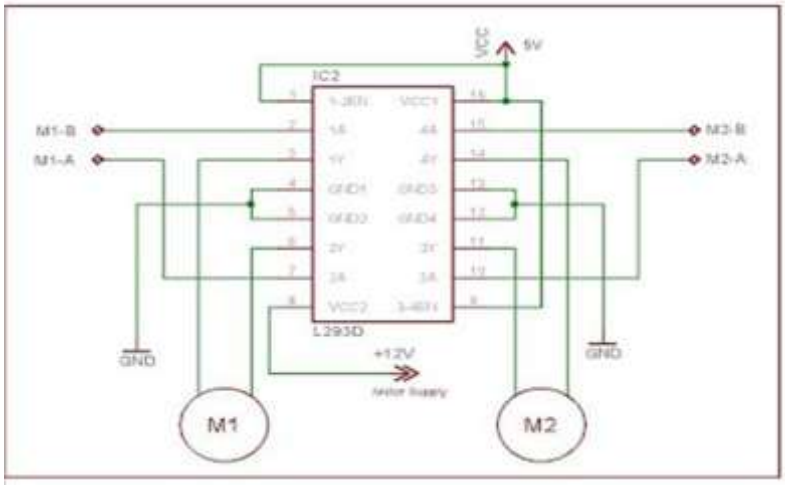
HC-06 Specifically includes: Master device: HC-06-M, M=Master Slaver device: HC-06-S, S=Slaver

The main function of Bluetooth serial module is replacing the serial port line, such as: One connects to Bluetooth master device while the other one connect to slaver device. Their connection can be built once the pair is made. This Bluetooth connection is equivalently liked to a serial port line connection including RXD, TXD signals. And they can communicate with each other.

1. When MCU has Bluetooth salve module, it can communicate with Bluetooth adapter of computer and smart phones.
2. The Bluetooth devices in the market mostly are salve devices, such as Bluetooth printer, Bluetooth GPS. So, we can use master module to make pair and communicate with them.
3. Bluetooth serial module's operation doesn't need drive, and can communicate with the other Bluetooth device. But communication between two Bluetooth modules require at two conditions:
   i) The communication must be between master and slave.
   ii) The password must be correct.

MOTOR DRIVER CIRCUIT

The pin 8 of IC should be connected to the 9v battery or 12v. This pin8 is internally connected to the driver circuit inside the IC which helps the motor to get the good supply which also helps the smooth functioning of motors. L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction.



Motor Driver Circuit

It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence H-bridge IC are ideal for driving a DC motor.

In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293D motor controller.

There are two Enable pins on L293D. Pin 1 and pin 9, for being able to drive the motor, the pin 1 and 9 need to be high. For driving the motor with left H-bridge you need to enable pin 1 to high. And for right H-Bridge you need to make the pin 9 to high. If anyone of the either pin1 or pin9 goes low, then the motor in the corresponding section will suspend working. It's like a switch.

L293D Logic Table

Let's consider a Motor connected on left side output pins (pin 3,6). For rotating the motor in clockwise direction the input pins have to be provided with Logic 1 and Logic 0.

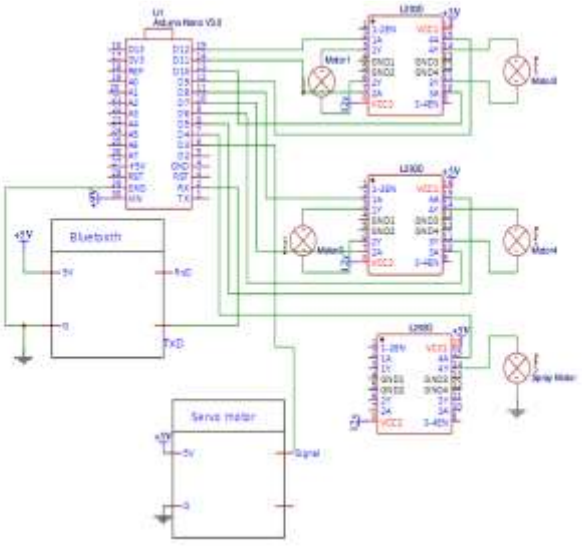
- **Pin2** = **Logic1** and **Pin 7** = **Logic 0** | Clockwise Direction
- **Pin 2** = **Logic 0** and **Pin 7** = **Logic 1** | Anticlockwise Direction
- **Pin 2** = **Logic 0** and **Pin 7** = **Logic 0** | Idle [No rotation] [Hi-Impedance state]
- **Pin 2** = **Logic 1** and **Pin 7** = **Logic 1** | Idle [No rotation]

In a very similar way the motor can also operate across input pin 15,10 for motor on the right hand side.

DC MOTOR

Almost every mechanical movement that we see around us is accomplished by an electric motor. Electric machines are means of converting energy. Motors take electrical energy and produce mechanical energy. Electric motor is used to power hundreds of devices we use in everyday life.

Electric motors are broadly classified into two different categories: DC (Direct Current) and AC (Alternating Current). Within these categories are numerous types, each offering unique abilities that suit them well for specific applications? In most cases, regardless of type, electric motors consist of a stator (stationary field) and a rotor (the rotating field or armature) and operate through the interaction of magnetic flux and electric current to produce rotational speed and torque. DC motors are distinguished by their ability to operate from direct current. A DC motor in simple words is a device that converts direct current (electrical energy) into mechanical energy.



Circuit Diagram

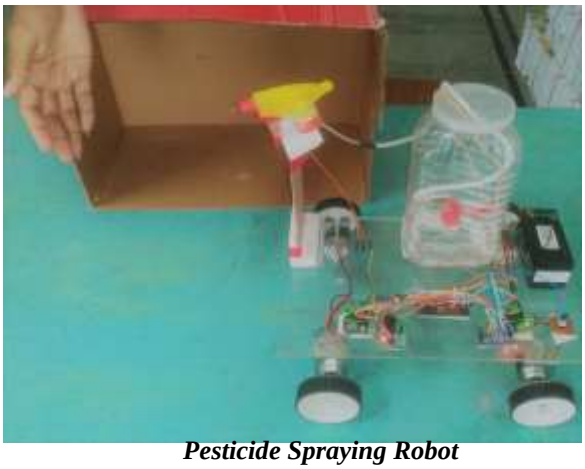
A smart phone Android operated robot. Now here is a simple to control your robot/robo car using Bluetooth module HC-06 and 89c2051 microcontroller with your android Smartphone device. The controlling devices of the whole system are a microcontroller. Bluetooth module, DC motors are interfaced to the microcontroller. The data receive by the Bluetooth module from android smart phone is fed as input to the controller. The controller acts accordingly on the DC motor of the robot. The robot in the project can be made to move in all the four directions using the android phone. The direction of the robot is indicators using LED indicators of the Robot system. In achieving the task, the controller is loaded with program written using Embedded "C" Languages. Android smart phone controller Bluetooth robot using microcontroller. First make sure your HC-06 Bluetooth module is paired with your mobile. The default password for pairing is "1234" or "0000". Check the manual of Bluetooth module.

Step to connect:

1) Connect the wiring, power up, while the device is not connected, the Bluetooth module board has a white LED flashing
2) At PC side, search Bluetooth device.
3) Found name called "HC-05" device

First make sure your HC-06 Bluetooth module is paired with your mobile. The default password for pairing is "1234" or "0000". Check the manual of Bluetooth module. Click on "SELECT DEVICE" icon to select paired Bluetooth module. When press "up arrow" it sends the data "A" to Bluetooth module connected with the circuit. When microcontroller detects "A" the robot/robot car moves FORWORD. When press "DOWN ARROW" it sends the data "B" to Bluetooth module connected with the circuit. When microcontroller detects "B" the robot/robot car moves REVERSE. When press "LEFT ARROW" it sends the data "C" to Bluetooth module connected with the circuit. When microcontroller defects "C" the robot/robot car turns LEFT. When press "RIGHT ARROW" it sends the data "D" to Bluetooth module connected with the circuit. When microcontroller defects "D" the robot/robot car turns RIGHT. When press "STOP" button which is in the centre of remote it sends the data "E" to the Bluetooth module connected with the circuit. When microcontroller defects "E" the robot/robot car gets stopped Click on "DISCONNECT" icon to disconnect paired Bluetooth module. The controller acts accordingly on the DC motor of the robot. The robot in the project can be made to move in all the four directions using the android phone. In achieving the task, the controller is loaded with program written using Embedded 'C' Languages.

RESULT



Pesticide Spraying Robot

CONCLUSION

The experiment showed that the robot can basically complete the work of automatic controlled and meet spraying requirements in the greenhouse.

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