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## Wireless Bomb Disposal Robot using Night Vision Camera

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### ABSTRACT

*This paper presents the wireless bomb disposal robot which will help to improve the defense of our nation from terrorist, suicide bombers, and other such activities. In this project, we are going to merge two applications that are spying and bomb detection. This Spy Robot is a small robot with a night vision camera attached to it. The motors will be run by the relays which will be then controlled through Remote via RF module. This work is designed to develop a War field robot which is capable of detecting bombs land mines and which is wirelessly controlled through RF module. Input from the user is transmitted over the sensor to the Receiver, where it is received, identified and given to the appropriate module (Robot) to act. The Robot consists of a Base, a robotic Arm and a wireless camera on it. We have used DC motors for movement of the robotic arm. As we are not risking the life of a bomb squad expert or any other soldier or commando. Hence introducing the safest way for disposing of the explosive to save the life of common people.*

**Keywords:** Wireless Technology, RF Module, Robotic Arm, Bomb Disposal.

### 1. INTRODUCTION

Here we are going to construct a Robot which is used for bomb disposal purpose. Use the wireless camera for video feedback so the operator can operate more efficiently. The operation of the robot is controlled by using wireless module so it can provide more range of operation.

The robot that we are going to make is a command and control robot. This robot takes commands from the user in the form of control signal and performs the required action. The central idea behind this robot is to provide a line of defense to a bomb disposal squad against the life-threatening risk, faced by them in the event of an explosion. It provides the squad a safe distance to dispose of a bomb, which he normally has to do with his bare hands.[1]

The main technology used here for serial communication with the robot is the Bluetooth technology. Bluetooth technology can be used to share data between two devices considering the range between two devices. The Bluetooth module HC-05 will be connected to the robot and the commands to the robot will be given through the android application. [2]

The technical improvement together with the need for high-performance robots created faster, more accurate and more intelligent robots using new robots control devices, new drives, and advanced control algorithms. This is specially designed bomb detection and disposal robot system with night vision camera to save human life and protect the soldiers from landmines or bombs. One of the

most important things about these robots is that they have the capability to perform missions remotely in the field, without any actual danger to human lives.

Android has complete software package consisting of an operating system, middleware layer, and core applications. Different from another existing platform like iOS (iPhone OS), it comes with software development kit (SDK), which provides essential tools and Application. Using a Smartphone as the “brain” of a robot is already an active research field with several open opportunities and promising possibilities. In this paper, we present a review of current robots controlled by mobile phone and discuss a closed loop control systems using audio channels of mobile devices,[3]

**2. LITERATURE SURVEY**

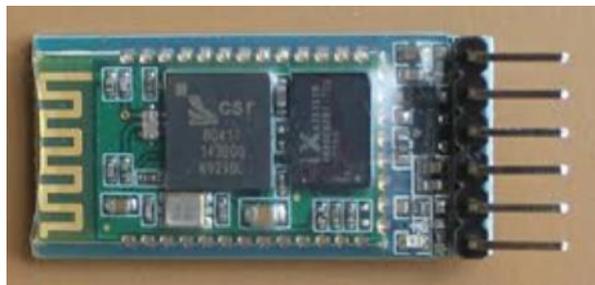
This literature survey includes the architecture of Bluetooth module HC-05 along with L293D motor driver IC.

**A. Bluetooth Module HC-05**

HC-05 Bluetooth Module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Its communication is via serial communication which makes an easy way to interface with the controller. HC-05 Bluetooth module provides switching mode between master and slave mode which means it able to use neither receiving nor transmitting data.[8]

The Bluetooth module has two devices i) master device ii) slave device. One device connects to the master while the other device connects to the slave. The Bluetooth module HC-05 consists of six pins. The six pins are Key, 5V, GND, Tx, Rx, Status.

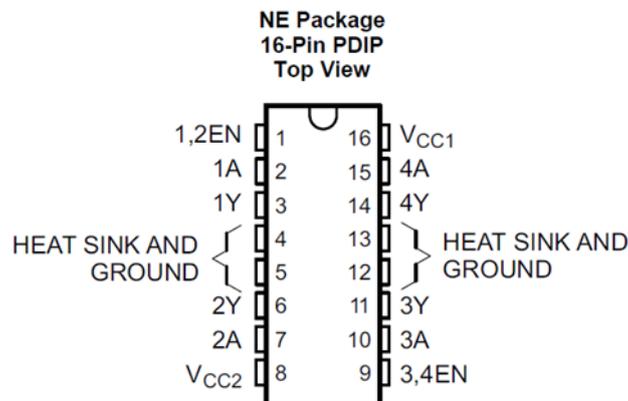
- In order to have proper communication, the master device must be connected to the slave. Once the pairing is done between two devices, the device will ask to enter the password.
- The password will be either 0000 or 1234. Enter the password and both the devices will be connected to each other.[1]



**Figure 1: HC-05 Bluetooth Module**

**B. L293X Motor Driver IC**

The L293 and L293D devices are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. 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.



**Figure 2: L293X Pin Description [7]**

Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled, and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled, and their outputs are off and

in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.[4]

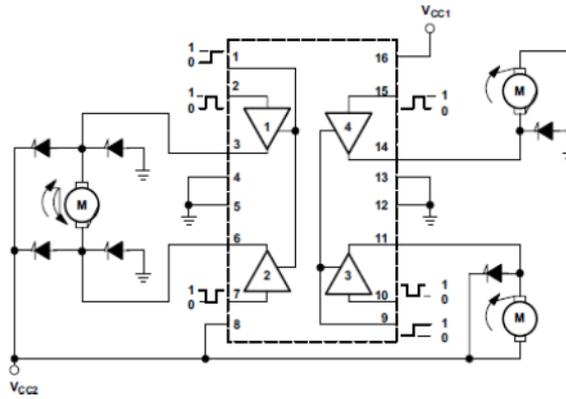


Figure 3: Functional Diagram of L293X [7]

### C. Arduino UNO

The Arduino Uno is an 8-bit microcontroller board based on the ATmega328. It has 14 digital pins and 6 analog pins and other power pins such as, GND, VCC. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It has SRAM 2kb and flashes memory 32kb. EEPROM with 1KB. Arduino is open source hardware board with many open source libraries to interface it on board microcontroller with many other external components like LED, motors, IR sensors and many other things one wants to interface with Arduino board. Arduino is a complete board which includes all things to connect with external peripheral and to program through the computer. It contains everything needed to support the microcontroller. We either need to connect it to a computer using a USB cable or power it with an AC-to-DC (7-12v) adapter. The Arduino circuit acts as an interface between the software part and the hardware part of the project. Arduino had used the Atmel Atmega AVR series of chips, specifically the ATmega8, ATmega168, ATmega328, ATmega1280, and ATmega2560. [6]

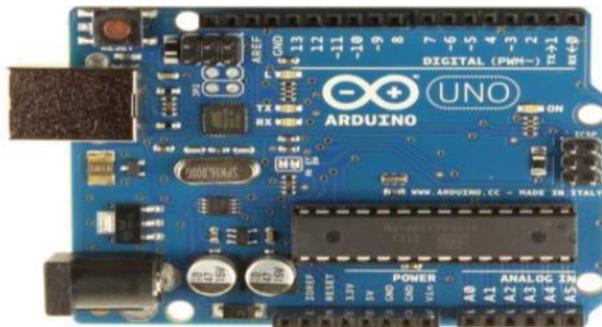


Figure 4: Arduino Uno Module

### D. 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. The electric motor is used to power hundreds of devices we use in everyday life. An example of small motor applications includes motors used in automobiles, robot, hand power tools and food blenders. Micro-machines are electric machines with parts the size of red blood cells and find many applications in medicine.

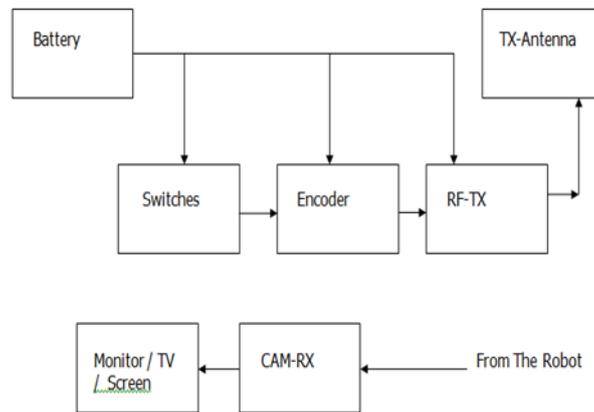
The DC motors are connected to the L293D IC through pins 3 and 6 and another motor through pins 11 and 14. The input pins are connected to the Arduino board. The Figure shown below is the Proteus implementation of connection of Arduino with L293D along with the motor interfacing for driving the robot. [1]

## 3. BLOCK DIAGRAM

In this robot, there is two section one is transmission section and another one is receiver section.

### 3.1. Block Diagram of Transmitter Section

The below figure shows the block diagram of transmitter section which is consists of switches, encoders, RF-Module, Camera, monitor/screen.



**Figure 3.1: Block Diagram of Transmitter Section**

a. Power Supply: Here Arduino Uno board, battery, motor driver required 12V power supply connected with BATTERY, RF RECEIVER, LED indicators, sensors and control circuit operates with DC 5V. AC ripples reducer circuit provides to obtain pure DC from pulsating DC.

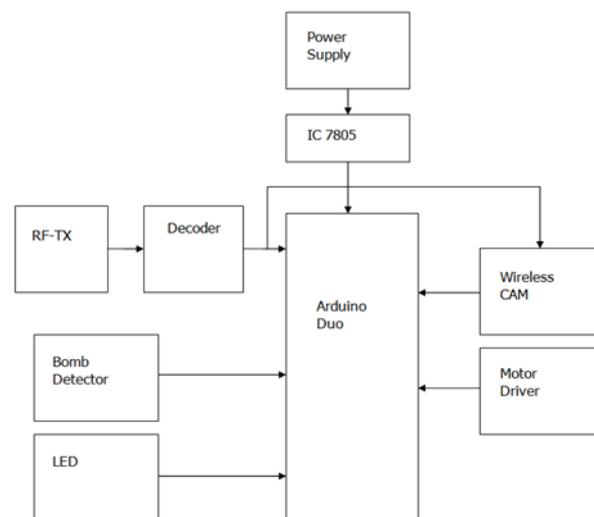
b. Parallel To Serial Encoder: Input is 4-bit parallel BCD number (connected with switches). It cannot transmit over long distance directly, hence converted in to serial using parallel to serial encoder circuit. The serially converted 4-bit BCD is transmitted by using radio frequency module. It can transmit data up to 250 meters in open space.

c. RF Frequency Modules: There are various types of RF modules available in the market like 315MHz, 433MHz; 668MHz from free frequency band, having maximum communication distance is 250mtrs. We can use any of them.

d. Camera RX: We used here camera receiver to receive transmitted video by a camera on the robot. The receiver required 9V DC and can be connected to the TV directly. For monitor TV tuner card required to convert the video signals in to monitor.

### 3.2. Block Diagram of Receiver Section

The below figure shows the block diagram of Receiver section which is consists of main processor Arduino Uno, Bomb Detector, Wireless camera, Motor Drivers.



**Figure 3.2: Block Diagram of Receiver Section**

a. RF Receiver: We required using same frequency receiver module as used in transmitter remote(it can be 433MHz/315MHz/668MHz). The received signal is decoded by RF module itself and gives serial output for the serial to the parallel decoder circuit. This circuit can decode serial data into parallel format (original format as in transmitter). Now that output is given to the Arduino, depends upon programming conditions, Arduino board drives motor driver and motor driver to the motors.

b. Motor Driver: Arduino board/ Microcontroller has very low current output it cannot drive current consuming sources, such as motor hence separate motor driver circuit required.

We can implement this circuit using related motor driver module or IC. Notification LED can directly drive with a current limiting resistor. LED indicators connected to which operation is working now, as like LED 1 for forward, LED 2 for reverse and so on. As our programming conditions system requires providing data by transmitter circuit and received at receiver end can operate the robot.

c. Sensors: Here we are using metal detector operates with metal detection from maximum 3-4 inch distance, connected with analog input pins of Arduino Uno board, according to programming Arduino peeps the buzzer. For RF received signal robot operate forward, reverse, left turn, right turn movements according to programming conditions.

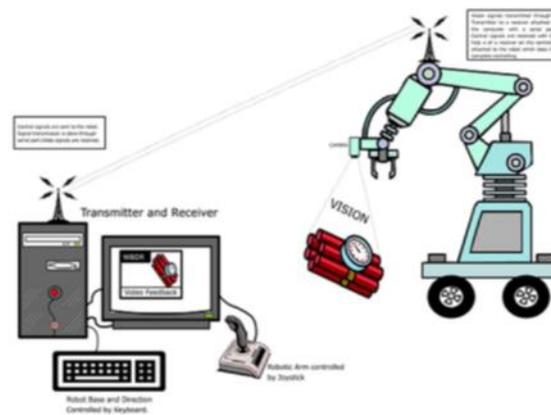


Figure 3.3: Robot Design

#### 4. APPLICATIONS [1]

We have designed a robot for the disposal of the bomb but there are a number of other applications of this robot. It can be used by:

- Military operations.
- Surveillance along the border.
- Search and Rescue Operation.
- Maneuvering in a hazardous environment.
- Fire: To provide video feedback on the site for analysis.

#### 5. CONCLUSION

The primary need for our paper would be accuracy. We have been able to view the things accurately that is currently happening in the surrounding area. Our design has not caused any sort of disturbances. The robot will move depending on the motor direction based upon the input we give through command by remote section unit. It displays the current operation is going on as example left robot, near to object, clear up. With the help of the camera, we are able to view the things that are happening in the surrounding area where the robot is hidden. By keeping the circuit easy and simple, most users will be able to use it easily.

By using this technology we can detect the bomb as early as possible and beings dismantle it easily so that we can easily save the life of the human.

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