International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 05 Issue: 08 | Aug - 2021 ISSN: 2582-3930

BOMB DISPOSAL ROBOT

A.PAVAN KUMAR, G.KARTHIK, N.LALITH, P.PRUDHVI, Undergraduate students

DR. P.A.NAGESWARA RAO, M.E, PHD, Associate Professor,

Department of ECE, GVP College for Degree and PG Courses,Visakhapatnam-45

Abstract -This project is very beneficial in areas where there is high risk for humans to enter. This system makes use of robotic arm as well as robotic vehicle which helps not only to enter an area involving high risk but also to pick whatever object it wants to. The system also includes night camera which will not only allow viewing whatever will be recorded in Day time but also during night. The whole system is controlled via Bluetooth. The system is set to control the movement of vehicle. In order to set the system in a Mode that operates the arm. At first the user needs to press the push buttons for moving the vehicle in whichever direction it wants i.e. forward, backward, right or left direction.

***Key Words*:** Robotics, ESP32 Microcontroller, Servo motor, power Module, Blynk, Bluetooth, Arduino

1. INTRODUCTION

The project has been designed keeping in view the current law and order situation in India and throughout the world. Everyday hundreds of trained personnel are either injured or losetheir lives while defusing bombs. This can be reviewed by the countless number of news items appearing daily in newspapers around the world. These include the TOI of 19th JAN 2010 [1].

Although the idea of our project is original, a number of projects with similar functionalities can be found. For Example the British Police have a bomb disposal robot, the Israeli Army has it and it is also being used by bomb disposal squads and a number of states of USA. The main idea of this robot is to provide the bomb disposal squad with safety and security from the risks that they face every day. The bomb disposal squads of Pune have metal detectors and other equipment for bomb detection and disposal, but they have to risk their lives by approaching the bomb or the suspicious packet without any safety and precautions.

Our robot provides an extra layer of protection to the bomb disposal squad by allowing them to check and analyze a suspicious packet before actually approaching it for disposal. Mobile robots reduce or eliminate a bomb technician's time-on-target. A robot takes risk out of potentially deadly scenarios and lets the bomb technician focus on what to do to an explosive device rather than on the immediate danger to life and limb. Even if a robot cannot reach an item for disruption, it can still be used to relay information to aid in tool and procedure selection to moving downrange. In addition, events recorded by a robot's camera can provide evidence for further analysis.

With excessive energy usage, the smart energy metre causes environmental problems and shortens its lifespan. Life expectancy (LE), genetics (GE), environment factors (EF), change over time (CT), and restricted longevity are all element that determine a smart meter's lifespan (LL).[1]

2. Purpose work

The rover consists of two arms one of them is used to hold the wire and another one is used to dispose of the bomb. It also contains a camera mounting mechanism that has a free moment up to 360 degrees in the vertical and horizontal directions.

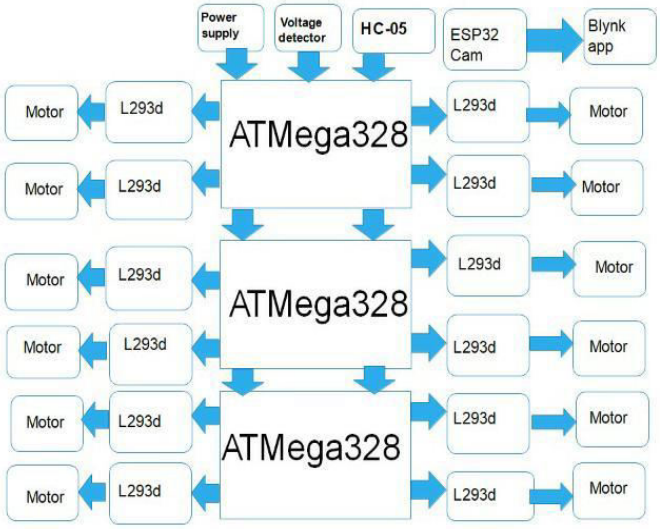

Fig 1: Block Diagram of Robotic ARM

3. ESP32 Microcontroller

The ESP32 is dual core; this means it has 2 processors. It has Wi-Fi and Bluetooth built-in. It runs 32-bit programs. The clock frequency can go up to 240MHz and it has a 512 kB RAM. This particular board has 40 pins, 20 in each row. It also has wide variety of peripherals available, like: capacitive touch, ADCs, DACs, UART, SPI, I2C and much more. It comes with built-in Hall Effect sensor and built-in temperature sensor.

ESP32 is a highly-integrated solution for Wi-Fi-and-Bluetooth IoT applications, with around 20 external components. ESP32 integrates an antenna switch, RF balun, power amplifier, low-noise receive amplifier, filters, and power management modules. As such, the entire solution occupies minimal Printed Circuit Board (PCB) area.

ESP32 has 34 GPIO pins which can be assigned various functions by programming the appropriate registers. There are several kinds of GPIOs: digital-only, analog-enabled, capacitive-touch-enabled, etc.

The Pulse Width Modulation (PWM) controller can be used for driving digital motors and smart lights. The controller

consists of PWM timers, the PWM operator and a dedicated capture sub-module. Each timer provides timing in synchronous or independent form, and each PWM operator generates a waveform for one PWM channel. The dedicated capture sub-module can accurately capture events with external timing.

The LED PWM controller can generate 16 independent channels of digital waveforms with configurable periods and duties.
The 16 channels of digital waveforms operate with an APB clock of 80 MHz Eight of these channels have the option of using the 8 MHz oscillator clock. Each channel can select a 20-bit timer with configurable counting range, while its accuracy of duty can be up to 16 bits within a 1 msec period. The software can change the duty immediately.
Moreover, each channel automatically supports step-by-step duty increase or decrease, which is useful for the LED RGB color-gradient generator.

4. Servo Motor

Most of the hobby Servo motors operates from 4.8V to 6.5V, the higher the voltage higher the torque we can achieve, but most commonly they are operated at +5V. Almost all hobby servo motors can rotate only from 0° to 180° due to their gear arrangement so to make sure our project can live with the half circle. If no, we can prefer for a 0° to 360° motor or modify the motor to make a full circle.
To make the motor rotate, we have to power the motor with +5V using the Red and Brown wire and send PWM signals to the orange color wire. Hence, we need something that could generate PWM signals to make this motor work, this something could be Microcontroller,555 Timers and many more

Fig 2: Servo Motor Wiring's

5. Power Module (HLK-PM01)

The **HLK-PM01** is commonly used in places where a microcontroller circuit has to be powered directly from AC mains. Most digital circuits operate at a voltage of 5V, this module can **convert the AC mains to 5V** with an efficiency of 70%.

The **HLK-PM01** is a small size low-cost **AC to DC converter** which can take in 110V/220V AC at 50/60 Hz and give 5V,3W output.

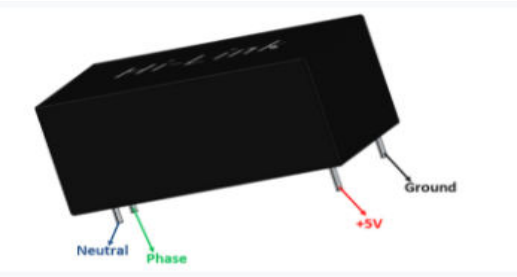

Figure 3: Pin layout of PM01

Pin Number	Pin Name	Description
1	AC	Connect to the Phase/Live terminal
2	AC	Connect to the Neutral terminal
3	-Vo	Output negative voltage here ground
4	+Vo	Outputs +5V regulated voltage

Table 1: Pin description of PM01

ATMEGA328:

●32K bytes of in-system self-programmable flash program memory
●The ATmega328 is a single-chip microcontroller created by Atmel in the Mega AVR family (later Microchip Technology acquired Atmel in 2016). It has a modified Harvard architecture 8-bit RISC processor core.
●1Kbytes EEPROM
●2Kbytes internal SRA
●Two 8-bit timer/Counters with Separate Prescaler and compare mode
●One 16-bit timer/Counter with separate Prescaler, compare mode, and capture mode
●Real-time Counter with separate oscillator
●Six PWM channels
●8-channel 10-bit ADC in TQFP and QFN/MLF package
●Programmable serial UART
●Master/slave SPI serial interface

L293D

There are two enable pins on L293D. Pin 1 (left H-bridge) and pin 9 (right H-bridge). To drive the corresponding motor, pin 1 or pin9 is need be set to HIGH. If either pin1 or pin9 goes low then the motor in the corresponding section will suspend the working.
The four input pins for the L293D are pin 2 and pin 7 on the left and pin 155 and pin 10 on the right as shown on the pin diagram. Left input INS will regulate the rotation of the motor connected on the left side and right input for motor on the right hand side.

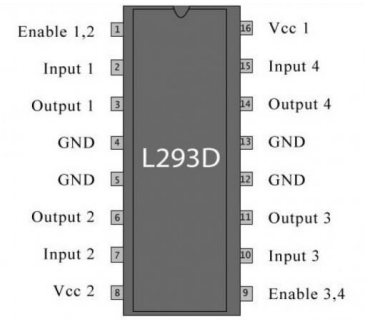

Fig 4: L293D Pin Diagram

HC-05 Bluetooth Module

HC-05 is a Bluetooth module which is designed for wireless communication. This module can be used in a master or slave configuration.
Bluetooth serial modules allow all serial enabled devices to communicate with each other using Bluetooth.
It has 6 pins,

1. **Key/EN:** It is used to bring Bluetooth module in AT commands mode. If Key/EN pin is set to high, then this module will work in command mode. Otherwise by default it is in data mode. The default baud rate of HC-05 in command mode is 38400bps and 9600 in data mode.

HC-05 module has two modes,

1. **Data mode:** Exchange of data between devices.
2. **Command mode:** It uses AT commands which are used to change setting of HC-05. To send these commands to module serial (USART) port is used.

2. **VCC:** Connect 5 V or 3.3 V to this Pin.
3. **GND:** Ground Pin of module.
4. **TXD:** Transmit Serial data (wirelessly received data by Bluetooth module transmitted out serially on TXD pin)
5. **RXD:** Receive data serially (received data will be transmitted wirelessly by Bluetooth module).
6. **State:** It tells whether module is connected or not.

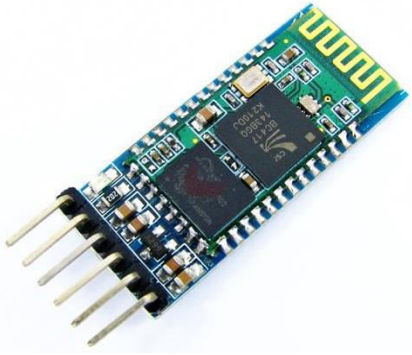

Fig 5: HC-05 Bluetooth Module\

DC Gear motor:

DC Motor – 60RPM – 12Volts geared motors are generally a simple DC motor with a gearbox attached to it. This can be used in all-terrain robots and variety of robotic applications. These motors have a 3 mm threaded drill hole in the middle of the shaft thus making it simple to connect it to the wheels or any other mechanical assembly.

Specifications and Features:-

- RPM: 60.
- Operating Voltage: 12V DC
- Gearbox: Attached Plastic (spur)Gearbox
- Shaft diameter: 6mm with internal hole
- Torque: 2 kg-cm
- No-load current = 60 mA(Max)
- Load current = 300 mA(Max).

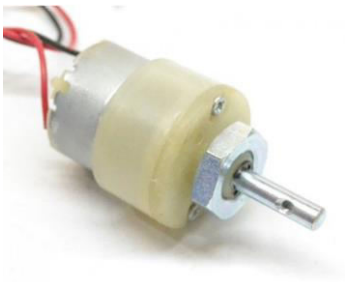

Fig 6: Dc Gear Motor 60Rpm

6. Design & Results

The ESP32 and the ATmega328 can communicate with each other by using the Serial communication.
The master controller is the ESP32 and the slave controller is the ATmega328 so the data from the Blynk app is shown in figure [9] is sent to the ESP32 using the BLYNK HTTP connection, and further, the data is sent to the ATmega 328 using the serial communication and according to the data sent to the ATmega328 the Atmega328 will send signals to the servo motor to control the fist. The configured input in the app to control the fist is shown in the flowchart in the figure [7] The data to control the base of the robot is sent via Bluetooth app as shown in the figure [10] is directly to the HC-05 Bluetooth module which forwards it to the

slave controller ATmega 328. According to the data sent via Bluetooth app, the Atmega328 will generate signals to control the robot base structure to move in the proportional direction that is configured in the app. The configured inputs in the app is shown in the flown chat in the figure [8]

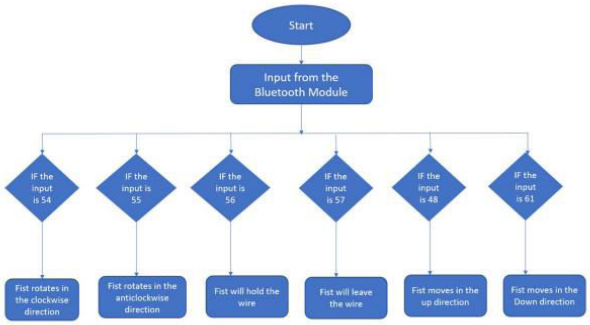

Fig 7: Robotic fist control flowchart

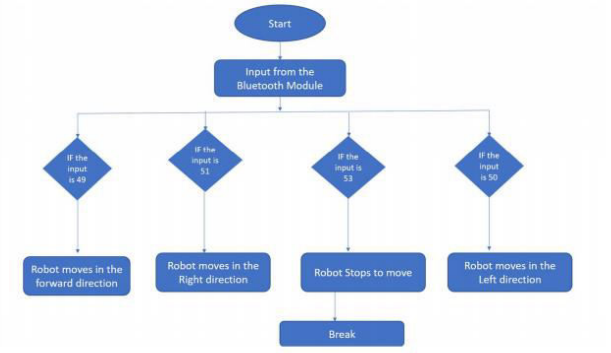

Fig 8: Robotic base control flowchart

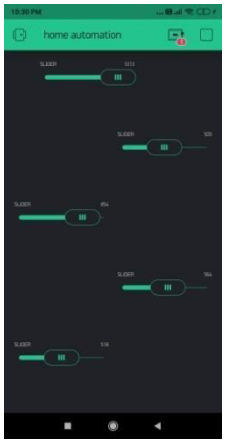

Fig 9: Blynk app

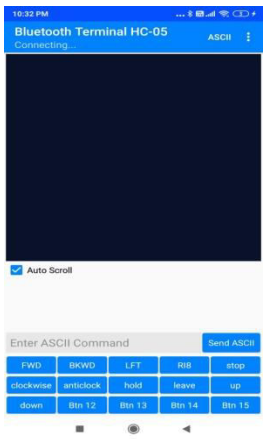

Fig 10: Bluetooth control app

RESULT:

Fig 11: Front View

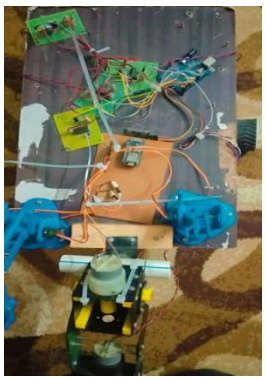

Figure 12:Top View Figure 13:Side View

7. CONCLUSIONS

The Wireless Bomb Disposal Robot has been designed in such a way that it can cater to the needs of the bomb disposal squad, the military, the police, and also the personnel who handle radioactive materials. It has countless applications and can be used in different environments and scenarios. For instance, at one place it can be used by the bomb disposal squad, while at another instance it can be used for handling mines. While another application can be to provide up-to-date information in a hostage situation.

REFERENCES

1. HongKai Li, ZhenDong Dai, “A semiautonomous sprawl robot based on remote wireless control”, IEEE International Conference on Robotics and Biomimetic (ROBIO), 2010.
2. S. Tadokoro, “Special project on development of advanced robots for disaster response (DDT Project)”, Proceedings of IEEE Workshop on Advanced Robotics and its Social Impacts (ARSO’05), 2005.
3. Dongseok, Ryu, Chang-Soon, Hwang. &Sungchul, Kang , “Wearable haptic-based multi-modal teleoperation of field mobile manipulator for explosive ordnance disposal”, Proceedings of the 2005 IEEE International Workshop on Safety, Security and Rescue Robotics, 2005.