

“Wireless Bomb Disposal and Spying Robot”

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Abstract — Bomb disposal and spying robot has been developed to dispose of the bomb wirelessly from a safe distance with the help of an expert. The whole operation of disposing the bomb is based on the robotic arm that is mounted on the top of the chassis. A V380 Wi-Fi camera is used with the help of which the expert can get the live feedback in the faraway distance on his laptop. The main objective of this project is to save human lives, and give an extra layer of safety to the expert. Our Robot functions accordingly to the input given via the transmitter. We have used NRF24L01 as transmitter as well as Receiver module. Here L293D motor driver IC which will eventually drive the motor attached to the robot.

Keywords—Disposal, Spying, safety, military, robotic arm, web camera, technology used, bomb disposal.

I. INTRODUCTION:

We humans are becoming more and more dependent on robots and machines. The reason behind the increasing use of these robots and machine is that they can replace humans in those areas where the tasks are bit critical and which have a risk to human life. The basic idea behind our project is to make a robot which can dispose a bomb which can be controlled by the expert as well as in supervision of expert from faraway distance and bomb can be carried by robotic arm of robot and can be disposed at a place which is faraway from human population and in this way so many lives of the people can be saved. The robot is controlled by the Control module and in our case it is laptop connected and the Robot is given instruction and accordingly it will dispose the bomb and it will also give the live feedback from the night vision camera.



Figure 1. Wireless Web Camera

II. VIDEO INTERFACING USING WIRELESS VIDEO CAMERA:

A wireless video camera V380 that supports night vision as well for better surveillance is used, the camera module supports audio/video transmitter as well and the receiver module is interfaced with the control module using a GUI interface and the live audio/video feedback from this camera is received by tuning the receiver to the particular frequency and the LCD is connected to the trans receiver module from the AV port in the receiver and thus live feedback can be viewed by the bomb disposal expert in the LCD display which is the laptop here.

III. IMPLEMENTATION:

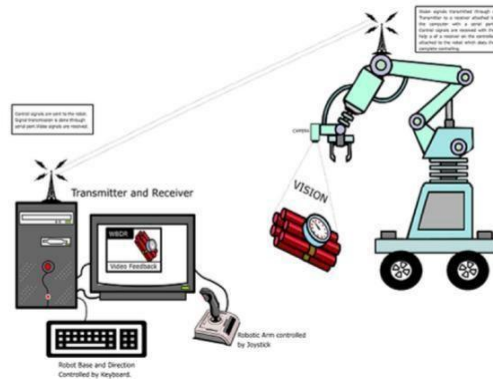


Figure 2: Proper Robot Design

In the transmitter side, an Arduino nano is connected with nrf transmitter module to the pc and at the receiver side an Arduino Uno is connected with nrf receiver module to the robotic model. The robotic model is controlled by the nrf module from the pc by using GUI control mechanism. A wireless video camera that supports night vision as well for better surveillance is installed on the chassis besides robotic arm at the receiver end. The camera module can record audio as well as video and it can also give the live feedback. Our whole project is based on master and slave concept and here the transmitter side act as the master and the receiver side act as the slave.

IV. TECHNOLOGY USED:

NRF24L01

NRF24L01 is manufactured by Nordic Semiconductor. It works at the 2.4 GHz frequency range and has a high on air data rate of up to 1- 2 Mbps and comes with an on board antenna for best performance maintaining a small size factor. As it is one the cheapest and easiest module to do wireless communication using Arduino, Raspberry Pi and other micro controllers. Libraries and sample codes are available for Arduino and Raspberry Pi which will make it easier for the user to start using the wireless module. It is used to do bidirectional communication between devices. It has a standard SPI interface,

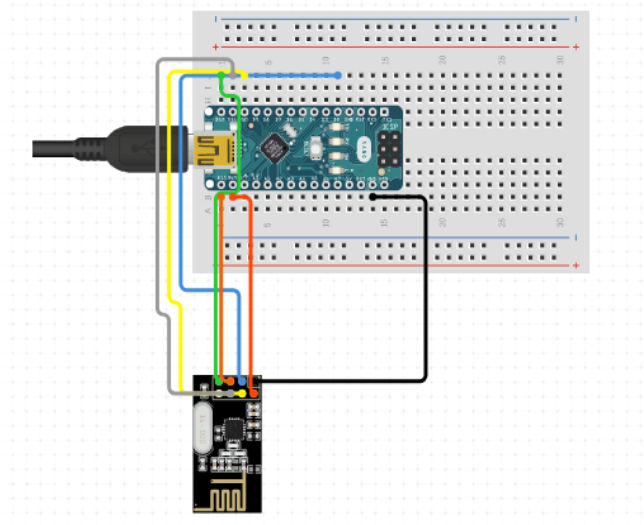


Figure 3: NRF24L01 as Transmitter

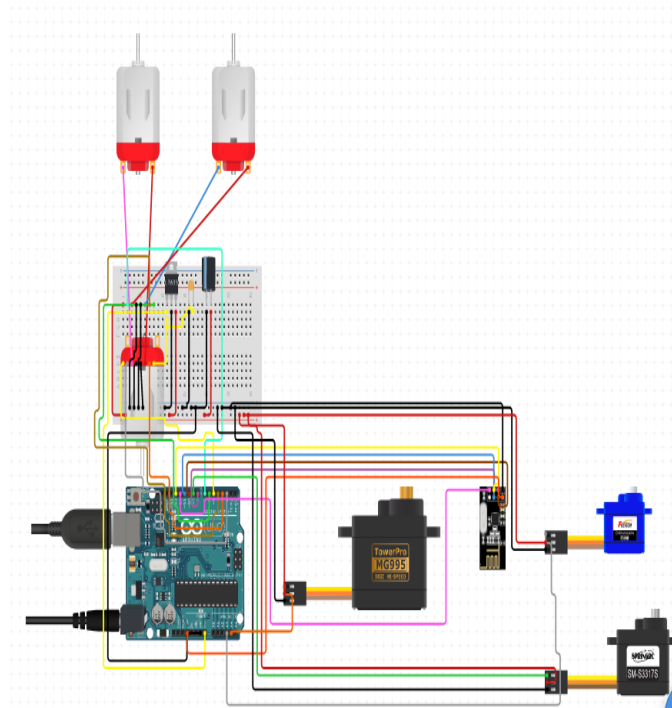


Figure 4: NRF24L01 as Receiver

Which means user can directly interface this module to any microcontroller without the need for any external circuit. Our RF transceiver is perfect for making wireless robots, home automation, wireless transmission of audio and video, etc. NRF24L01 is generally used in industrial devices and projects for data transmission. This Module is mostly used in computer, toys, remote control, games, and other electronic devices.

i. ARDUINO UNO

It contains everything needed to support the microcontroller along with 14 digital input/output pins; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. It is different from all preceding boards because in that it does not use the FTDI USB-to-serial driver chip. We have to connect it to a computer using a USB cable or power it with an AC-to-DC (7-12v) adapter. Arduino uses the Atmel ATmega AVR series of chips, specifically the ATmega8, ATmega168, ATmega328, ATmega1280, and ATmega 2560.

ii. L293D MOTOR DRIVER IC

L293D motor driver is used to provide bidirectional drive current of up to 600-mA at voltages from 4.5 V to 36 V. 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 can be obtained by both the devices 1,2 EN and drivers 3 and 4 enabled by 3,4 EN. When the outputs are active and in phase with their inputs when the input is high and when the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. A full-H (or bridge) reversible drive suitable for solenoid or motor applications with the proper data inputs are formed by each pair of drivers.

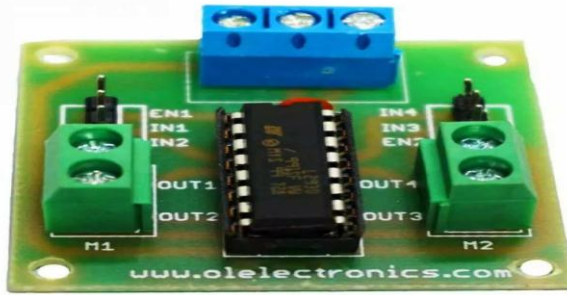


Figure 5: L293D MOTOR DRIVER MODULE

iii. SERVO MOTOR

Servo motor is an electrical device which can push or rotate an object with great precision. We want to rotate an object at some specific angle or distance, that's why we use servo motor. This is made up of simple motor which run through servo mechanism. If motor used is DC powered then it is called DC servo motor, and if it is AC powered motor then it is called AC servo motor. We get a very high torque servo motor in a small and light weight packages. Due to these characteristics they are being used in many applications like toy car, RC helicopters and planes, Robotics, Machine etc.



Figure 6: SERVO MOTOR

V. CONCEPT OF ROBOTIC ARCHITECTURE:

Our Robotic arm is a type of mechanical arm, which is programmable, with similar functions to a human arm. An Arduino microcontroller is used to control the disposal mechanism of the robotic arm..Robotic Arm is mostly mechanical and it is also called as kinematic chain. The arm is formed of links and joints which allows one or more degrees of freedom. Our model is a three degree of freedom robotic arm.We have used Servo Motor to control the robotic arm and due to these Servo motors, the speed of our Robotic Arm increases and thus the overall efficiency of the arm increases. Robotic Arm consists of mechanical grippers which consists of two fingers which can open and close to pick up small objects. Our robotic arm mimics the human arm and thus the main advantage of using the robotic arm is the enhanced security of the expert and thus help in saving the human life and also provide a cost effective solution.

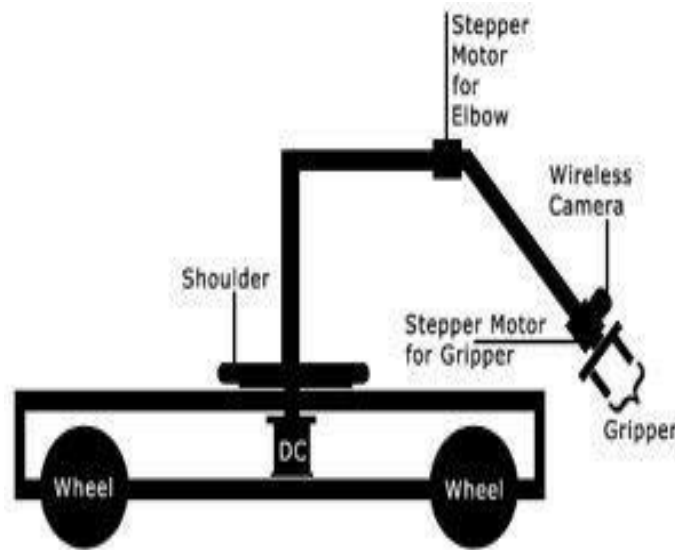


Figure 7: ROBOTIC ARCHITECTURE

WORKING

The Chassis is installed with the NRF24L01 module for wireless communication between master and slave, dc motors, night vision camera, robotic arm. On the transmitter end we have a pc which is interfaced with the NRF24L01 through Arduino Nano. NRF24L01 transmitter module is used as Arduino Uno. The Robotic chassis is used as a slave and it is controlled by the master i.e. PC. The expert uses the PC to control the slave. L293D motor driver IC will drive the motor attached to the robot. Wireless camera is used for audio/video recording and This robotic model can be used to lift the bomb packet.

APPLICATION

1. We have designed it as an assistant robot to the bomb disposal squad but there are a number of other applications of this robot. It can be used by Police In hostage situations as a spying robot.
2. Military: For reconnaissance missions.
3. Fire: To provide video feedback of the site for analysis.

CONCLUSION

It determines the signal which is transmitted and according to that control robot in forward, backward, left turn, right turn movements. 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 for 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. The camera detects the exact location of the robot. In this manner our project plays a crucial role in Military as well as in our Police department.

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