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Wireless Military Bomb Disposal Robot

R.Shankar[1], Abinav.R[2], Ashik.S[3], Sudesh Kumar.N.M[4], Rajasekar.K[5], P. John Major[6]
[1]Associate Professor, [2,3,4,5,6]UG Student, Department of Electronics and Communication Engineering,
Sri Manakula Vinayagar Engineering College, Puducherry

Abstract: Nowadays bomb disposal and diffusing has become a very critical and hazardous method to human's life, In order to overcome from this we are going to introduce a concept based on wireless bomb disposal robot. In this the bomb is disposed using the robot which will be controlled through the wireless control module .The control module consist of a transmitter and the Actual Robot consists of the receiver module .The receiver module is said to interfaced with an ARDUINO UNO R3 board .The Robot functions accordingly to the input given via the transmitter .The control module contains a LCD display which is interfaced with a wireless video receiver which receives video signal from the wireless camera. The wireless camera is said to be placed in the robot near the arm which houses the center shaft motors used for the actual diffusion purpose so that the video captured can be viewed in the LCD display which is placed in the control module. When the robot goes near the bomb, based on the input given from the control module the bomb can be diffused and disposed using the robotic arm.
Keywords: Control module, bomb detection, robotic arm, lcd display,

I. INTRODUCTION

For many years, humans have been the core motivation for the development of robot system. It surely had many challenges and limitations with the robotic researches that had taken place thus far. Many efforts have been taken for the development of robots to be used as a replacement for humans to do tasks that are a bit critical and risky to human life who have been constantly exposed to methods like bomb disposing, machine cuttings ,etc. Our basic idea is to provide a robot that can be used for bomb diffusion and disposal where it can be controlled from a distance by a bomb disposal expert so that the bomb is carried by the robotic arm by the robot and disposed at a place which is out of the danger zone, away from human population. The robot is controlled by the control module wirelessly and is used for cutting the wires in the bomb and 3 DC motors 10rpm video feedback is viewed live using a wireless camera that supports night vision as well and the bomb can be diffused as well as disposed. In case of any mishap only the robot gets damaged and human life can be saved using this robot and thus this technology is safe and can be well implemented. The main objective of the control module is to control the robot wirelessly.

The control module consists of a 7 inch LCD display which is used to view the video captured from the wireless camera. The bomb disposal controller can be used to control the robot up to a range of 100 meters for disposing and diffusing the bomb. The control module also consists of the board which houses the Switches and joystick based controller to control the robot wirelessly, which is done by interfacing these switches to the ATMEGA8 IC. The control module consists of a transmitter which is used to transmit the input function to receiver which is placed in the robot .

The transmitter consists of a ATMEL 328 microcontroller which is programmed and when the inputs from the switches are received via the corresponding pins from the ATMEGA8 IC are given to the transmitter which transmits the input to receiver and the robot is said to function accordingly. The robots base consists of six geared 200RPM DC motors of 40kg torque. The arm is placed in the mid-section of the robot and shaft motors and 40 kg torque is used for arm movement. This concept of bomb disposal robot can be used to dispose of bombs like the Basic pipe bomb and landmines which are both fatal if disposed ineffectively.

A pipe bomb is an improvised explosive device, which uses a tightly sealed section of pipe filled with an explosive material. The containment provided by the pipe means that simple low explosives can be used to produce a relatively large explosion, and the fragmentation of the pipe itself creates potentially lethal shrapnel. This Bomb disposal robot can also be used to dispose of landmines which can be fatal if dealt with by humans.

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Fig 1:

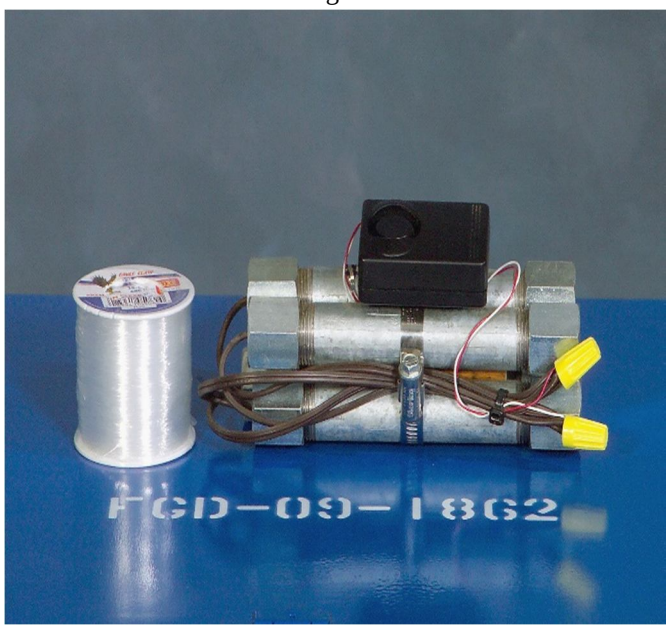


Fig 2:

II. ROBOT DESIGN

The robot consists of the following modules, which influence the behavior of the system (robot) namely the base part, the robotic arm part and video feedback part. The Base part consists of six DC motors of 200 RPM and 40kg torque with one DC motor attached to every wheel on the robotic base and 10 RPM DC motors used for movement of the robotic arm. The Robotic arm consists of two 10 RPM DC motors, which are used for the elbow and gripper movements. The video feedback part consists of the wireless video camera that supports night vision as well for better surveillance, this wireless camera is attached near to the center shaft motors used for the actual diffusion and disposal purpose , the camera is placed close to the robotic arm to improve the quality of the video signal and maintain a steady feedback output for the bomb disposal expert to dispose of the bomb by controlling the

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arm accordingly with the simultaneous video output viewed in the display.

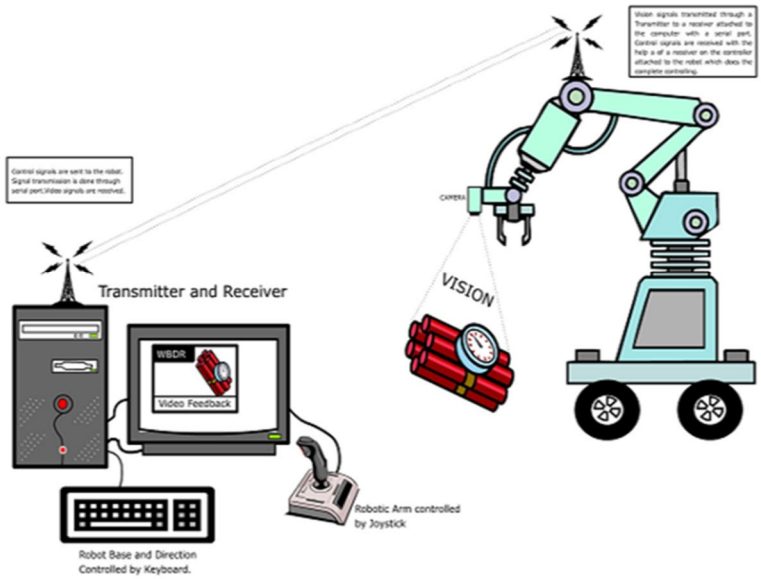


Fig 3:

III. CONTROL MODULE DESIGN

The robot is controlled by the control module wirelessly and video feedback is viewed live using a wireless camera that supports night vision as well and the bomb can be diffused as well as disposed. In case of any mishap only the robot gets damaged and human life can be saved using this robot and thus this technology is safe and can be well implemented. The main objective of the control module is to control the robot wirelessly. The control module consists of a 7 inch LCD display which is used to view the video captured from the wireless camera. The bomb disposal controller can be used to control the robot upto a range of 100 meters for disposing and diffusing the bomb. The control module also consists of the board which houses the Switches and joystick based controller to control the robot wirelessly, which is done by interfacing these switches to the ATMEGA8 IC. The control module consists of a transmitter which is used to transmit the input function to receiver which is placed in the robot .The transmitter consists of a ATMEL 328 microcontroller which is programmed and when the inputs from the switches are received via the corresponding pins from the ATMEGA8 IC are given to the transmitter which transmits the input to receiver and the robot is said to function accordingly.



Fig 4:

Further the PCB design for the switches and the joystick controller using the ATMEGA8 IC chip are as follows further this interfaced module is connected to the transmitter section which will transmit the actual inputs from these physical switches interfaced using this design board.

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The next few images gives a clear outcome of the PCB design used for the transmitter part which is interfaced using the ATMEGA8 IC. The modules are divided into two and connected using wires, the joystick module and the individual switches to control the robotic arm movements, one IC is interfaced with the joystick controls and another IC is interfaced with the arm movement motor switches , they are interfaced together and then interfaced with the long range transmitter that transmits the inputs received via the physical swithches.

The receiver receives the signal and the receiver uses ULN2003 IC which is interfaced with the motor driver circuit. This circuit includes the relay and a few other components which provides control for the motors in the robot.

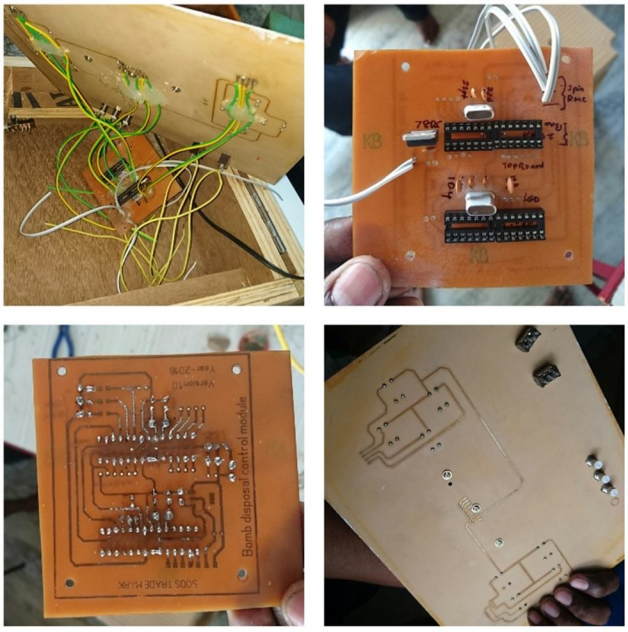


Fig 5:

IV. VIDEO INTERFACING USING WIRELESS VIDEO CAMERA



Fig 6:

A wireless video camera that supports night vision as well for better surveillance is used, the camera module supports a video transmitter as well and the receiver module is interfaced with the control module using a LCD display and the live video feedback from this camera is received by tuning the receiver to the particular frequency and the LCD is connected to the 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. Wireless A/V camera high receive sensitivity +18dB,Receive signal picture sound 0.9G/1.2G.with high quality output . RM0100 is a Wireless A/V camera high receives sensitivity +18dB, Receive signal picture sound 0.9G/1.2G.with high quality output. The

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RM0100 is a 2.4Ghz wireless camera works at ISM band. It may cause interferences with other wireless equipment that operates at the same band.

The Camera Transmitter with Receiver Set suitable for monitoring the robot, children and elders, and widely used for theft prevention, after-hours surveillance, home security, for household, companies, shops, factories, security CCTV system kit. You can view the cameras on your TV or record directly to VCR. The Wireless Camera and Receiver will provide a day and night monitoring solution with the convenience of wireless technology. RM0100 wireless camera meets wireless frequency security standards and recommends indexes while working. These standards and indexes are certificated by academic organization and represent the cogitative research of the scientific workers who continuously explore and annotate the involved fields.

V. ARM CONCEPT

The robotic arm consists of two center shaft motors and two 10rpm dc motors. The center shaft motor is mainly used for cutting purposes in the process of bomb diffusion. The two 10 rpm motors are used for elbow and gripper movements. Furthermore since there are different types of bombs available in different sizes and different dimensions using one particular concept for the gripper can be obsolete, we will be integrating a different concept similar to that of a holder for the robotic gripper arm that can house different types of holders / cutters to efficiently diffuse as well as dispose of different types of bombs.



Fig 7:

VI. METAL DETECTOR

The metal detector mainly uses a digital transmitter and receiver. When our search coil passes through the metal then the digital signals of certain amplitude breaks through the peak detector. Since these are ion audio range they are sent to the headphones .On further testing in air the sensitivity with optimum tuning and by using a 25mm brass coin it produces a clear signal at 150mm and screaming signal at 110mm. It also be able to detect the pin at 30mm. The metal detector circuit contains a transmitter coil (t) and receiver coil (r).the transmitter coil (t) is driven by square wave oscillator which is set up by an alternating magnetic field . The receiver coil is positioned by which it overlaps the transmitter coil (t).By adjusting the overlap a point is found where the voltage in receiver coil (r) is said to be null by which no output is said to be produced .a metal object which enters the field causes an imbalance results in a signal. This circuit contains a transmitter (ic1a) in a 555 oscillator configuration using dual low power CMOS ICM7556IPD of the IC.



Fig 8:

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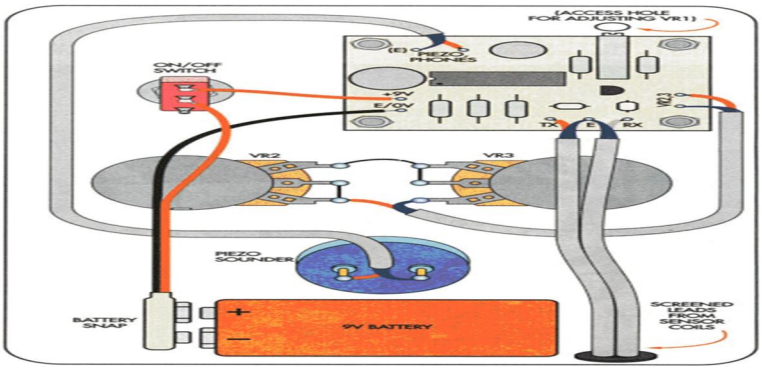


Fig 9:

VII. FUTURE ENHANCEMENT

A. *Compact Design*

A compact design results in a much faster motion and thus increases the accuracy and efficiency. Therefore the robot can be enhanced to be of much smaller size for the purpose of a faster and accurate operation. Compact design is also required where the situation demands the robot to reach for small places. For example, in the aftermath of an earth quake, the robot has to search for people trapped under the rubble. It has to enter holes where humans cannot enter. Hence a compact robot will easily do the job. Quick Movement Being a bomb disposal robot, it requires very fast movement. This is required as the bomb disposal squad have very little time in checking out the bomb and then defusing it. Therefore a fast robot is necessary to be successfully used as a Bomb Disposal Robot.

B. *Image Processing*

Image processing technology to differentiate between one Military outfit to another military outfit can **also** be done in the near future by interfacing the camera o/p to process the digital images for better military surveillance**.**

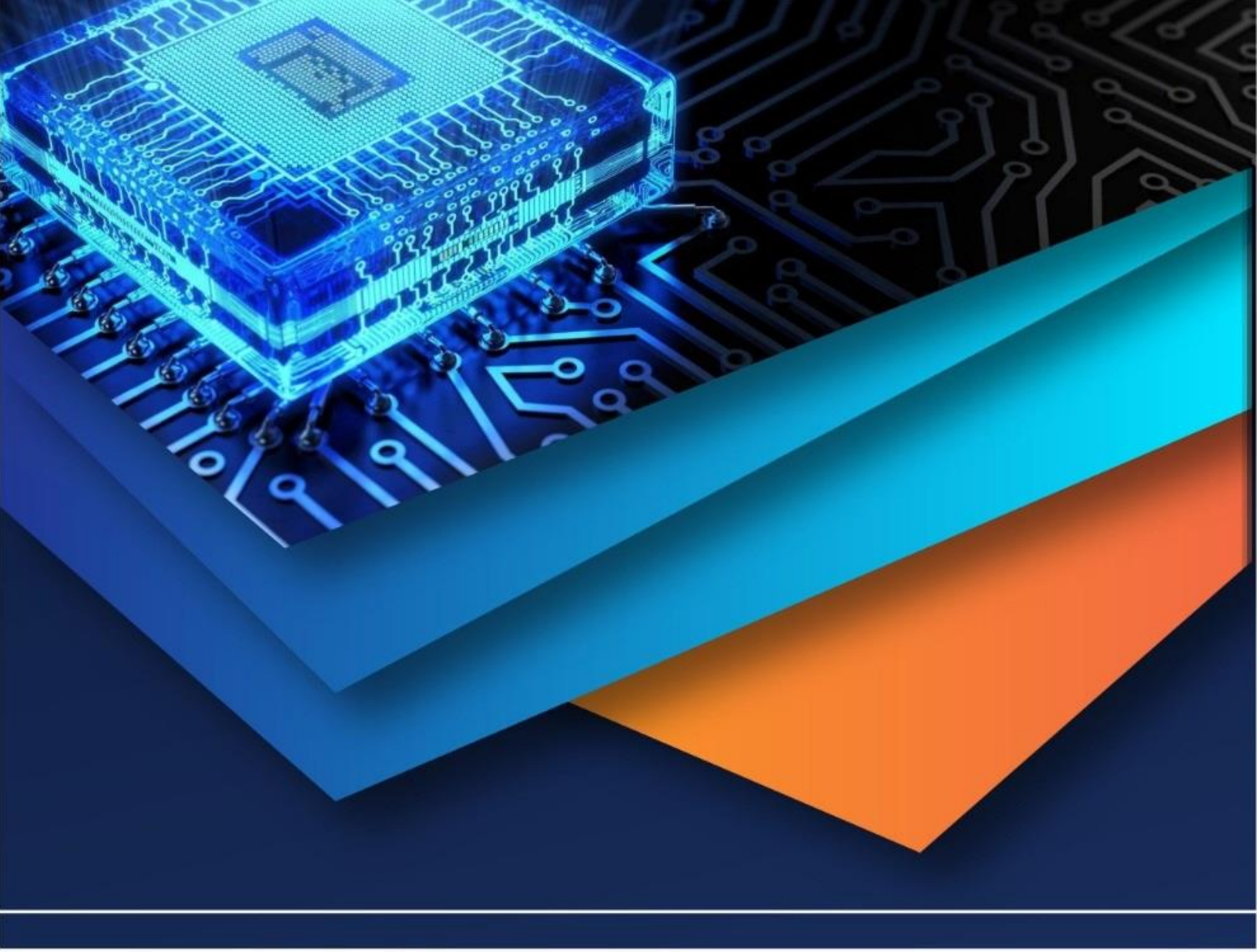
VIII. CONCLUSION

This project is very efficient and low in cost. By using this technology we can detect the bomb as early as possible and dismantle it easily so that we can easily save the life of the human beings

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