

Remotely Controlled Armed Surveillance Rover

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Abstract: A remotely operated ground vehicle was designed and developed for use in counter terrorism and counter-insurgency operations by the Indian Army. The Rover can traverse difficult terrain, extreme slopes, inspect suspicious objects (e.g. improvised explosive devices) with a robotic weapon with a camera (even when hidden under a bridge), and give visual feedback to an operator away at a safe distance of certain range. It can be operated using mobile and can be self-triggered when a command is given. Militaries are now equipped with various types of rovers. Rover for assistance and spy purposes are developing. This project represents an application of Rover in the military. This rover is 4-wheeled developed on a rocker-bogie mechanism. According to recent Rover developments, rovers with rocker-bogie mechanisms can glide on rough surfaces, sand, and loose soil easily. The degree of freedom for the rover is 4 with the ability to rotate 360°. This rover is equipped with frequency hopping which makes it an anti-hack device. This project is useful for attacking the opponents in the war without losing our army officers. So by using this project we can do war without losing human life on our side.

Keywords: Armed Surveillance Rover, Surveillance Rover, Rover, Armed Rover

I. INTRODUCTION

Surveillance means monitoring the operations that should not be able to see with our eyes. Surveillance focuses on individuals, buildings and properties, or vehicles that are insisted to be suspicious on the basis of that they are on the way to illegal or inappropriate operations/activities. Surveillance operations may be done by using the mobile in nature to enhance the visual confirmations.

The main objective of this work is

A. Where Man Can't Afford to go

Rovers have traditionally used to rotate when a man/soldier are not able to go or rescue in a places like hazardous areas, cold places etc..

B. For Rescue Operation

Surveillance rovers are used to rescue people whether they are kidnapped by enemies or terrorists. Surveillance rovers can be used in wars i.e when our army officers went to near the enemies then there will be risk of our army officers life's, so this rover will be sent to that place and operate by sitting in our base station.

II. RELATED WORK

Sharkey realized that the robotic intelligence can be harnessed to manufacture killing objects. This work can be very useful for US military they have created single battle field soldier to operate robots or rovers from somewhere on the ground.

Green, W.E. said that the most of the military operations can be done in urban environments. In this operations has dangerous tasks like bomb detection, search and rescue with robots can save resources and saves the life's of people and soldiers.

Zuberi O., stated that this missions can now range from surveillance to bomb disposal and urban search and rescue operations.

This research can also be danger to the operator where they have been from can be identified by the enemies, it should leads to the danger to their lives.

In this paper we should discuss the development of a surveillance rover with the help of weapon or weapon launcher to rescue operations like counter terrorism or insurgency operations etc..

III. PROBLEM IDENTIFICATION

During this process, certain problems were faced regarding the effective working of the Rovers. The main problem faced was how it will be reload automatically when the bullets or arms will completed in the weapon.

IV. PROPOSED METHODOLOGY

The rover design is based on the weapon used in it and also based on camera. The purpose of this rover will be to reduce the human effort during tense situations like wars, counter terrorism activities etc. The movement of the rover can be explained as follow:

Rover uses servomotor to achieve steering action and DC motor for drive. Arduino boards are able to read the inputs from the operator and performs operations like turning on the Bluetooth module, rotating of motors which are publishing something online. All should be controlled by using an Android app developed by us.

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The block diagram of proposed system is as follows:

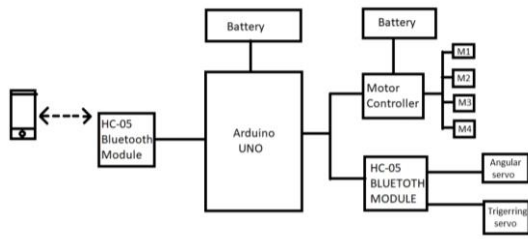


Fig. 1: Block Diagram

Remotely controlled Armed surveillance rover can be operated, firstly we should develop an app interface and then connect to the Bluetooth module i.e HC – 05 which is placed in the project. Then It will interact with Arduino UNO. We have placed two batteries one is power source to the Arduino UNO and other is to the motors. Then we will operate the project by giving command from the app interface. If we want to move the vehicle then motor drivers will move the vehicle i.e it will move vehicle 360 degrees based on the Rocker-Bogie mechanism and then we should move the weapon up to down and down to up from 0 to 90 degrees with the help of Angular Servo Motor and then if we confirm the enemy presence by watching at the live transmission coming from the vehicle which the help of camera fixed in the project, we shoot the enemy with the help of Triggering Servo Motor.

V. HARDWARE SUBSYSTEM DESCRIPTION

A. Arduino UNO

Arduino UNO is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins in 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 contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.



Fig. 2: Arduino UNO

B. At Mega328P Micro Controller

It is the heart of the system which controls all the activities of transmitting and receiving. ATmega328 is an 8-bit, 28-Pin AVR Microcontroller, manufactured by Microchip, follows RISC Architecture and has a flash-type program memory of 32KB. Atmega328 is the microcontroller, used in basic Arduino boards i.e Arduino UNO, Arduino Pro Mini and Arduino Nano. It has an EEPROM memory of 1KB and its SRAM memory is 2KB. It has 8 Pins for ADC operations, which all combine to form PortA (PA0 - PA7). It also has 3 built-in Timers, two of them are 8 Bit timers while the third one is 16-Bit Timer.

The pin diagram of Atmega 328P Micro Controller is given below

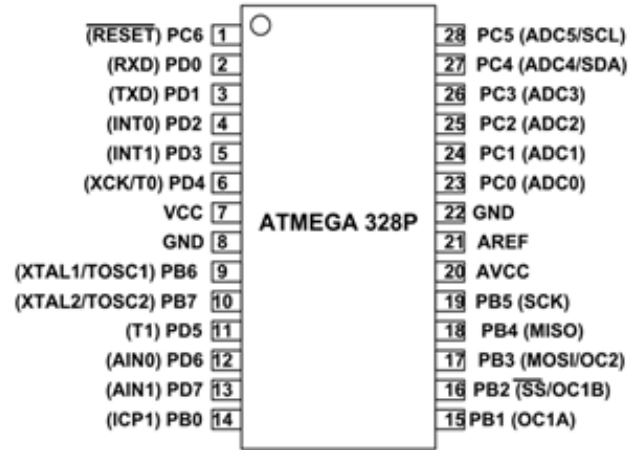


Fig. 3: At mega328P

C. DC Motor

A motor is a electronic device which helps to convert electrical energy into mechanical energy. In this project we have used four Dc motors to run/move the rover in 0 to 360 degrees. Dc motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor. The motor used to run the robot is shown in figure 4



Fig. 4: DC Motor

D. Motor Driver

Motor drivers acts as interface between motors and the control circuits.



A motor driver takes the low current signal from controller circuit and amps it up into a high current signal, to correctly drive motor. We have used DC motor drivers which converts step and direction input from the controller to currents and voltages compatible with the motor. A motor driver allows you to conduct automatic works using electrical power. The majority of the motor drivers in the markets are in the form of IC's.

E. Bluetooth Module

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 controller or PC. If we want to increase the range of Bluetooth we will use repeaters which will increase the range of Bluetooth by setting nodes in the field.

F. AV Receiver and Camera

AV receiver is used to receive the input from camera which will placed in the rover. Camera will surveilling the location based on the range will set by operator. It enables you to realize wireless sharing of AV data from the camera.

A Night vision camera will used in the project. The av receiver used in the project is shown in figure 5 and the camera used in the project is shown in figure 6.



Fig. 5: AV Receiver



Fig. 6: Camera

VI. SOFTWARE IMPLEMENTATION

A. Arduino IDE

The Arduino IDE is open source software platform which is used to the code and upload in the Arduino boards. The Arduino IDE will be compatible in operating systems like Windows, Mac OS and Linux etc.. It supports the programming languages like C, C++ and Embedded C etc.. The code written in the Arduino IDE is known as Sketching. It will upload in the Arduino boards with the IDE.

The Arduino IDE will appear as:

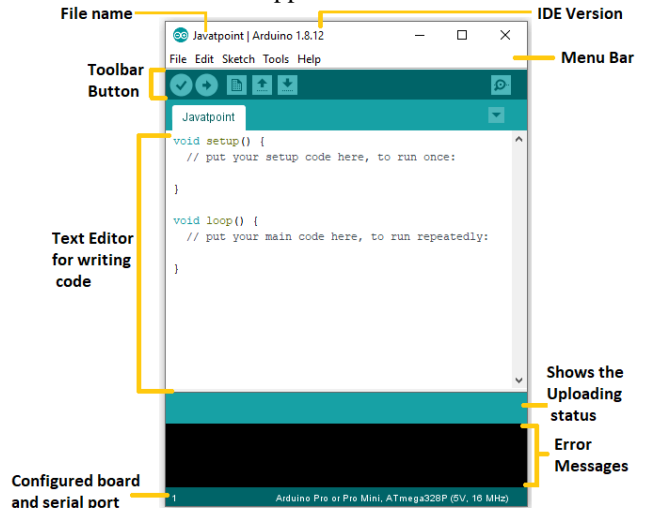


Fig. 7: Arduino IDE

B. Mobile Controlling App

An app is developed to operate the rover. The main controlling screen of app is given in figure 8.

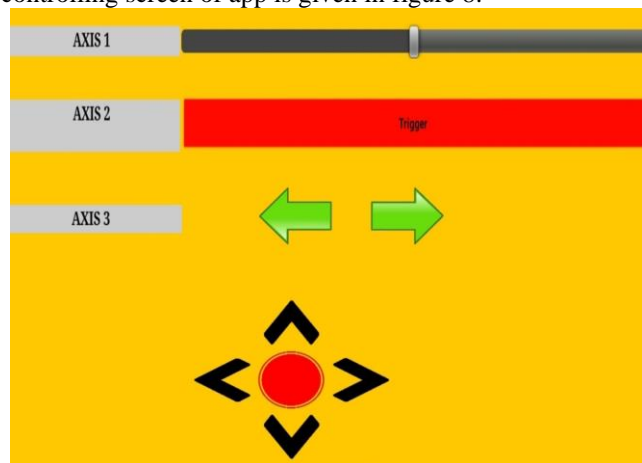


Fig. 8: App Controlling Page

Axis 1: Axis 1 is used to set the angle of the gun from 0 degrees to 90 degrees.

Axis 2: Axis 2 is used to trigger the weapon.

Axis 3: Axis 3 is used to move the weapon from left to right or right to left.

The below indications are used to move the vehicle which is able to turn 360 degrees and the red button is used to stop the vehicle.

VII. RESULTS

The final output of this design is given in figure 9.



Fig. 9: Remotely Controlled Armed Surveillance Rover

VIII. CONCLUSION

After constructing a Surveillance rover according to the proposed design, it was concluded that the basic design of the rover was effective, but limitations in the materials used limited the efficiencies of the system and reduced the dexterity. Some aspects of the design were very effective, for example the rover is spying in the enemy's location in case of being caught by enemy forces. The advantages of the robot are it can destroy the enemy forces without actually sending any man power.

DECLARATION STATEMENT

After aggregating input from all authors, I must verify the accuracy of the following information as the article's author.

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- **Authors Contributions:** The authorship of this article is contributed equally to all participating individuals.

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