

# Developing and Testing of Unmanned Automatic Army Firing Vehicle

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**Abstract**— Nowadays the technological advancements are used by the military forces for reducing the risk of their casualties and to defeat their enemies. Robotics is one of the hot fields of modern age in which the nations are concentrating upon for military purposes in the state of war and peace. The robot is in form of a vehicle mounted with a web cam, which captures and sends video to base station. The movement of vehicles is controlled by microcontroller. Robotic system can perform many security and surveillance functions more effectively than humans. One of the major applications of this work can be analyzed using android based smart phone which can be used to control the movement of the robot. The robot sends the signal to the RF receiver mounted on the robot via RF transmitter at the base station. With this feature the robot can transmit real time videos with night vision capabilities and cannot be identified by the enemies in war zone.

**Key words:** Microcontroller, R F Receiver and Transmitter, Web Camera

## I. INTRODUCTION

Nowadays, with the development of technology, several robots with very special integrated systems are particularly employed for such risky jobs to do the work diligently and precisely. A wireless camera is fitted on the robot circuit which captures images and videos of enemy territories and transmits these images, which are received by the receiver unit of the TV. Now-a-days there are many technical advancements; these advancements are used by the military. With the development of sophisticated technology, it mostly relies on the high-tech weapons or machinery being used. Robotics is one of the hot fields of modern age in which the nations are concentrating upon for military purposes in the state of war and peace. They have been in use for some time for demining and rescue operations but now they are prospered by using them for combat and spy missions. This robotic technology is being used in war spying. These robots are under examination for autonomous, co-operative and controlled environment. Here we are using a robot which is moved by a chain drive. Location is received with the help of the android application and then the vehicle is controlled by Bluetooth module.

The automated vehicle works during off road navigation and mainly used in military and firefighting operations i.e. material handling, fire extinguishing, etc. Our Unmanned Ground Vehicle (UGV) is operated by 2 driving motors; a CO2 based fire extinguisher is used which is actuated by a mechanism developed by us. The UGV can be operated in all terrains due to the flexible chain drive. We have used a wireless remote to operate all the motors on the UGV. The main aim of our project is to introduce an UGV in India that can be used by the Indian Army, Fire Fighters and the police at a low cost. There is a lot of future scope for this project; the main being an installation of a wireless camera so

as to monitor the operation of the UGV. By Chinmay Velankar [1].

With the help of new technology and insect-sized micro unmanned air vehicle came to light. This invention increased performance of troops because they are very effective with the least loss rate of units at operations. In addition, they are easy-to-use and portable. This essay provides information about unmanned air vehicles' present-day conversion and micro unmanned air vehicles. It also compares manned and unmanned air vehicles and why we use unmanned air vehicles. It explores where we are using micro air vehicles and gives several examples which are very good at in their field. By Shoaib Mughal.

## II. OBJECTIVES OF WORK

- To develop a automated firing army vehicle.
- Implementation of PC based control unit for vehicle.
- To control the vehicle by using Bluetooth module.
- To implement embedded system programming in microcontroller for the movement of the vehicle.
- To develop the weapon carrying equipment with enough capacity.
- Capturing the images of surrounding to focus the target.
- To save many lives of soldiers in war field
- To fetch and display important data from enemy camps automatically.
- To develop a light weight prototype vehicle as per above conditions and analyzing practically.

## III. MATERIALS AND METHODOLOGY

### A. Hardware Requirements

#### 1) ATMEL AT89S52 MICROCONTROLLERS:

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry standard 80C51 instruction set and pin out; the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

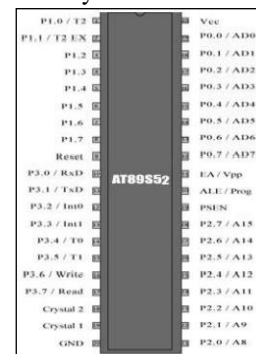


Fig1: Atmel AT89S52 Microcontroller PIN Configuration

The pin configuration used for selected microcontroller as shown in figure 1.

2) **PIEZO BUZZER:**



Fig. 2: Piezo Electric Buzzer

Piezoelectricity is the ability of some materials (notably crystals and certain ceramics, including bone) to generate an electric field or electric potential in response to applied mechanical stress. The effect is closely related to a change of polarization density within the material's volume. If the material is not short-circuited, the applied stress induces a voltage across the material. The word is derived from the Greek piezo or piezo-in, which means to squeeze or press. The piezo electric buzzer shown in figure 2.

3) **BUETOOTH MODULE:**

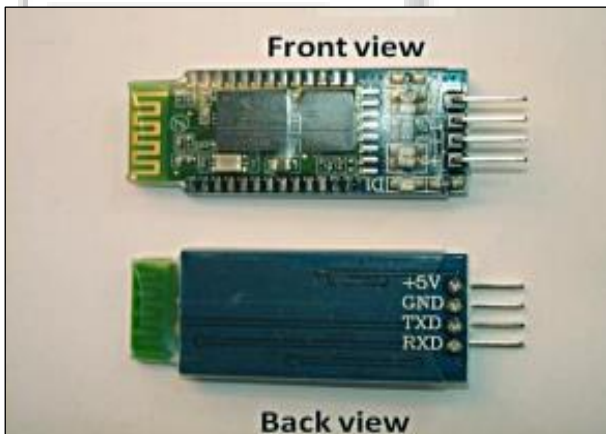


Fig. 3: Bluetooth Module

The Bluetooth module used in this shown in figure 3, It is a class-2 Bluetooth module with Serial Port Profile, which can configure as either Master or slave. A Drop-in replacement for wired serial connections, transparent usage, you can use it simply for a serial port replacement to establish connection between HC-05 Specification.

4) **WIPER MOTOR**

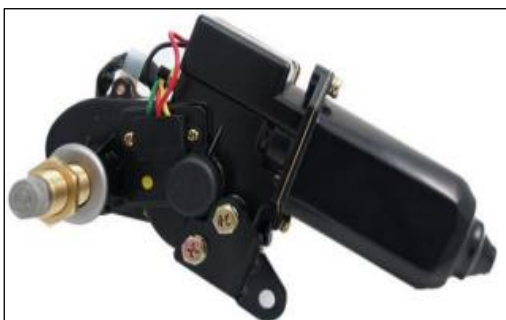


Fig. 4: Wiper Motors

The electric wiper motor is a permanent magnet, rotary electric motor shown in figure 4. A worm gear machined on the armature shaft drives the output shaft and gear through an idler gear and shaft. The output shaft operates the output arm, which is connected to the wiper linkage. As the electric motor revolves the output arm, the linkage is forced to move in a back and forth motion.

5) **RELAY:**

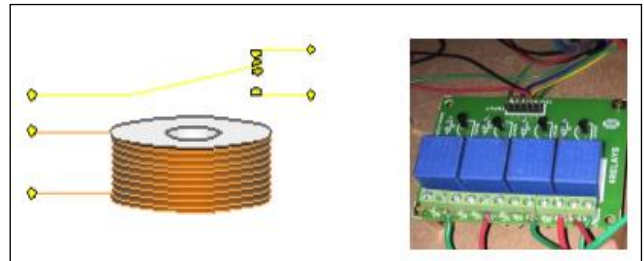


Fig. 5: Relay

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be ON or OFF so relays have two switch position and they are double throw (changeover) switches.

The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without amplification. Relays are usually SPDT or DPDT but they can have many more sets of switch contacts. The figure 5 shows the relay.

6) **DC MOTOR:**



Fig. 6: DC Motor

A machine that converts dc power into mechanical energy is known as dc motor. Its operation is based on the principle that when a current carrying conductor is placed in a magnetic field, the conductor experiences a mechanical force. The direction of the force is given by Fleming's left hand rule. The figure 6 shows permanent magnet D C motor.

7) **RF SURVEILLANCE CAMERA:**



Fig. 7: Wireless camera and Receiver

A wireless Night Vision Camera: Apart from what a basic camera consists of, it consists of a transmitter unit. It captures images and transmits these images through the transmitter in form of digital signals, which are received by the receiver unit connected to the TV or computer. A Receiver Unit: The robot also consists of a receiver unit which receives the command signals for controlling the motors and thus the robot unit. Control Unit: It consists of a remote transmitter unit consisting of microcontroller, encoder and a RF module and a receiver unit embedded on the circuit consisting of an RF receiver module, a microcontroller and a decoder.

#### B. Software Requirements

##### 1) Design tools:

The Keil C51 compiler comes with an additional header to accommodate the AT89S52 microcontroller. This file is Reg52.h and is located in the c:\c51\inc directory. If you are using the evaluation copy of the Keil software, the directory is c:\c51eval\inc. The Keil tool chain consists of the following executable located in the c:\c51eval\bin directory:

- $\mu$ Vision uvw51e.exe
- C Compiler c51.exe
- Assembler a51.exe
- Evaluation version of the Keil tool

$\mu$ Vision is a Windows based front end for the C Compiler and Assembler. It was developed in the USA as was the printed manual set. Compiler, Assembler and Linker options are set with simple mouse clicks.  $\mu$ Vision runs on Windows 3.1, 95 and NT. The Compiler, Assembler and Linker are DOS executable. They can be accessed with batch files. This provides maximum flexibility. This Integrated Development Environment (IDE) has been expressly designed with the user in mind.

The C51 ANSI compiler along with the A51 assembler is designed specifically for the Intel MCS<sup>®</sup>8051 microcontroller family, including the 8x931 USB. The C51 is 100% compatible with existing 8051 programs. Extensions provide access to all 8051 hardware components. Sample USB/931 code is available: [www.keil.com/usb](http://www.keil.com/usb). C51 supports code banking. The compiler can be run in either DOS mode or called from the Windows based front end  $\mu$ Vision.

This Macro Assembler is included with each Compiler package or is available separately. All utilities needed to complete your project are included for all members of the 8051 family. This Assembler is DOS based or can be run from  $\mu$ Vision which is included with every Assembler and Compiler package.

The evaluation version of the Keil tool set is restricted to a 2K code size and the code must be located at 0x4000. Useful object code is produced. Other than these restrictions, the tool set works exactly as the full version does. This allows you to fully evaluate the features and power of Keil products.

#### IV. FABRICATION AND WORKING PRINCIPLE

##### A. Development of metal frame

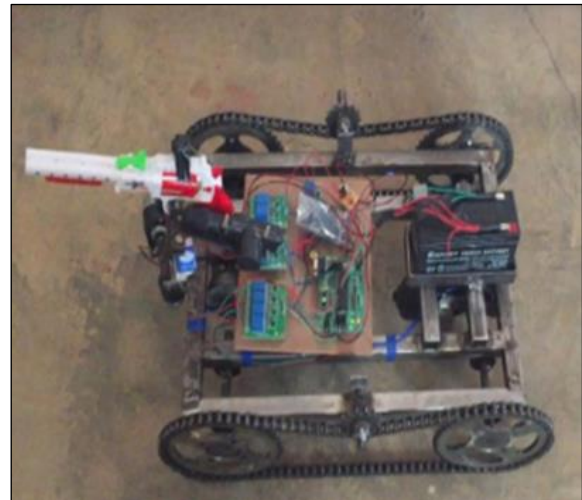


Fig. 8: fabricated metal frame with microcontroller setup  
The metal frame is made rectangular in outer plane shape. The material used in making metal frame is mild steel to withstand load acting on the equipment firmly. The frame is subtended by the four wheels made up of the same material to convert electrical into translator motion. The wheels are connected by the chain drives for the movement either in forward or backward direction as per the need. The frame is welded at suitable places to provide base for the components such as battery, circuit board. A microcontroller is incorporated at the base of the frame to control all other electrical components of the equipment. There are about nine relays used in this vehicle which are directly connected to the microcontroller which help in switching the circuit. There are two wiper motors placed, one for front and another for back wheel. This drives the chain drive in which the motion takes place and it is controlled by the two twin relay. A small DC motor is mounted at the base which rotates the camera and the gun, this motor rotates 360 degree with the gun and the camera which is also controlled by a twin relay. The assembled body frame as shown in figure 8.

##### 1) Concoction of Microcontrollers and Relays for Control of Vehicle:



Fig. 9: The microcontroller setup  
A microcontroller is fixed at the mini printed circuit board (PCB) in our equipment to produce signals which further will

be received by the relays and it controls all the logic function of other electronic devices. Basically relays in circuits are used for controlling of the equipment, In other words they controls the mechanical motion by means of electrical energy supplied. So in our unmanned military army firing vehicle totally 9 relays are connected in the circuit board. A set of four relays are used for controlling the movement of four wheels which are driven by the chain. A set of two relays control the movement of the gun in left and right side. Another set of two relays are used for control of up and down movement of the gun. And the remaining one relay is incorporated for the triggering action of the gun. The piezo electric buzzer thus indicates to the observer by beep sound when the vehicle is turned on. The complete assembled microcontroller shown in figure 9.

### B. WORKING PRINCIPLE

The construction of Bluetooth controlled video analyzing car consists of a frame. This is used for mounting the components such as D.C motor, Battery and gear wheel. The front and back wheels are fitted in the base of the frame. The front wheel is fixed by the bolt and nut. The rear wheel is fitted with the help of shaft, bearings and bearing cap. The gear wheel (spur) is fixed in this shaft for front and backward movement of the vehicle. The 2 D.C motor is coupled with this back 2 wheel arrangement with proper welding. Where 2 dc motors activates to run the chassis front and back and one stationary and one motor running for right or left movement.

The power for driving the motor is taken from the battery.. The diode is used during the charging of battery. The diode allows current only in forward direction. The lead acid D.C 12 Volt battery is used.

The receiver circuit is fixed inside the vehicle. The receiver having four relays. These relays output are connected to the D.C motor. The construction of Bluetooth controlled video analyzing car consists of a frame which is used for mounting the components such as D.C motor, Battery and gear wheel. The front and back wheels are fitted in the base of the frame. The front wheel is fixed by the bolt and nut. The rear wheel is fitted with the help of shaft, bearings and bearing cap.

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### V. OUTCOME AND DISCUSSION

Successfully built a stand-alone rover capable of manual mode control added a rotating camera platform that can target the enemy with human control. By developing this unmanned military firing army vehicle, we are sure that it overcomes the drawbacks of the conventionally used RF circuited vehicles.

This RCV includes advantages such as robust control, minimal interference and a probable working range.

The accurate controls are available to serve purposes dependant on the area of application of the RCV. We have tried to reduce the circuit complexity and improve upon the human machine interface. The cost analysis of the project described in section of this paper clearly indicates a huge improvement in the cost expenditure of the production of these unmanned Vehicles. Moreover handling these UGV does not require much skill on the part of the user. Even an ordinary person can maneuver these UGV without having to know much about the internal circuitry.

In this way the cost involved in training people to use such UGV can also be saved. Work is flexible in security as passwords protect the vehicle so that it can be operated only if correct password is entered in displaying unit. The vehicle is equipped with cameras and communication equipment. It is designed to saving lives of the soldiers as well as to perform reconnaissance. Its small size enables it to enter in underground areas, report on possible occupants. Thus we are confident that the concept of our unmanned military firing army vehicle will be helpful in future generations of autonomous robotic vehicles developed by the Army and other services.

### VI. CONCLUSIONS

We are proud that we have completed the work with the limited time successfully. The BLUETOOTH CONTROLLED WEAPON SYSTEM is working with satisfactory conditions. We are able to understand the difficulties in maintaining the tolerances and also quality. We have done to our ability and skill making maximum use of available facilities. Thus we have developed a "BLUETOOTH CONTROLLED WEAPON SYSTEM" which helps to know how to achieve low cost analyzing robot with remote control operation. By using more techniques, they can be modified and developed according to the applications.

Robotics' experiences search for a push right now. The military has recognized that automatic devices are far more efficient than the use of human soldiers, as there is a reduced risk of mistakes and the devices can also be equipped with powerful weapons. The military has recognized another advantage, too: more and more robots can do dangerous work that was previously undertaken by humans. The use of robots for such tasks makes a soldier's work much more secure; it can even saves lives. Certainly, most nations try to avoid wars and battles but in order to achieve peace in conflict zones, a well prepared military is crucial. The realistic concept that the military still performs life-threatening tasks is reason enough to develop robots that will support soldiers on their missions.

### VII. SCOPE FOR FUTURE WORK

- Size can be reduced.
- Latest equipment can be used.
- Automatic loading unloading gun can be used.
- High pixel camera can be used and image processing and face recognition can be applied.
- Automatic target recognition can be applied.

- Applying the accurate GPS and GSM to get a precise location and tracking system.

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