

# War Tanker with Automatic Sensing Of Hit Directions

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**ABSTRACT:** The system designed here is an unmanned vehicle that is equipped with a toy gun is controlled through the remote. The robot can be controlled in two Modes i.e., Manual and Automatic mode. In manual mode, the operator can control the tanker through remote and can chase the rivals from a secured place. The vehicle can be controlled in all directions; similarly the gun can be positioned towards the target through same remote. The gun moving mechanism can be positioned towards the enemy direction through the remote itself. In the automatic mode, the operator can control only the robot (tanker) movement i.e., forward, backward, right and left directions. The gun moving and firing mechanisms are automatically taken care by the robot itself depending on the direction from which the tanker is hit. Depending on the direction from which the tanker is hit, the gun will be automatically moved or rotated to that particular direction and fires. When the system is utilized at warzones, the system can be controlled from a bunker through remote designed with ZigBee module. So the remote control unit is designed using push buttons and MEMS module. The push buttons are used to control the position of the gun in two axes along with the firing mechanism. So a total of seven push buttons are used. The MEMS module is used to control the movement of the war tanker in four directions i.e., forward, backward, right and left.

## 1. INTRODUCTION

Manpower scarcity has been a perennial problem for many armed forces around the world. Over the years, there has been a decline in the absolute numerical make-up of these organizations, which, if not managed properly, can affect their operational capabilities. This scarcity is a situation that is unlikely to improve in the foreseeable future, given the current low birth rates and conflicting demands for manpower.

From a numerical perspective, this constraint means that the armed forces cannot mass together the sheer number of ground troops as before. From a risk perspective, every soldier on the battlefield is now a precious resource which should not be exposed to unnecessary risks. This translates into further constraints for battle planners, who may not have the leeway to select the riskier but more expedient military options. Finally, from the skills perspective, smaller population bases make it difficult to find, select, train and develop specialized combatant resources like pilots and submariners.

Thus, it is crucial that new avenues be explored to circumvent this prevalent trend of manpower shortages. One viable solution lies in exploiting technology and pushing the limits of force multipliers. Within the domain of force multipliers, there lies a relatively new discipline, unmanned warfare.

The definition of 'unmanned' chosen for this article is fairly loose, as the emphasis is not solely on taking men out of machines but also on how to employ technology to make better use of its manpower. Thus, while the focus is on unmanned warfare in its literal sense, the article will also touch on some equipment or systems which result in lower manpower usage (or higher operational capability with the same manning). In doing so, please accept that some aspects of this article border on technological innovation as opposed to unmanned warfare.

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## II. MATERIALS AND METHODS

### 1.14 War tanker

A tank is a tracked, armoured fighting vehicle designed for front-line combat which combines operational mobility and tactical offensive and defensive capabilities. Firepower is normally provided by a large-calibre main gun in a rotating turret and secondary machine guns, while heavy armour and all-terrain mobility provide protection for the tank and its crew, allowing it to perform all primary tasks required of armoured troops on the battlefield.

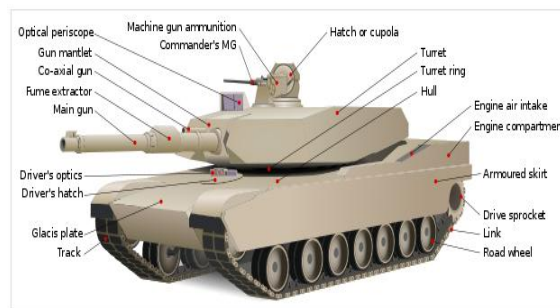


Fig. 1 Description of War Tanker

### 1.15 Functional description

The functional description and working operation as per the block diagram is explained below. As mentioned in the introduction the unmanned vehicles are either operated autonomously or through Tele-communications i.e., remote. The robot (war tanker) designed here is the remote operated one. Through this remote the robot can be controlled sitting at a safe place. The remote is designed with six control keys, MEMS, micro-controller and the Zigbee transmitter. Out of these seven keys, two keys are to rotate the gun on the tank in clockwise and anti-clockwise directions. Two keys are used to set the tanker in automatic or manual mode of operation. Two keys are used for the gun to lift up and down in vertical direction and one key is used to start firing from the gun. When automatic mode of operation is selected, the vehicle movement will only be controlled where as gun firing will be done automatically depending on the target hit direction.

### Block Diagram and Circuit Diagrams

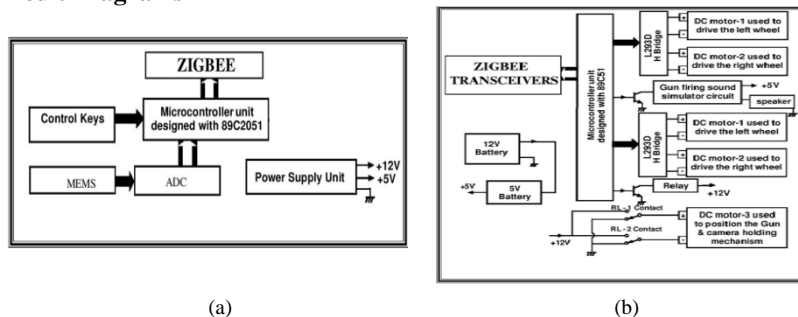


Fig. 2 (a) Block Diagram of Vehicle Control Station (b) Block Diagram of War Tanker

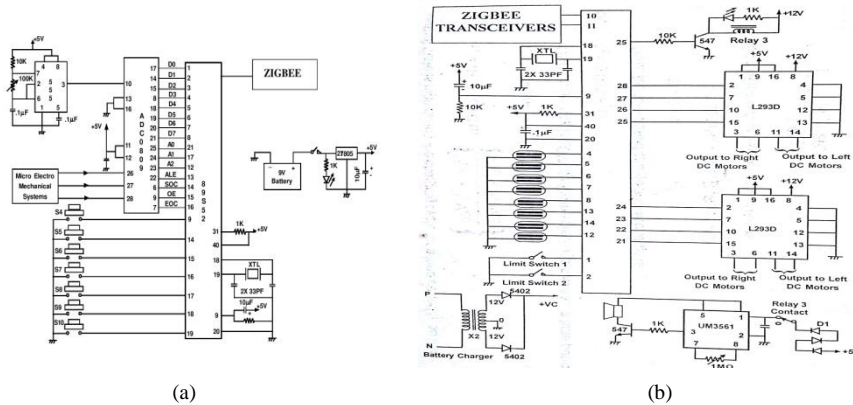


Fig. 3 (a) Circuit Diagram of Vehicle Control Station (b) Circuit Diagram of War Tanker

### 1.16 Remote Control Unit

The remote control unit is nothing but the transmitter unit through which the tanker is controlled. The main components present in this unit are the push buttons, micro controller, MEMS, ADC, 555 Timer chip, ZigBee transmitter and power supply unit for all these components. As mentioned earlier, a total of seven keys (push buttons) are used to control the vehicle and these are interfaced with the 89C51 micro controller. MEMS module is used to control the robot and is interfaced with the 89C51 micro controller through ADC.

### 1.17 MEMS Module

Micro Electro Mechanical System or MEMS represent an extraordinary technology that promises to transform whole industries and drive the next technological revolution. These devices can replace bulky actuators and sensors with micron scale equivalents that can be produced in large quantities by fabrication processes used in integrated circuit photolithography.

### 1.18 ADC (Analog to Digital Converter)

As the peripheral signals usually are substantially different from the ones that micro-controller can understand (zero and one), they have to be converted into a pattern which can be comprehended by a micro-controller. This task is performed by a block for analog to digital conversion or by an ADC. This block is responsible for converting an information about some analog value to a binary number and for follow it through to a CPU block so that CPU block can further process it.

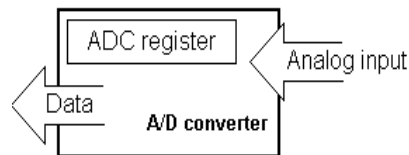


Fig.5 Block diagram for converting an analog to a digital form

### 1.19 Clock Generator

The required clock for the ADC is generated using 555 Timer IC, which is configured as Astable multi-vibrator (Self Oscillator). In this mode of operation the required frequency can be adjusted using two external components i.e., resistor and capacitor. Keeping capacitor value constant where as by varying the value of resistor the frequency can be adjusted from 1Hz to 500 KHz. Here the required frequency is 100 KHz approximately

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## 1.20 ZIGBEE Module

The data-transmitting unit including 89C51 microcontroller designed to operate at 5V DC, and required supply is derived from the mains. A small keyboard designed with 7 keys is interfaced with this microcontroller. This keyboard is designed to generate the data that is stored in RAM and it is delivered through output pin of the controller (transmitter). The main function of the data transmitting section is to generate 8-bit binary code that is to be transmitted through Zigbee transmitter. The 8-bit binary code produced by the keyboard is fed to microcontroller, which functions as encoder; the data obtained from the keyboard is stored and it is converted into 8-bit information which is transmitted through amplified modulated input signal. If any key is pressed; that information is converted into 8-bit data.

## 1.21 DC Motor

An electric motor is a machine, which converts electrical energy into mechanical energy. It is based on the principle that when a current-carrying conductor is placed in a magnetic field, it experiences a mechanical force whose direction is given by Fleming's Left-hand rule. If an Electric current flows through two copper wires that are between the poles of a magnet, an upward force will move one wire up and a downward force will move the other wire down. A direct current (DC) motor is a fairly simple electric motor that uses electricity and a magnetic field to produce torque, which turns the motor.

## 1.22 H-Bridge (General description)

H-Bridge is an electronic circuit which enables a voltage to be applied on either side of the load and the H-bridge DC motors allow the car to run backwards or forwards. H-Bridge is a configuration of 4 switches, which switch in a specific manner to control the direction of the current through the motor. Below figure shows simplified H-bridge as switches. The states of these four switches can be changed in order to change the voltage across the motor, of the current flow and the rotation of motor.

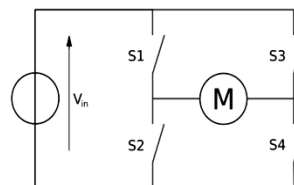


Fig.6 H-Bridge

## 1.23 Limit Switches

In electrical engineering a limit switch is a switch operated by the motion of a machine part or presence of an object. They are used for control of a machine, as safety interlock, or to count objects passing a point. A limit switch is an electromechanical device that consists of an actuator mechanically linked to a set of contacts. When an object comes into contact with the actuator, the device operates the contacts to make or break an electrical connection. Limit switches are used in a variety of applications and environments because of their ruggedness, ease of installation, and reliability of operation.

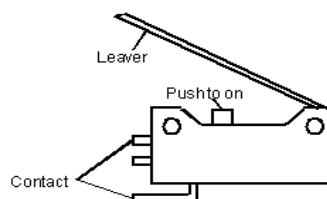


Fig. 7 Limit Switch

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## 1.24 UM 3562 (Gun Sound Generator)

The IC UM 3562 used in this project is a low cost, low power CMOS LSI designed for use in toy application. Since the IC includes oscillating and selector circuits, a compact sound module can be constructed with only a few additional components. The UM 3562 contains circuit to produce three gun sounds. The circuit constructed here has a facility to adjust machine gun shooting rate.

## 1.25 Relay

A relay is an electrical switch that opens and closes under the control of another electrical circuit. In the original form, the switch is operated by an electromagnet to open or close one or many sets of contacts. These contacts can be either Normally Open (NO), Normally Closed (NC), or change-over contacts. A relay is able to control an output circuit of higher power than the input circuit, it can be considered to be, in a broad sense, a form of an electrical amplifier. So a relay can be defined as an automatic electromagnetic/electronic switch, which can be used to make or break the circuit.

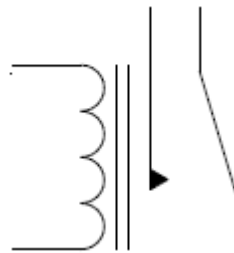


Fig. 8 Schematic of relay with contact

## 1.26 8051 Micro Controller

The 8051 architecture consists of these specific features

- Eight –bit CPU with registers A (the accumulator) and B
- Sixteen-bit program counter (PC) and data pointer (DPTR)
- Eight- bit stack pointer (PSW)
- Eight-bit stack pointer (Sp)
- Internal ROM or EPROM (8751) of 0(8031) to 4K (8051)
- Internal RAM of 128 bytes:
  1. Four register banks, each containing eight registers
  2. Sixteen bytes, which maybe addressed at the bit level
  3. Eighty bytes of general- purpose data memory
- Thirty –two input/output pins arranged as four 8-bit ports:p0-p3
- Two 16-bit timer/counters: T0 and T1
- Full duplex serial data receiver/transmitter: SBUF

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- Control registers: TCON, TMOD, SCON, PCON, IP, and IE
- Two external and three internal interrupts sources.
- Oscillator and clock circuits.

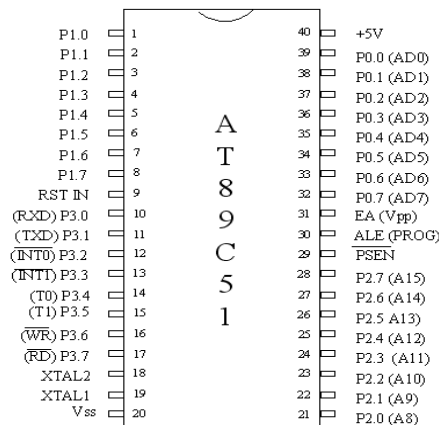


Fig. 9 Pin Diagram of AT89C51 (8051 Micro Controller)

### 1.27 Power Source

The required power supply to drive the tanker is derived by 12V, 7 Ah (Ampere hour), rechargeable, lead acid heavy duty battery. Here we require two different DC levels of +5V and +12V. The battery as it is delivering 12V is used to drive the DC motors through the H Bridge IC's, whereas for the remaining electronic circuitry consists of microcontroller, LCD and RF receiver requires +5V constant source. To generate a stable supply of +5V, 7805 three terminal voltage regulator chip is used which provides constant supply, though the battery terminal voltage falls down to 8V. The DC motors are designed to operate at 12V DC and each motor consumes a maximum current of 150 milli-amps, there by four motors for the robot movement together consumes 600 milli-amps.

### III. RESULT AND DISCUSSION

The system designed here is unmanned vehicle that is equipped with a toy gun is controlled through the remote. The robot can be controlled in two formats i.e., one in manual mode of operation and the other in automatic mode of operation. In the manual mode of operation, the operator can control the tanker through remote and can chase the rivals from a secured place. The vehicle can be controlled in all directions; similarly the gun can be positioned towards the target through same remote. The gun moving mechanism can be positioned towards the enemy direction through the remote itself.



Fig. 10 Unmanned War Tanker



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The gun moving and firing mechanisms are automatically taken care by the robot itself depending on the direction from which the tanker is hit. Depending on the direction from which the tanker is hit, the gun will be automatically moved or rotated to that particular direction and fires.



Fig. 11 War Tanker Cannon

Bluetooth and Wi-Fi should not be confused with Zigbee. Both Bluetooth and Wi-Fi have been developed for communication of large amount of data with complex structure like the media files, software etc. Zigbee on the other hand has been developed looking into the needs of communication of data with simple structure like the data from the sensors.



Fig. 12 Zigbee and MEMS Module

In this paper war tank is designed and developed successfully. For the demonstration purpose, a prototype module is constructed; and the results are found to be satisfactory.



(a)

(b)

Fig. 13 (a) Remote Control Unit (b) Control Switches on Remote Control Unit

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## IV. CONCLUSIONS

The employment of unmanned platforms in the battlefield serves not only to overcome the constraints arising from manpower and resource shortages, but also increases the operational capability of a fighting force. They will provide tangible increases in combat range, firepower, speed, element of surprise, command and control, etc. As unmanned warfare and the mastery of unmanned technology will become increasingly important parts of a nation's strategic architecture, here armed forces and defence industries will need to pay appropriate attention to this aspect of warfare.

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