An Intelligent Combat Robot

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Abstract: This paper is described to develop a robotic vehicle using RF technology for remote operation attached with wireless camera for monitoring purpose. The robot along with camera can wirelessly transmit real time video with night vision capabilities. This is kind of robot can be helpful for spying purpose in war fields. An 8051 series of microcontroller is used for the desired operation. At the transmitting end using push buttons, commands are sent to the receiver to control the movement of the robot either to move forward, backward and left or right etc. This new Combat robot is radio operated, it has got two barrel turret through bullet can be fired, radio camera in synchronization with the turret can rotate up and down, left and right up to a safe firing limit turret and camera mechanism has been installed which has all the function like tank, turning to any angle on its axis, moving forward and reverse turning left and right, running instantly into reverse direction. The RF transmitter acts as a RF remote control. It has an another function like a self suicide.

Keywords: Combat robot; Selfsuicide; Wireless camera, Lasergun, Radio operated; Terror attack; Self-powered

I. INTRODUCTION

Any people cannot forget 9/11 when 101 people including nine foreigners and 14 policemen have lost their lives while about 300 people were injured in the worst terror attack seen in the country in which desperate men fired indiscriminately at people. Being an ex-defence person, our blood was boiling as our brave soldiers were fighting the militants to free all the hostages from Mumbai hotels. It struck an idea in our mind, why can't we make a robot to tackle such type of situation. This combat robot is an improved version of previous robot. This Combat robot is radio operated, it has got two barrel turret through bullet can be fired, radio camera in synchronization with the turret can rotate up and down, left and right up to a safe firing limit. Turret and camera mechanism has been installed on my previous spy robot vehicle, which has all the function like tank, turning to any angle on its axis, moving forward and reverse turning left and right, running instantly into reverse direction. This robot is radio operated; self powered, and has all the controls like a Normal car. A pair of laser gun has been installed on it, so that it can fire on enemy remotely when required; this is not possible until a wireless camera is installed. Wireless camera will send real time video and audio signals. Which could be seen on a remote monitor and action can be taken accordingly. It can silently enter into enemy area and send us all the information through its' tiny camera eyes. It is designed for, fighting as well as suicide attack.

The Main Objectives of using robot are

A. Where man dares not venture
Robots have traditionally been put to use in environments that are too hazardous for man.

B. We even make them go to war
The main aim to develop a model which is efficiently used to minimize terrorist causality. Being able to achieve reliable long distance communication is an important open area of research to robotics as well as other technology areas. As interest in robotics continues to grow, robots are increasingly being integrated into everyday life. The results of this integration are end-users possessing less and less technical knowledge of the technologies.

The faithful robots do not hesitate to tread even the dreaded terrain of battlefields [2]. Their use in Afghanistan and Iraq wars make us wonder if robots have indeed become intelligent! Battle robots of various shapes and sizes were deployed to defuse landmines, search for criminals hiding in caves, search for bombs under cars and in building, for espionage and what not! These robots were controlled by humans.

C. Self Suicide
When the robot is surrounded by number of enemies and the situation is too critical, at that time this robot will self explode and kill all the enemies surrounded by it.

II. HARDWARE IMPLEMENTATION

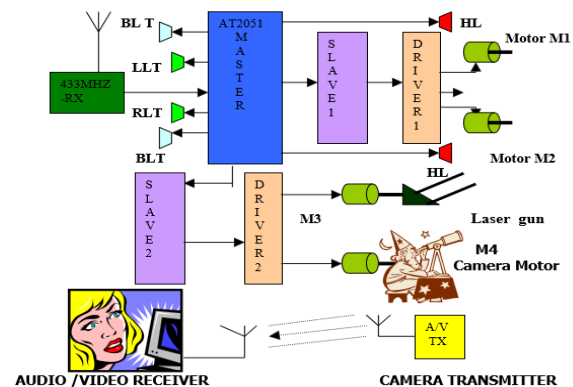The block diagram of the hardware implementation of Entire system is as shown in the Figure 1.

Figure1-Block diagram

Heart of this robot is Intel's most power family of microcontroller 8051, there are using two AT89C2051 microcontrollers. Ic2 is first microcontroller which acts as master controller, decodes all the commands received from the transmitter and give commands to slave microcontroller1 ic3 ,and slave2 ic5. Slave

microcontrollers are responsible for executing all the commands received from the master and also generating PWM pulses for the speed control. Ic4 is LD293 motor driver IC which drives two motors m1 and m2. These two motors are vehicle driver motors. Slave2 microcontroller controls the gun and camera movements in up/down, left or right direction. IC6 is driver IC which drives gun and camera motors in two angles and it can be control in following ways.

1. Start/stop
2. Increase speed
3. Decrease speed
4. Direction change
5. Turn left/Right

A.   Transmitter circuit:-

Twelve keys are connected in four by three matrixes to the microcontroller IC1 at 2051. Key data is transmitted through the 433MHZ transmitter module through its pin no 3 of the microcontroller. Which is TX pin of the inbuilt UART of the microcontroller and works on 1200bits/sec. X1 along with c4 and c5 gives the required clock input to the microcontroller c 1 and r1 forms the reset circuitry connected to pin no 1 of the microcontroller. Key pressed value is transmitted through antenna. The transmitter module is shown in Figure 2.
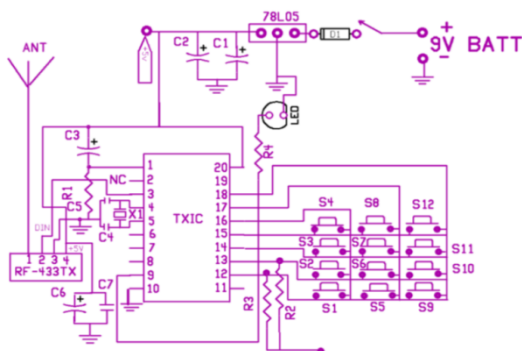

Figure2-Transmitter module

B.   Receiver Section1-

RF433-RX is 433MHZ radio receiver which receives the transmitted codes from the remote place transmitted by the transmitter these codes are converted to digital format and output is available to the pin no 2 of the ic2 master micro-controller, this is the RX pin of inbuilt UART of the micro- controller. Here it is using UART to receive our codes at 1200 baud rate. Based on the input codes master will   give command to slave microcontroller ic3 and robot will behave as follows.

a. moves in forward direction
b. moves in reverse direction,
c. speed controls in both the direction
d. it can even turn left or right while moving forward or in reverse   direction.
e. Instant reverse or forward running without stopping
f. In case of bump, moves reverse turn left or right and wail for the next instruction.
g. On the spot left or right turn to pass through the narrow space

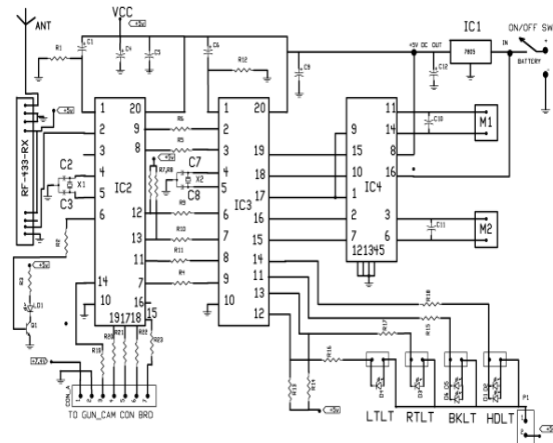h. It has also a head light, back light and turning lights to left a right.

Fig:- Receiver module 1

C.   Receiver Section 2

When one of the pin becomes high and other pin becomes low motor will turn in one direction reversing the polarity of pin motor will   turn other direction. When forward command is received, both the motors will run in forward direction. When reverse command is received both the motors will run in reverse direction. While moving in forward or reverse direction if left or right command is received one of the motor stops and other keeps moving this action gives left or right turn. For example if left motor is stopped, robot will turn in right direction, and when right motor is stopped robot will turn in left direction. Please refer to the function diagram given above to understand the working of the motor driver IC LD 293d. Pin 6 of the master micro-controller controls the transistor Q1 biasing resistance R2. Light emitting diode glows when ever it's base gets high logic. This led will flash when ever micro-controller receives command codes; it is an indication of communication being taking place between transmitter and receiver. Pin 14,15,17,18 and 19 of the master microcontrollers are connected to CON_A connector; attachment board is attached to this connector through CON_B .These pins gives command and control signals to the camera and gun controller PCB attachment board. Ic6 is slave2 micro-controller responsible to control the control the gun and camera movements. .This controller receives the control signals through CON_B to pin 2,3,6,7 and 8. IC7 is again motor driver IC for the motor and camera Movements. it's working is same as explained before for ic4. Pin 16 and 17 are connected to pin1 and 9 of ic7 these are the EN PIN of ic7 for both the motors.Pin18,19 and 14,15 connected to 10,15 and 2,7 controls both the camera and gun control motors. Transistor Q2 on the attachment board controls the DPDT relay K1 it's normally open contacts when closes, flashes both the laser diodes fixed inside the two turrets, which of course it has removed from gas lighter.R25 is biasing resistance for transistor Q2, which drives the relay K1 .Diode D8 connected across relay coil is to protect the circuit from the induced EMF in relay coil during on/off operation.R26 is a current limiting resistance through laser

diodes. IC5 78L05 is   low current 5V dc regulator IC required to give regulated voltage to ic6 and ic7. Capacitor C16, C18 and C19 are noise filters. Capacitor C17 is a filter for 5v power supply. Capacitor c13 and r24 gives the required reset pulse to IC 6. C14, C15 and crystal X3 gives the required clock pulses to ic6 slave2 microcontroller.
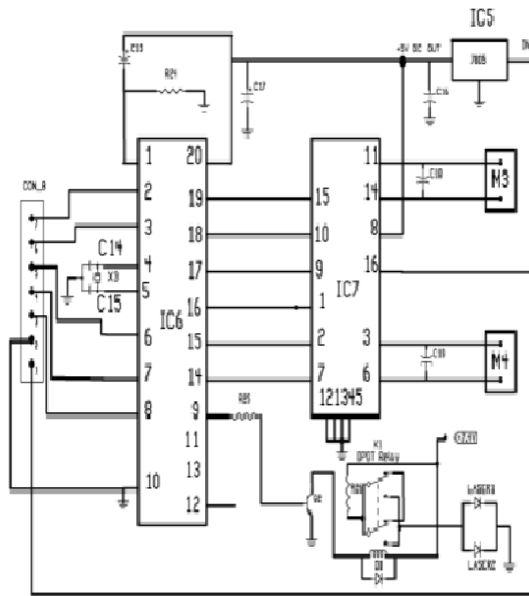

Fig:-
Receiver circuit 2

III.   COMPONENTS OR SUBSYSTEMS DESCRIPTION

A.   AT 89C2051 Microcontroller
The AT89C2051 is a low-voltage, high-performance CMOS 8-bit microcomputer with 2K bytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high-density non volatile memory technology and is compatible with the industry-standard MCS-51 instruction set.

By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C2051 is a power- full microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89C2051 provides the following standard features: 2K bytes of Flash, 128 bytes of RAM, 15 I/O lines, two 16-bit timer/counters, a five vector two-level interrupt architecture, a full duplex serial port, a precision analog comparator, on-chip oscillator and clock circuitry.
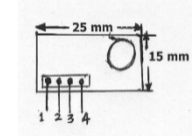
In addition, the AT89C2051 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes.

The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port and interrupt system to continue functioning.

The power-down mode saves the RAM contents but freezes the oscillator disabling all other chip functions until the next hardware reset.
B.   *Transmitter Module-433.92MHZ*

WIRELESS TRANSMITTER MODULE TX1-433.92MHZ-S

C.   RX-1 Receiver Module
This is the radio frequency receiver module, which can facilitate the OEM designers to design their remote control applications in remote control in the quickest way. The circuit is designed with SMD components and the module size is small enough to be able to be fitted in almost any application. Super-regenerative Version W/O Decoder (AM): RX-3304
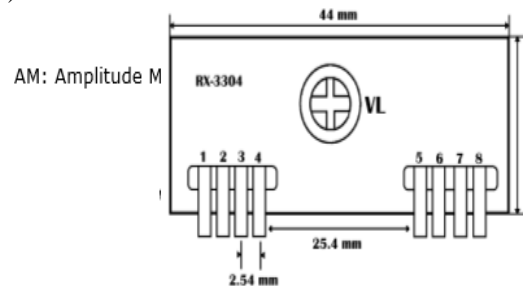

Fig:-5.4 Receiver Module

C.   JMK AV Receiver with Wireless Camera
It is mini wireless monitoring video camera and wireless receiver set for home and small business surveillance and is used here for demonstration purpose. Simply install the wireless camera in the room where we want to monitor and set the wireless receiver in the next room (up to 15 meters away) and hook it up to a TV or DVR to watch the action or record the footage for the security records. Here we are placing this wireless camera in the combat robot.

IV.   SOFTWARE REQUIREMENTS

a.   ASM51 Software
*   8051 belongs to MCS-51 family of microcontrollers
*   MCS-51 was developed by Intel but other manufacturers (e.g., Siemens, Philips) are second sources of this family.
*   8051 implements a separate memory space for programs (code) and data.
*   Both code and data may be internal, however, both expand using external components to a maximum of 64K code memory and 64K data memory.
*   Internal memory consists of on-chip ROM and on-chip data RAM.

- On-chip RAM contains a rich arrangement of general purpose storage, bit addressable storage, register banks, and special function registers.
- In the 8051, the registers and input/output ports are memory mapped and accessible like any other memory location.
- In the 8051, the stack resides within the internal RAM, rather than in external RAM.

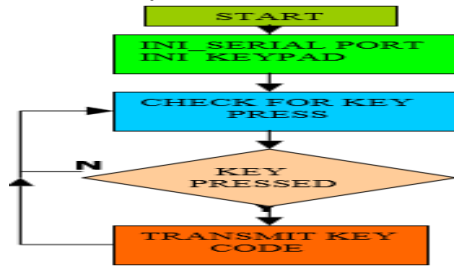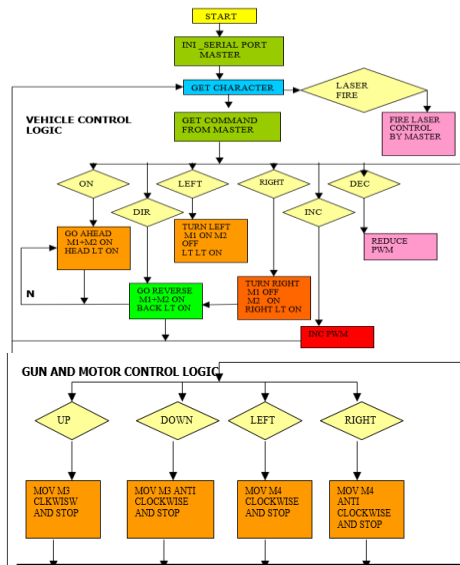## V.   FLOW CHART

A.   Transmitter flow Chart:-

Fig- Flow Chart of Transmitter

Receiver Flow Chart :-

VI.   RESULTS AND DISCUSSION

Remote controllers are designed to direct the orientation of robot and to operate the laser gun. Robot keeps on moving in one modes i.e., Manual mode not in self-mode. It's brought under user's control in the case of manual mode. By watching a real time video which is sent by the camera, the person which is seated at the base station which takes actions against that i.e. movement left, right; shooting the enemy & self suicide. When the situation is not in control the base station observer takes actions i.e. self suicide or self explosion7.

VI.   CONCLUSION

In today's situation India is sick off massive terror attacks, bomb explosions at plush resorts. To avoid such terror attacks TECHNOLOGICAL power must be needed. It's our onus to take an initiative to design a model of a suitable robot that meets combatant needs. So to avoid terror attacks and to ensure more security at the border and high density areas it's wise to maintain a world class military technology in accordance with combatant needs. To avoid such disasters TECHNOLOGICAL power must exceed HUMAN power. Human life and time are important. Even every nation needs its own defense system for their integrity and security. In such a way construction of these robots will carry nation's name, fame globally.

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BIOGRAPHIES

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