MILITARY SURVEILLANCE AND DEPLOYMENT ROBOT

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***Abstract*— The aim of this paper is to focus on a robot that can provide help to the Indian military forces. The robot will act as a surveillance robot which will be of use during day as well as night time. The robot will also drop explosives at certain place which will provide stealth during war like scenario. In certain cases where the robot has been seen by the enemy forces, this robot will also act as a suicide bomber.**

***Index Terms*— Phosphorus-based explosive, camera with night vision, optical design, robot sensing vision.**

I. INTRODUCTION

Need for advancement in technology for military is growing day by day due to enormous development in the field of technology and also reduce loss of precious human life during wars. This is the factor which has encouraged us to develop this technique which results at minimum risk to human life and at minimum cost. Here, instead of exposing the soldier to dangerous situations, we have designed a machine that will effectively do the same job. This robot will be self-sufficient to not only survey the area and tell us about the scenario but also will act as a suicide bomber in tensed times. The robot will be equipped with not only a wireless camera to view the area but an explosive of sufficient energy will be kept inside the robot.

This robot will not only act as a suicide bomber but will also help in hiding the explosives in a safe area so that it can be detonated as and when required, thus offering stealth. For video surveillance, our design offers wireless technology which is flexible, cost efficient and quick way to deploy, particularly over a large area as in a war scenario or even as military surveillance. This idea actually has a great future in military applications and can be expanded in ideology using advanced technology. Many more applications can be added in our proposed technique to monitor more parameters. Similar projects have been used by various military organizations of the world to reduce loss of human life.

The main objective of using a robot is:

A. *Where man dares not venture*

Robots have traditionally been put to use in environments that are too hazardous for man.

B. *For rescue operation*

Robots also work under precarious conditions, for search and rescue after disasters. A host of robots built by the University of South Florida’s Centre for robot assisted search and rescue were in action at the world trade center site within hours after the disaster to dwell into the rubble and rescue survivors. Similarly, robots are also put to work in underground mines. A lot of research today is focused on improving rescue functions of robots.

II. RELATED WORK

Voth D., [1], had proposed an Intelligent System paper which stated that a long-range planning was made to prepare for modern warfare including developing robotics for military use. The Robotics Institute has developed a small, unmanned ground vehicle called a "throw-bot" that can be tossed into buildings to gather and relay information back to soldiers before they enter the building.

Sharkey [2], realized that intelligence and autonomous-robotics research projects have been harnessed to manufacture killing machines. This has benefited the US military by enabling a single battlefield soldier to initiate a large-scale robot attack from the air or on the ground.

Green, W.E. [3] said that more often homeland security, disaster mitigation and military operations are performed in urban environments. Time consuming, labor intensive and possibly dangerous tasks like bomb detection, search-and-rescue and reconnaissance done with robots could save resources. An aerial robot capable of flying in closed quarters like warehouses, stadiums, underground parking lots and tunnels is featured. The working prototype can fly slowly, safely and transmit wireless video for situational awareness. The design is analytic and employs a multi-disciplinary design optimization to formulate the integration of aerodynamics, sensor suite and task performance.

Zuberi O., [4] mentioned in his paper that un-manned systems have rapidly increased both in number and versatility. Their missions can now range from surveillance to bomb disposal and Urban Search and Rescue. This has opened up an unprecedented number of venues for research; and now, the research is not only limited to proof of concept, but has advanced to improving the systems. The earlier versions of such robots that were put into the field faced a host of problems, one of which was of situational awareness of the robot operator. This problem not only limited the utility of the robots but also at times became dangerous for the user himself. In this paper we discuss the development of a generic terrestrial mobile robot along with the integration and development of some techniques to improve situational awareness for the robot operator.

III. PROBLEM IDENTIFICATION

During this process, certain problems were faced regarding the effective working of the robot. The main problem faced was how to drop an explosive at a certain place of rough terrain.
Detonate the explosive once it has been placed at a particular location.

IV. PROPOSED METHODOLOGY

The robot design and construction basically depends upon the weight and the dimensions of the explosive being used. The purpose of this robot will be to reduce the human effort during tense situation. The movement of the robot can be explained as follows.

Robot uses servomotor to achieve steering action and DC motor for drive. Steering command from guidance algorithm

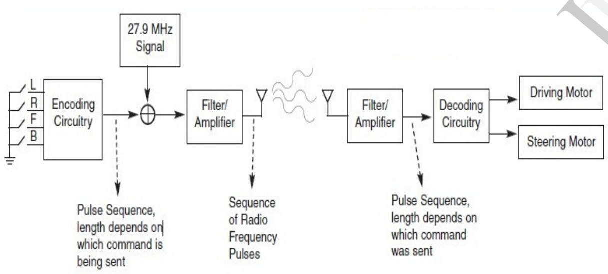

Fig.1: Block diagram of wireless connection

is converted to PWM signal with appropriate pulse width. Velocity command is also converted PWM signal with appropriate duty cycle. Steering operation forms closed loop as servo motor loop is closed in the module itself.

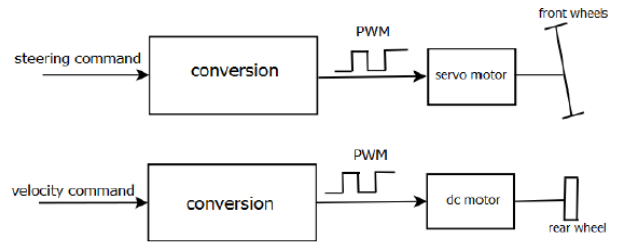

Fig.2 : Block diagram of conversion

The dropping of the explosive is done by placing the explosive below the body of the robot and then a section of the robot is moved so as to drop the explosive. The surveillance of the robot is done by mounting a camera equipped with night vision thus proving flexibility during the day as well as night. The dropping of the bomb will be done by a motor operated door which will open as per requirement and the terrain. The robot will also include proximity sensors which can detect any movement if the robot does not respond to the remote control, thus providing more flexibility of detonating the bomb. Wireless camera will send real time video and audio signals which could be seen on a remote monitor and action can be taken accordingly. Being small in size, it is not possible to track it on their radar. It can silently enter into enemy canopy or tent and send us all the information through its' tiny camera eyes. It can also be used for suicide attack, if required. Based on the input codes master will give command to slave microcontroller and robot will behave accordingly, it moves in the forward n reverse directions. Also it speed it controlled in both the directions. It can even turn left or right while moving forward or in reverse directions. Also it can move instantly in reverse or forward direction without slipping. In case of bumps, it moves in reverse direction and turns left or right and waits for the next instruction. The use of the door mechanism at the lower level of the robot will help us to drop the robot at the required position. The detonation of the explosive will be done when the conditions are as required using the cellular network.

V. HARDWARE SUBSYSTEM DESCRIPTION

A. *Microcontroller circuit* (ATmega 8535)

It is the heart of the system which controls all the activities of transmitting and receiving. The ATmega8535 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing instructions in a single clock cycle, the ATmega8535 achieves throughputs approaching 1 MIPS per MHz allowing the system designer to optimize power consumption versus processing speed. The microcontroller used in our circuit is as shown in figure 3.

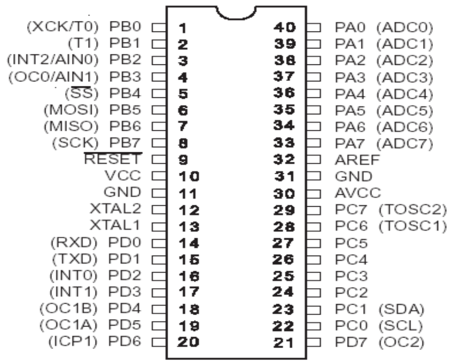

Fig 3: Atmega 8535

B. *DC Motors*

For the movement of our robot, we are using DC motors. It is operated by 12VDC power supply. In any electric motor, operation is based on simple electromagnetism. A current carrying conductor generates a magnetic field; when placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. The motor used to run the robot is shown in figure 4.

Fig 4: DC Motor

C. *Motor Driver L293D*

The device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads and switching power transistors. To simplify use as two bridges each pair of channels is equipped with an enable input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included. This device is suitable for use in switching applications at frequencies up to 5 kHz. The L293D is assembled in a 16 lead plastic package which has 4 centre pins connected together and used for heat sinking. The chip is designed to control 4 DC motors. There are 2 Input and 2 output pins for each motor.

D. *RF Communication*

Radio frequency (RF) is a rate of oscillation in the range of about 3 kHz to 300 GHz, which corresponds to the frequency of radio waves, and the alternating currents which carry radio signals. RF usually refers to electrical rather than mechanical oscillations. The energy in an RF current can radiate off a conductor into space as electromagnetic waves (radio waves). This is the basis of radio technology.

E. *AV Receiver and 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. Depiction of AV Receiver wireless camera is as shown in figure 5.

Fig 5: AV Receiver

Fig 6: Camera

V. SOFTWARE IMPLEMENTATION

AVRDUDE - AVR Downloader Uploader - is a program for downloading and uploading the on-chip memories of Atmel’s AVR microcontrollers. It can program the Flash and EEPROM and where supported by the serial programming protocol, it can program fuse and lock bits. AVRDUDE also supplies a direct instruction mode allowing one to issue any programming instruction to the AVR chip regardless of whether AVRDUDE implements that specific feature of a particular chip.

AVRDUDE can be used effectively via the command line to read or write all chip memory types (EEPROM, flash, fuse bits, and lock bits, signature bytes) or via an interactive (terminal) mode. Using AVRDUDE from the command line it works well for programming the entire memory of the chip from the contents of a file, while interactive mode is useful for exploring memory contents, modifying individual bytes of EEPROM, programming fuse/lock bits, etc. The required program for the movement of the robot can be done using this simple software, which includes only a certain command lines to work with. The required program can be put in the IC using this software.

A. *Flow Charts*

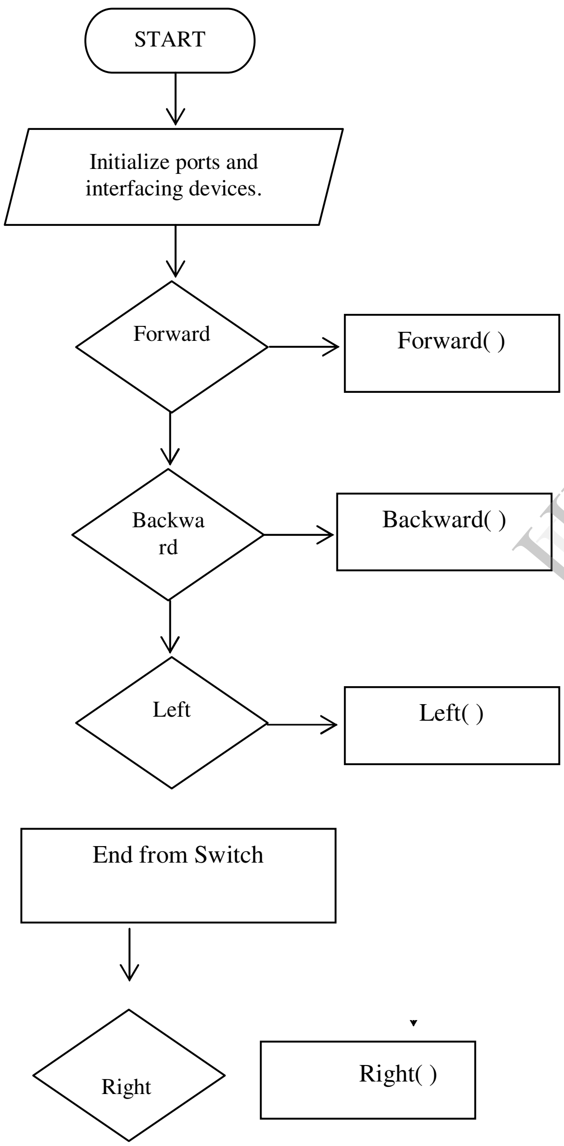

Fig 7: Robot Movement

VI. CONCLUSION

After constructing a deployment robot according to the proposed design, it was concluded that the basic design of the robot 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 suicide bombing 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. Root is even equipped with proximity sensors which gives alert in case of any movement within 25 meter range of the bot.

REFERENCES

[1]. Voth, D., "A new generation of military robots", Green, W.E.; June 2010

[2]. Sharkey, N, " Automated Killers and the Computing Profession" ,. ; Univ. of Sheffield, Sheffield., April 2012

[3]. Green, W.E, "An aerial robot prototype for situational awareness in closed quarters", August 2011

[4]. Zuberi. O, "Human Performance Issues and User Interface Design for Tele-operated Robots",; May 2012

[5]. Kirk, D.R, " Emergency 101 - suicide bombers, crowd formations and blast waves" , June 2010.

[6]. Carafano, J., & Gudgel, A, "The Pentagon's robots: Arming the future", 2007.

[7] http://en.rian.ru/military_news/20130730/182491171/Russia-Develops-Silent-Robotic-Armored-Vehicle.html

[8] http://www.shephard.co.uk/news/uvonline/uv-europe-2011-unmanned-snatch-a-work-in-progress/9271/