

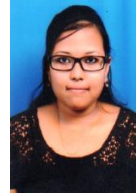
Design and Implementation of Multi Purpose Robot for Military Application



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Abstract:

A robot is a mechanical or virtual artificial agent, usually an electro-mechanical machine that is guided by a computer program or electronic circuitry. There are different kinds of robots that are specifically employed for doing special tasks in military applications. In military services, there are some areas in which some of the tasks involve greater risk and danger, and therefore, those tasks must be performed without military personnel, solely by the robots. This intelligent robot with wireless camera can be operated remotely for monitoring as well as controlling purpose. This robot is capable of capturing videos, and then transmitting them remotely to a PC or TV by using wireless technology. This prototype of military robot is used in war fields to know about the status of the enemies around that area. It monitors the area in various positions with a camera by controlling the Robot with the help of PC commands using Zigbee wireless communication. The Robot has PIR sensor which will detect the intruder or an unauthorized person. Metal detection sensor is also present to detect any land mines present under the ground. When a land mine is detected, the Robot will stop and displays a command "metal detected" on the PC through Zigbee.

Keywords:

Robot, Military applications, Zigbee, PIR Sensor, TV, Land mines, PC Commands.

Introduction:

The advent of new high-speed technology and the growing computer Capacity provided realistic opportunity for new robot controls and realization of new methods of control theory. This technical improvement together with the need for high performance robots created faster, more accurate and more intelligent robots using new robots control devices, new drives and advanced control algorithms. This project describes a new economical solution of robot control systems. The presented robot control system can be used for different sophisticated robot applications. The project aims in designing a robot which is capable of detecting human beings and land mines in its path and which is wirelessly controlled through PC using Zigbee technology and the live images of the war field can be seen on the TV. This robot also shoots using the laser light. It is a very low cost robot used to monitor the Warfield. The robot can be moved in all the directions using the PC wirelessly. Zigbee is a PAN technology based on the IEEE 802.15.4 standard.

Unlike Bluetooth or wireless USB devices, Zigbee devices have the ability to form a mesh network between nodes. Meshing is a type of daisy chaining from one device to another. This technique allows the short range of an individual node to be expanded and multiplied, covering a much larger area. The controlling device of the whole system is a Microcontroller. Whenever the user presses a button in the PC, the data related to that button is sent through Zigbee module interfaced to PC. This data will be received by the Zigbee module in the robot system and feeds this to Microcontroller which judges the relevant task to the information received and acts accordingly. The live images from the camera in the robot system can be sent to TV through AV system. Whenever, land mines are detected, it alerts through buzzer alarm system. The Microcontrollers used in the project are programmed using Embedded C language.

This project utilizes two DC Motors respectively. The DC motor generates torque directly from DC power supplied to the motor by using internal commutation, stationary permanent magnets, and rotating electrical magnets. It works on the principle of Lorentz force, which states that any current carrying conductor placed within an external magnetic field experiences a torque or force known as Lorentz force. Advantages of a brushed DC motor include low initial cost, high reliability, and simple control of motor speed. Disadvantages are high maintenance and low life-span for high intensity uses.

Maintenance involves regularly replacing the brushes and springs which carry the electric current, as well as cleaning or replacing the commutator. These components are necessary for transferring electrical power from outside the motor to the spinning wire windings of the rotor inside the motor. The driver used for DC Motors is 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 (such as relays solenoids, DC and stepping motors) and switching power transistors.

This project makes use of a micro controller, which is programmed, with the help of embedded C instructions. This Microcontroller is capable of communicating with input and output modules. The controller is interfaced with dc motors, which are fixed to the Robot to control the direction of the Robot. An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers.

Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result.

The War field robot using 16F877A Microcontroller is an exclusive project that can move the robot according to the instructions given by Computer and also alerts through buzzer when any metal is being detected by it. It also alerts when any human beings are near by using PIR sensor.

PC SECTION:

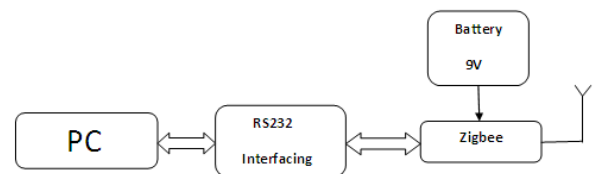


FIG : PC Section of Multipurpose Robot

TV Section:

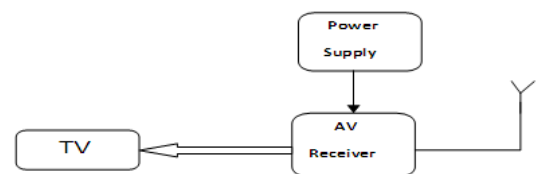
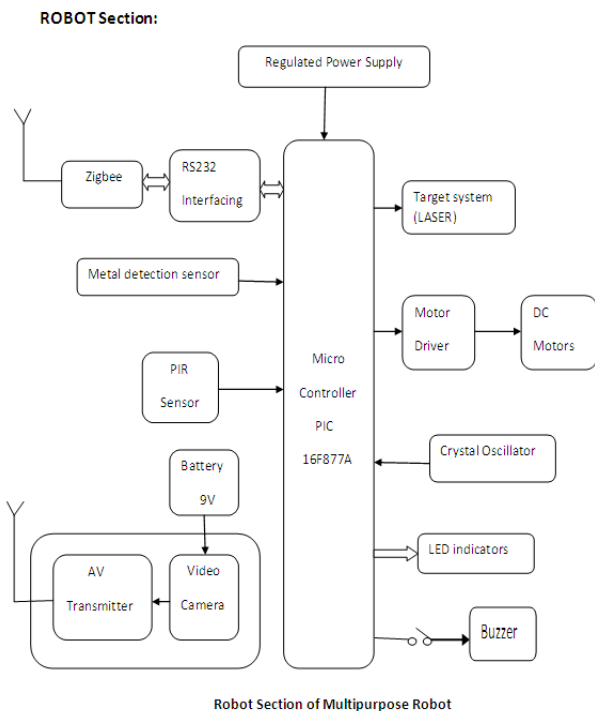


FIG : TV Section of MULTIPURPOSE ROBOT



Zigbee Technology:

ZigBee is an established set of specifications for wireless personal area networking (WPAN), i.e., digital radio connections between computers and related devices. This kind of network eliminates use of physical data buses like USB and Ethernet cables. The devices could include telephones, hand-held digital assistants, sensors and controls located within a few meters of each other. ZigBee is one of the global standards of communication protocol formulated by the relevant task force under the IEEE 802.15 working group.

The fourth in the series, WPAN Low Rate/ZigBee is the newest and provides specifications for devices that have low data rates, consume very low power and are thus characterized by long battery life. Other standards like Blue tooth and IrDA address high data rate applications such as voice, video and LAN communications. The ZigBee Alliance has been set up as “an association of companies working together to enable reliable, cost-effective, low-power, wirelessly networked, monitoring and control products based on an open global standard”.

Once a manufacturer enrolls in this Alliance for a fee, he can have access to the standard and implement it in his products in the form of ZigBee chipsets that would be built into the end devices. Philips, Motorola, Intel, HP are all members of the Alliance. The goal is “to provide the consumer with ultimate flexibility, mobility, and ease of use by building wireless intelligence and capabilities into every day devices.

ZigBee technology will be embedded in a wide range of products and applications across consumer, commercial, industrial and government markets worldwide. For the first time, companies will have a standards-based wireless platform optimized for the unique needs of remote monitoring and control applications, including simplicity, reliability, low-cost and low-power”.

Metal detection Sensor SM12

A metal detector is a device which responds to metal that may not be readily apparent. The simplest form of a metal detector consists of an oscillator producing an alternating current that passes through a coil producing an alternating magnetic field. If a piece of electrically conductive metal is close to the coil, eddy currents will be induced in the metal, and this produces an alternating magnetic field of its own. If another coil is used to measure the magnetic field (acting as a magnetometer), the change in the magnetic field due to the metallic object can be detected. The first industrial metal detectors were developed in the 1960s and were used extensively for mining and other industrial applications. Uses include de-mining (the detection of land mines), the detection of weapons such as knives and guns, especially in airport security, geophysical prospecting, archaeology and treasure hunting. Metal detectors are also used to detect foreign bodies in food, and in the construction industry to detect steel reinforcing bars in concrete and pipes and wires buried in walls and floors. Metal detectors use electromagnetic fields to detect the presence of metallic objects. They exist in a variety of walk-through, hand-held, and vehicle-mounted models and are used to search personnel for hidden metallic

objects at entrances to airports, public schools, courthouses, and other guarded spaces; to hunt for landmines, archaeological artifacts, and miscellaneous valuables; and for the detection of hidden or unwanted metallic objects in industry and construction. Metal detectors detect metallic objects, but do not image them. An x-ray baggage scanner, for example, is not classed as a metal detector because it images metallic objects rather than merely detecting their presence.

PIR sensor

The PIR Sensor detects motion up to 20 feet away by using a Fresnel lens and infrared-sensitive element to detect changing patterns of passive infrared emitted by objects in its vicinity. Inexpensive and easy to use, it's ideal for alarm systems, motion-activated lighting, and holiday props. The PIR Sensor is compatible with all Parallax microcontrollers. BASIC Stamp and SX/B code is available under Downloads below, and Spin code is posted to the Propeller Object Exchange. PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses.

They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors. PIRs are basically made of a pyroelectric sensor which can detect levels of infrared radiation. Everything emits some low level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is actually split in two halves. The reason for that is that we are looking to detect motion (change) not average IR levels. The two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low.

ADVANTAGES AND DISADVANTAGES

Advantages:

1. Detection of metals in mines.
2. This Robot can be operated from anywhere in the world.

3. Fast response.
4. Efficient and low cost design.
5. Low power consumption.
6. Wireless controlling of Robot through PC using Zigbee Technology.

Disadvantages:

1. The quality of tone received depends on the network signal strength.
2. Limited distance.

Applications:

1. It can be used in places where humans cannot work.
2. Mainly in military applications, robots play a vital role for detection of explosives.
3. Can be used to detect metals.
4. Can be used in mines.
5. Security system.
6. Remote surveillance for War fields.

Result:

The project "Design and Implementation of Multipurpose Robot for Military Application" was designed such that the robot can be operated using PC which is capable of detecting human beings and land mines in its path and which is wirelessly controlled through PC using Zigbee technology and the live images of the war field can be seen on the TV. This robot also shoots using the laser light. It is a very low cost robot used to monitor the Warfield. The robot can be moved in all the directions using the PC wirelessly.





Conclusion:

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

Future Scope:

Our project "War field robot" is mainly intended to operate a robot using PC. The system also to detects the metallic presence and the PIR sensor detects any human presence in its way and if any human presence is being detected it stops and buzzers an alarm system. The micro controller is programmed in such a way that the depending on the pressed key the robot will move intelligently and with the help of metal detection sensor it detects the presence of metallic objects in mines and alerts through buzzer alarm system. The drawback of this project is that the status of robot is not known.

This can eliminate by having a GSM module, which gives the status of robot working. We can also add Ultrasonic module, which is used for obstacle detection with GSM module which gives respective information. By connecting wireless camera to the robot, then we can see the outer world from our personal computer only by using GPRS and GPS. We can use this robot at so many fields and we can use to handle so many situations.

By connecting bomb detector to the robot, we can send it to anywhere i.e (battle field, forests, coal mines, to anyplace) by using our personal computer and we can able to detect the bomb at field, here sensor detects the bomb and gives information to micro controller and it gives the information to transceiver and it sends the information to the personal computer. By connecting temperature sensor to the robot we can get the temperature of dangerous zones in personal computer itself instead of sending human to there and facing problems at field we can send robot to there and sensor will detect the temperature and it gives information to the micro controller and micro controller gives the information to the transceiver from that we can get the data at pc side. By connecting smoke sensor to the robot we can get the information related concentration of smoke or gases in respective field's i.e. (coal mines, dangerous zones, etc).

sensor sense the information and it give to the micro controller and it gives to the transceiver and from that we get the information in personal computer. By connecting corresponding instruments to the robot we can use it in agriculture for farming purpose. This robot can move either forward and backward and left and right depend upon our instructions so we can do some part of agriculture from pc only by using robot. By connecting firing instrument and wireless camera to the robot we can fire the target from pc. Here by using camera we can see the opposite target and we can fire the target from personal computer by pressing selected button and we can easily handle the situations like Mumbai terrorist's attack without loss of human life's and we can decrease our soldiers effort too.

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