All Terrain Offensive and Defensive Robot

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ABSTRACT

Generally, various risky tasks or certain difficult operations cannot be done completely by humans and thus there is need for change in present era. As robots play vital roles in different fields of industries, medical, colleges, home appliances, military and defence, thus robots can be good and effective option for such difficult purposes. The proposed work is to develop an all terrain robot prototype. The robots which are presently in the market works on simple terrains while this project claims to make a prototype which can work on plain surfaces as well as rough surfaces such as forests, hilly and rocky areas. This project presents a offensive and defensive robot which uses different technologies like Arduino, Android Application, Bluetooth module and Laser Module. It develops a low voltage power supply, low cost and wireless robot prototype which is controlled using microcontroller and android application.

KEYWORDS: *Microcontroller, Arduino, Android Application, Bluetooth module and Laser Module*

1. INTRODUCTION

Robotics is the branch of technology that deals with the design, construction, operation and application of robots, as well as computer systems for their control, sensory feedback, and information processing. These technologies deal with automated machines that can take the place of humans in appearance, behavior, and/or cognition. Many of today's robots are inspired by nature contributing to the field of bio-inspired robotics.

Robots have become a subject of great interest now-a-days. In our imagination, a robot is a machine that looks like a human being. Robots are in fact, defined as man-made mechanical devices that can move by themselves, whose motion must be modeled, planned, sensed, actuated and controlled, and whose motion behavior can be influenced by "programming".

The concept of creating machines that can operate autonomously dates back to classical times, but research into the functionality and potential uses of robots did not grow substantially until the 20th century. Throughout history, robotics has been often seen to mimic human behavior, and often manage tasks in similar fashion. Today, robotics is a rapidly growing field, as technological advances continue, research, design, and building new robots do jobs that are hazardous to people such as defusing bombs, mines and exploring shipwrecks.

As strange as it might seem, there really is no standard definition for a robot. However, there are some essential characteristics that a robot must have and this might help you to decide what is and what is not a robot is. It will help you to decide what features you will need to build into a machine before it can count as a robot.

A robot has these essential characteristics:
➢ **Sensing**: First of all your robot would have to be able to sense itssurroundings. It would do this in ways that are not dissimilar to the way that you sense your surroundings. Giving your robot sensors (eyes), touch and pressure sensors (hands) taste sensors (tongue) will give your robot awareness of its environment.
➢ **Movement:** A robot needs to be able to move around its environment. Whether rolling on wheels, walking on legs or propelling by thrusters a robot needs to be able to move. To count as a robot either the whole robot moves, like the sojourner or just parts of the robot moves, like the Canada arm.
➢ **Energy:** A robot needs to be able power itself. A robot might be solar powered, electrically powered, battery powered. The way your robot gets its energy will depend on what your robot needs to do.
➢ **Intelligence**: A robot needs some kind of "smarts." This is where programming enters the pictures. A

programmer is the person who gives the robot its 'smarts.' The robot will have to have some way to receive the program so that it knows what it is to do.

It is a system that contains sensors, control systems, manipulators, power supplies and software all working together to perform a task. Designing, building, programming and testing a robot is combination of physics, mechanical engineering, electrical engineering, structural engineering, mathematics and computing. In some cases biology, medicine, chemistry might also be involved. A study of robotics means that students are actively engaged with all of these disciplines in a deeply problem-posing, problem-solving environment.

ISSAC ASIMOV popularized the term Robotics. Asimov is a visionary who envisioned in the 1930's the position brain for controlling robots. He invented three laws of robotics:

➢ A robot may not harm a human through action or inaction, allow human to come to harm.
➢ A robot must obey the orders given by human beings; expect such when orders conflict with the first law.
➢ A robot must protect its own existence as long as it does not conflict with first or second laws.

2. LITERATURE REVIEW
Prototype robot which can navigate in very rough terrain, ascend and descend staircase as well as sloping surface and cross ditches. The robot is made up of six differentially steered wheels and some passive mechanism, making it suitable to cross long ditches and landscape undulation. Static stability of the developed robot have been carried out analytically and navigation capability of the robot is observed through simulation in different environment, separately. Description of embedded system of the robot has also been presented and experimental validation has been made along with some details on obstacle avoidance. Finally the limitations of the robot have been explored with their possible reasons. [1]

Most of the military organization now takes the help of robots to carry out many risky jobs that cannot be done by the soldier. These robots used in military are usually employed with the integrated system, including video screens, sensors, gripper and cameras. The military robots also have different shapes according to the purposes of each robot. Here the new system is proposed with the help of low power Zigbee wireless sensor network to trace out the intruders (unknown persons) and the robot will take the necessary action automatically. Thus the proposed system, an Intelligent Unmanned Robot (IUR) using Zigbee saves human live and reduces manual error in defence side. This is specially designed robotic system to save human life and protect the country from enemies. [2]

Modern approach for surveillance at remote and border areas using multifunctional robot based on current IOT used in defence and military applications. This robotic vehicle has ability to substitute the solider at border area t provide surveillance. The robotic vehicle works both as autonomous and manually controlled vehicle using internet communication medium. This multisensory robot used to detect presence of enemy capture it in camera and give the live streaming to the authorized person Surveillance is major role. This paper presents a smart surveillance robot for military application by using Raspberry Pi for security purpose. An field Raspberry pi sends a wireless command

which is received by Authorized person on web Page and accordingly robot moves. [3]

3. EXISTING SYSTEM
Robotic arm based robots were stationary. Previously used military robots were designed only for a single terrain track purpose and they did not have any kind of robotic arm.

4. PROPOSED SYSTEM
This project is divided into modules for better understanding of the circuit. The modules include Arduino UNO Microcontroller board, Motor driver, Servo motor, laser and an Wireless A\V Camera. The coding is done in Arduino software.

Microcontroller is the heart of this project which controls the robot. Robot moves according to the input controls given by the microcontroller. Our proposed system All Terrain Offensive and Defensive robot uses Arduino UNO (microcontroller Atmega 328), DC motor drivers and Servo motor driver which drive the DC motors and servo motor respectively, Laser module to target and an Robotic Arm to pick up and drop bombs which is monitored by camera and the whole system is controlled via Bluetooth according to the commands given by the user.

5. BLOCK DIAGRAM
The figure below illustrates the overall control function of the system. The system is directly installed beside the conventional electrical switches on the wall. The strong light beam from the LASER gun which can either harm the target or just produce a spot to detect the target. an Robotic Arm to pick up and drop bombs which is monitored by camera and the whole system is controlled via Bluetooth according to the commands given by the user. Every component is connected to the Arduino such as Motor drivers, Servo motor driver, Laser module, Wireless A\V Camera and Bluetooth module which mainly controls the Robot direction.
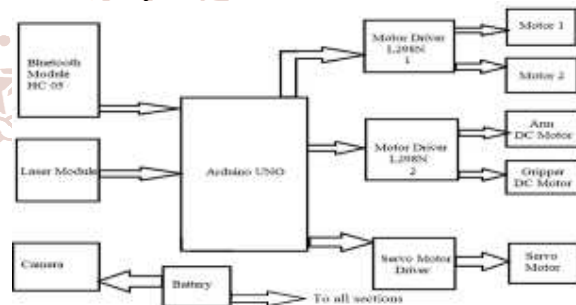

Figure 1: block diagram

6. WORKING AND EXECUTION:
With the development of technologies especially in robotic technology, robots are predominant in many of the applications. Some of those are of highly risky type and hazardous areas. Military and battle field applications are now growing their usage of robots in some crucial and complicated tasks. Before going to the details about Robots with Laser gun, let us have quick understanding of LASER as a weapon.

A LASER (Light Amplification by Simulation Emission) beam is actually a uni-directional strongly focused light unlike the one from a simple bulb. It consists of synchronized troughs and crests, i.e. the waves do not interfere with each other. This produces a strong focused light of very high power of the order of 1000 to 1 million times greater than a typical

bulb light. It is device that controls the emission and absorption of the photons by pumping sufficient amounts of energy. In this, source of photons are amplified into a beam of light. The wave length of these lasers are varies into different spectrum like visible, infrared and ultraviolet.

Principle behind the LASER revolves around three things; those are absorption, spontaneous emission and stimulated emission. An adequate amount of energy from the photon is interacts with the atom, causing the atom to jump from lower energy state to higher energy state. This atom is fall back to the lower energy state by emitting a photon called as spontaneous emission. In stimulated emission is the release of energy from the atom by artificial means, so the photon interacts with the excited atom, has the same energy and polarization as the incident photon.

The robot while moving in the required direction shoots strong light beam from the LASER gun which can either harm the target or just produce a spot to detect the target. The LASER needs to be driven by some energy source. In a simple prototype design using a basic LASER pen, the device is driven by a transistor acting as a switch. The transistor receives low logic signal from the microcontroller and is in off condition, making the LASER module directly connected to the 5 V power supply.

A robotic arm is a type of mechanical arm, usually programmable, with similar functions to a human arm; the arm may be the sum total of the mechanism or may be part of a more complex robot. The links of such a manipulator are connected by joints allowing either rotational motion (such as in an articulated robot) or translational (linear) displacement. The links of the manipulator can be considered to form a kinematic chain. The terminus of the kinematic chain of the manipulator is called the end effector, and it is analogous to the human hand. A typical robotic arm is made up of seven metal segments, joined by six joints. The computer controls the robot by rotating individual step motors connected to each joint. For difficult, dangerous tasks, a specialist in remote handling technology, has developed the disarming robot. The all-terrain mobile robot on caterpillar treads is controlled wirelessly via radio. Lead gel batteries provide it with power, which makes it completely independent. Because of the low center of gravity, the manipulator arm can lift up to 66 lbs securely. It is used for disposal of bombs in this project.

6.1 Advantages and Applications of ATR:
Advantages:
➢ Good traction
➢ All terrain Robot with weight growth potential
➢ Low power consumption
➢ Wireless control

Applications:
➢ Military operations
➢ Surveillance along Line of Control
➢ Picking up and dropping bombs (disposal)
➢ A laser gun for defense purpose can also be used for a combat.

7. RESULT
The All Terrain Offensive and Defensive Robot was successfully executed. The system was successfully implemented to move the robot left, right, forward, backward or stay in the same position.

The Laser module to target and a Robotic Arm to pick up and drop bombs which is monitored by camera and the whole system is controlled via Bluetooth according to the commands given by the user.

Figure 2: final prototype of the project

8. CONCLUSION AND FUTURE SCOPE
8.1 Conclusion:
The proposed robot has scope of widespread industrial, defense and home applications. It can be used to analyze the environment of a coal mine without any human intervention. It can also be employed in a hostage situation to pin point the exact location of terrorists with the help of LASER module, saving many lives during rescue mission. Various advantages of this system are its range of operation up to 100m, secure data transfer can be done with the help of Bluetooth Module and Android Application. Entire project will help in Military and Defense operations such as human detection, distance measurement, obstacle detection and also due to their bug like wheels it can travel in all terrains.

8.2 Future Scope:
The Arduino used can be replaced by powerful regulatory circuits which are more efficient than Arduino UNO. The components used in our projects are confined to particular distance. The range can be increased by adapting new technologies by using Ardunio Lily Pad, Mega, Leonardo and there is a wireless communication of Zigbee, Wi-Fi, etc. Weapon system can be advanced in this robot. This also can be made into Automatic robot by improvising the GPS system and Artificial Intelligence.

9. REFERENCES
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