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Wireless ROBOT with Electromagnetic Gun for Security & Surveillance Purpose

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Abstract: *Many advances in electromagnetic (EM) rail gun and power supply technology have been made in recent years. Laboratory experiments with rail guns have demonstrated muzzle velocities of 2–3 km/s and muzzle energies 8 MJ. The extension of this technology to the muzzle velocities (7500 m/s) and energies (10 GJ) needed for the direct launch of payloads into orbit is very challenging, but may not be impossible. For launch to orbit, even long launchers (1000 m) would need to operate at accelerations 1000 gees to reach the required velocities, so that it would only be possible to launch rugged payloads, such as fuel, water, and material. A rail gun system concept is described here and technology development issues are identified. Estimated launch costs could be attractively low ($600/kg) compared with the Space Shuttle ($20 000/kg), provided that acceptable launch rates can be achieved. Further evaluations are needed to establish the technical and economic feasibility with confidence..*

Keywords: - *Electromagnetic Rail Gun, Robotics, unmanned ground vehicle (UGV)*

I. Introduction

Robotics can be described as the current pinnacle of technical development. Robotics is a confluence science using the continuing advancements of mechanical engineering, material science, sensor fabrication, manufacturing techniques, and advanced algorithms. The study and practice of robotics will expose a dabbler or professional to hundreds of different avenues of study. For some, the romanticism of robotics brings forth an almost magical curiosity of the world leading to creation of amazing machines. A journey of a lifetime awaits in robotics. Robotics can be defined as the science or study of the technology primarily associated with the design, fabrication, theory, and application of robots. While other fields contribute the mathematics, the techniques, and the components, robotics creates the magical end product. The practical applications of robots drive development of robotics and drive advancements in other sciences in turn. Crafters and researchers in robotics study more than just robotics. The promise of robotics is easy to describe but hard for the mind to grasp. Robots hold the promise of moving and transforming materials with the same lean and ease as a computer program transforms data. Today, robots mine minerals, assemble semi- processed materials into automobile components, and assemble those components into automobiles. On the immediate horizon are self-driving cars, robotics to handle household chores, and assemble specialized machines on demand. It is not unreasonable to imagine robots that are given some task, such as reclaim desert into photovoltaic cells and arable land, and left to make their own way. Then the promise of robotics exceeds the minds grasp. In summary, robotics is the field related to science and technology primarily related to robotics. It stands tall by standing the accomplishments of many other fields of study.

II. Problem Statement

Humans have been fighting one another since time immemorial. When multiple nations fight with one-another, each one wants to be strongest among all, and in present technology when it comes to a war, it is not only sufficient to have man power, but it is also important to have latest tools which makes a country strong enough to win a war against their opponents. Here comes the picture of an unmanned ground vehicle (UGV), which saves human lives in defense operations, which can go to a place that could be completely unreachable to human beings and which can sense the presence of metals, fire, smokes etc unlike humans.

III. Indentations And Equations

The main objective of this project is to design & develop a UGV (unmanned ground vehicle) which can be used for surveillance, rescue & defense purposes.

The objectives are,

- To use for Security and Surveillance.
- For sharing location.
- Pick and place purpose.
- Defense purpose

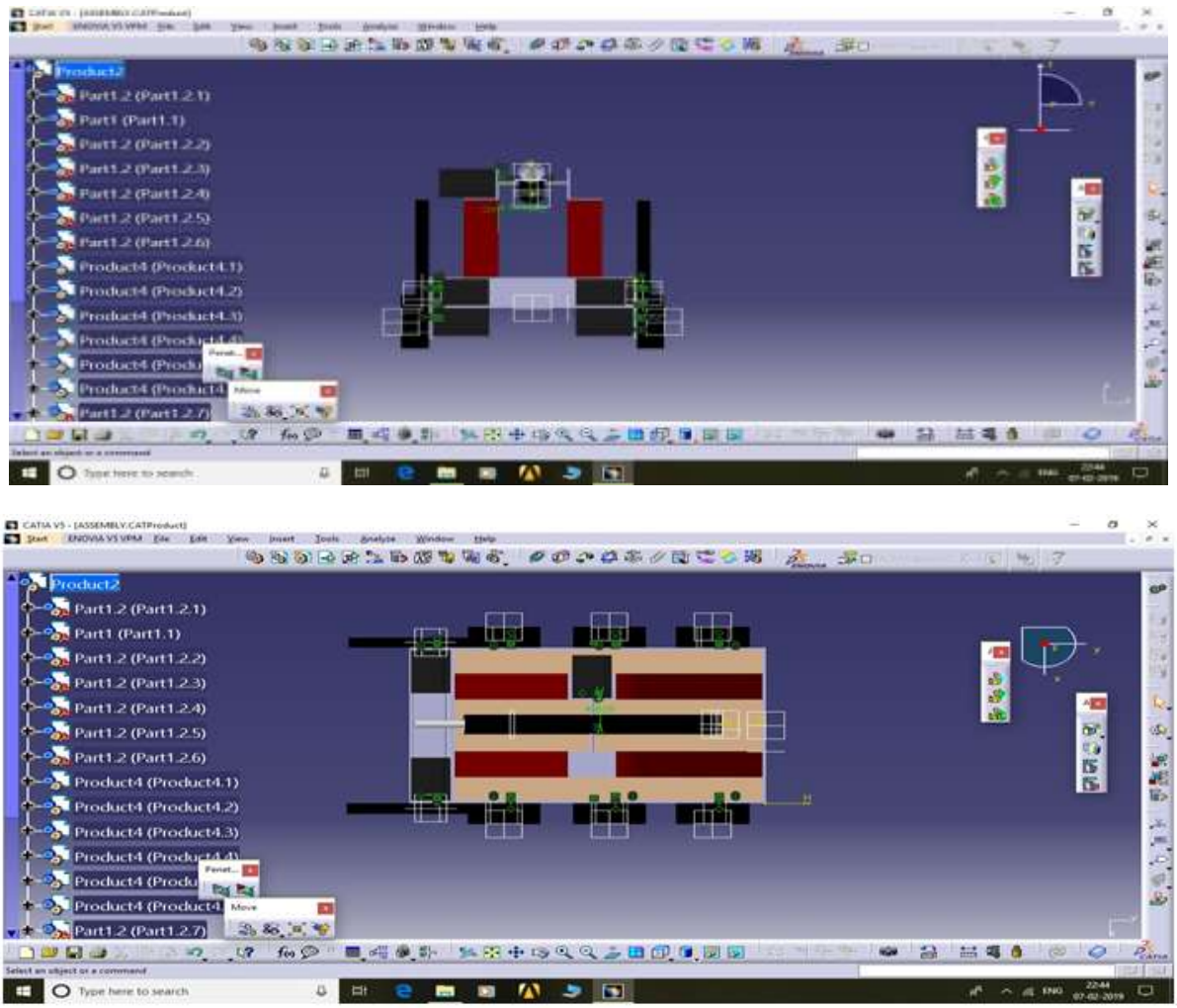

Fig.1.CAD Model

1) Construction And Working

- ***Chassis:-***
- ***Construction:-***

The main component on which the all parts rest & are fixed is Chassis. The chassis is made up of 2x2 inch Aluminum angles. It has dimensions- 2.5 ft. in length & 1.75 ft. in width. This angles are screwed together & further formed a chassis.

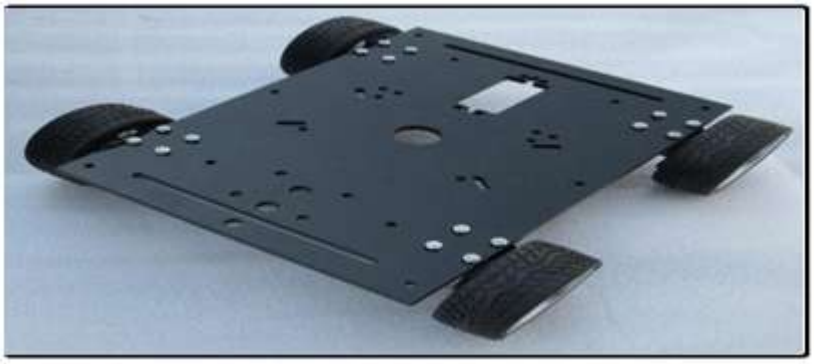

Fig.2. Chasis

1. Bore Wheels

- **Construction:-**

The robot rolls or is able to make movements using this bore wheels. This Bore wheels are 4 inches in diameter. Its outer circumference has groves which help for better grip on road. These grooves help the robot for 0' rotation. The wheels are connected to DC reduction motor separately of 60 rpm. The bore wheels are total 6 in quantity.

Fig.3. Bore Wheels

2. Electromagnetic Gun:-

Construction:-

Our project includes electromagnetic gun which is used to fire bullet through it. The main advantage of this gun is that it is totally eco-friendly and creates no pollution. It has induction coils wound in it which create magnetic flux and push the bullet upwards out of the barrel. It has 2 induction coils & iron core bullet in it. The size of gun barrel is 1.5 cm in diameter & 1 ft in length.

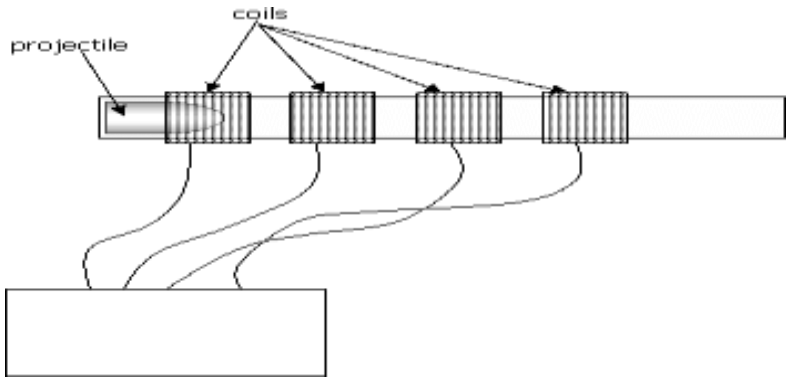

Fig.4. Electromagnetic Gun

Working:-

1) Coil gun Basics

The Reluctance Coil gun:-

A reluctance coil gun is basically a solenoid which can launch iron or steel projectiles by careful timing of the coil current. The cutaway diagram below shows the very simplest of coilgun designs.

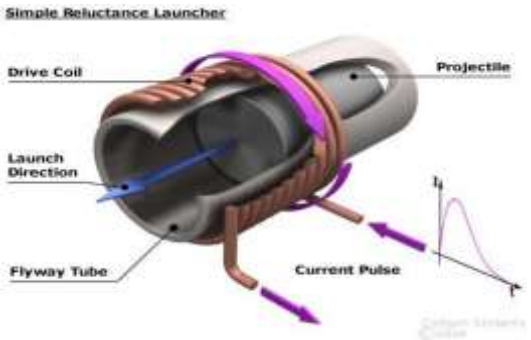

Fig.No.5.Coil gun Basics

A coil is wound over a non-conducting 'flyway' tubeand the projectile is positioned at the breech end of the tube. If a short current pulse is passed through the coil the projectile will accelerate into the coil, and if this pulse is terminated just as the projectile gets to the middle of the coil it will leave with a gain in velocity. This is, in a nutshell, how a reluctance coilgun works. One of the most important facets of coilgun design is the correct timing and shaping of the current pulse. There are many refinements which can be implemented to improve the performance and this site explores several avenues of investigation. Research on the reluctance coilgun isn't as widespread in the literature as its cousin the induction coilgun, however there are some papers that provide a basic theoretical framework.

Gripper Arm:-

Construction:-

Gripper arm is a type of arm which is made by using different linkages & is operated by using DC reduction motor of 100 rpm. It serves the purpose of pick & place such a picking a bomb & placing it at different place. It also diffuses the bomb in case it is needed. It is connected to the rear end of the project. It exerts a force of 13N on the object. It can lift load from 0-150 Grams. When the gripper is given command through the laptop then the motor actuates and works likewise.

Fig.6. Gripper Arm

Wireless Camera

The video capturing is done using wireless camera. Nextly the transmission is done wirelessly by radio frequency. A receiver is connected to the display source which gets signal by camera & it displays likewise. The range of receiver is 30 mtrs.

Fig.7. Wireless Camera

Signal Transmission & receiving system

Mainly our project is controlled wirelessly. So it's very important unit of our project. The transmission takes place by Radio Frequency up to 2.5GHz.

The transmitters & receivers used are as follows:-

Zigbee- Transmitter & Receiver:-

Fig. 8. Transmitter

Construction:-

For the last few years, we've witnessed a great expansion of remote control devices in our day-to-day life. Five years ago, infrared (IR) remotes for the television were the only such devices in our homes. Now I quickly run out of fingers as I count the devices and appliances I can control remotely in my house. This number will onlyincrease as more devices are controlled or monitored from a distance. To interact with all these remotely controlled devices, we'll need to put them under a single standardized control interface that can interconnect into a network, specifically a HAN or home-area network. One of the most promising HAN protocols is ZigBee, a software layer based on the IEEE 802.15.4 standard. This article will introduce you to ZigBee - how it works and how it may be more appropriate than simply accumulating more remotes. Why so many remotes? Right now, the more remotely controlled devices we install in our homes, the more remotes we accumulate. Devices such as TVs, garage door openers, and light and fan controls predominantly support one-way, point-to-point control. They're not interchangeable and they don't support more than one device. Because most remotely controlled devices are proprietary and not standardized among manufacturers, even those remotes used for the same function (like turning on and off lights) are not interchangeable with similar remotes from different manufacturers. In other words, you'll have as many separate remote control units as you have devices to control. Some modern IR remotes enable you to control multiple devices by "learning" transmitting codes. But because the range for IR control is limited by line of sight, they're used predominantly for home entertainment control. A HAN can solve both problems because it doesn't need line-of-sight communication and because a single remote (or other type of control unit) can command many devices. Of the few attempts to establish a standard for home networking that would control various home appliances, the X-10 protocol is one of the oldest. It was introduced in 1978 for the Sears Home Control System and the Radio Shack Plug'n Power System. It uses power line wiring to send and receive commands. The X-10 PRO code format is the de facto

standard for power line carrier transmission. X-10 transmissions are synchronized to the zero-crossing point of the AC power line. A binary 1 is represented by a 1ms burst of 120KHz at the zero-cross point and binary 0 by the absence of 120KHz. The network consists of transmitter units, receiver units, and bidirectional units that can receive and transmit X-10 commands. Receiving units work as remote control power switches to control home appliances or as remote control dimmers for lamps. The transmitter unit is typically a normally-open switch that sends a predefined X-10 command if the switch is closed.

The X-10 commands enable you to change the status of the appliance unit (turn it on or off) or to control the status of a lamp unit (on, off, dim, bright). Bidirectional units may send their current status (on or off) upon request. A special code is used to accommodate the data transfer from analog sensors. Currently, a broad range of devices that control home appliances using the X-10 protocol is available from Radio Shack or web retailers such as www.smarthome.com and www.x10.com. Availability and simplicity have made X-10 the best-known home automation standard. It enables plug-and-play operation with any home appliance and doesn't require special knowledge to configure and operate a home network. The downside of its simplicity is slow speed, low reliability, and lack of security. The effective data transfer rate is 60bps, too slow for any meaningful data communication between nodes. High redundancy in transition is dictated by heavy signal degradation in the power line. For any power appliances, the X-10 transmission looks like noise and is subject to removal by the power line filters. Reliability and security issues rule out the use of the X-10 network for critical household applications like remote control of an entry door.

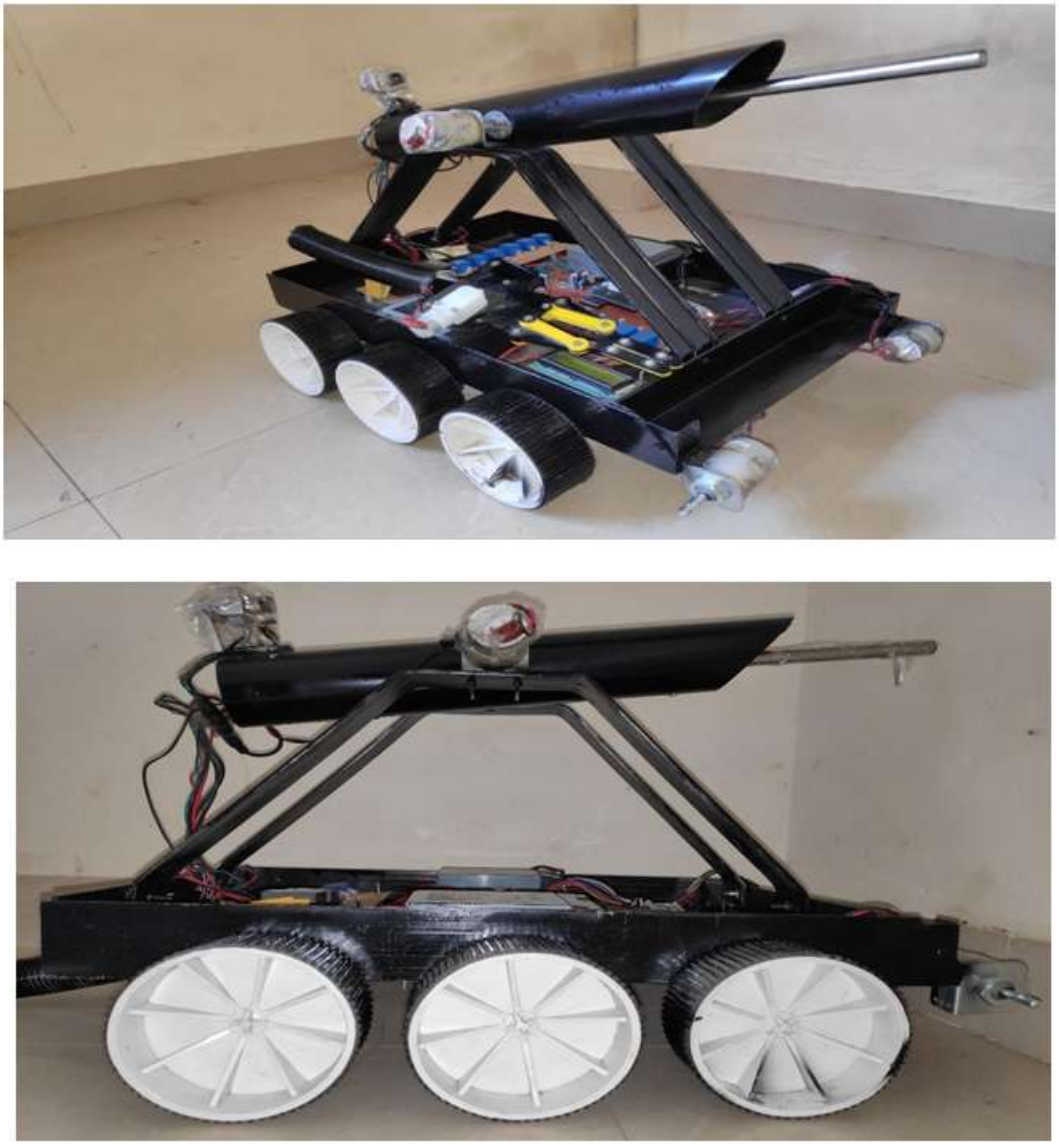

Image 01.Actual Photo

* FUTURE SCOPE

1.Obstacle sensing can be upgraded with ultra-sonic sensors which provide accurate Sensing.
2.Artificial Intelligence algorithms could be used to for better analysis of obstacles And decision making.
3.It can be developed for operating at all temperature range
4.GPS system for location sharing.
5.Staircase climbing for reaching on the stairs.

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