

An Experiment with circular saw blade – SPIKE Robot

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Abstract:- Robotics is an art which comprises of technology which deals with the design, construction, operation, and application of robots as well as computer systems for their control, sensory feedback, and information processing. This work gives the reader detail information about the Spike Robot that was created with basic wired robotics concept but reserves the capability to perform many actions, possible modifications will surely be going to enhance that capability.

Keywords:- Circular saw blade, Geared Motor, Rectifier, Transformer

I. INTRODUCTION

As robots have become more advanced and sophisticated, experts and academics have increasingly explored the question of what ethics might govern robot's behavior, and whether robots might be able to claim any kind of social, cultural, ethical or legal rights. One scientific team has said that it is achievable that a robot brain will exist by 2020.

A computer scientist, scientific author and a mathematician Vernor Vinge has suggested that a moment may come when computers and robots are smarter than humans. He calls this "The Singularity". He suggests that it may be somewhat or possibly very dangerous for humans. This is discussed by a philosophy called Singularitarianism.

There are also concerns about technology which might allow some equipped robots to be controlled mainly by other robots.

Spike: The legal meaning of the word Spike is 'thin, pointed piece of metal, wood, or another rigid material'. So as the name and meaning suggests, the robot's name was kept so because of its unique sharp circular saw blade that retains the capacity to chop away anything that comes in its way. Its control and locomotion was controlled by the user through the basic components listed below:

A **switch** is an electrical component that can break an electrical circuit, by either interrupting the current or diverting it from one conductor to another. The most familiar form of switch is a manually operated electromechanical device with one or more sets of electrical contacts, which are connected to external circuits. Each set of contacts can be in one of two states: either "closed" meaning the contacts are touching and electricity can flow between them, or "open", meaning the contacts are separated and the switch is not conducting.

In case of SPIKE the switches controlled almost every single movement of the robot undeviatingly or periphrastically.

II. POWER SUPPLY TO THE ROBOT

A robocar needs DC power to operate wheels and ballista. This supply is generally between 12 to 36 Volts. In Spike the weapon used was a self starter motor of two wheeler bikes which needs 24 volt DC. The self starter motor needs 24 volt lead acid battery with the capacity of 14Ah. Spike is a wired robot so we had an option to give external supply to the circular saw blade that's why we used AC to DC step down transformer. The wheels are powered by another transformer. The use of another transformer for wheel's section is explained further.

1. Initial power supply- The initial power supply is 230V AC given to the transformer. This is generally a domestic power supply used in regular basis.

2. Step down transformer –Transformers are the core of the electronic and electrical as well. These transform the voltage level to another level by increasing or decreasing current at the output side. The step down transformer converts higher voltage level to a lower voltage level. The reimbursement is made by accommodating current or impedance. There are various transformers available with various output voltage and current ratings.

Also if we deal with such motors, having difference of chalk and cheese, with single transformer we discover issues like- risk for burning transformer coil, complex circuit for distributing voltage and current for

each motor and reduced and improper RPM of wheels due to lack of current. To overcome these issues, the only most economical and easy solution is to use different transformers for weapon motor and for wheels.

Transformer for Wheel's motor: The total voltage and current requirement for wheels are 24V and 3A respectively. One should keep in mind that the dc motor will not always require the current as they are rated to be operated. In case of wheels there are a lot of chances of speed variation so the motor will require a lot more current. This will lead to the overloading and causing a permanent damage to transformer. So it is highly recommended to use a transformer with higher current rating than required for motors. We used a 24 volt, 5 ampere transformer for wheels to avoid aforesaid damage.

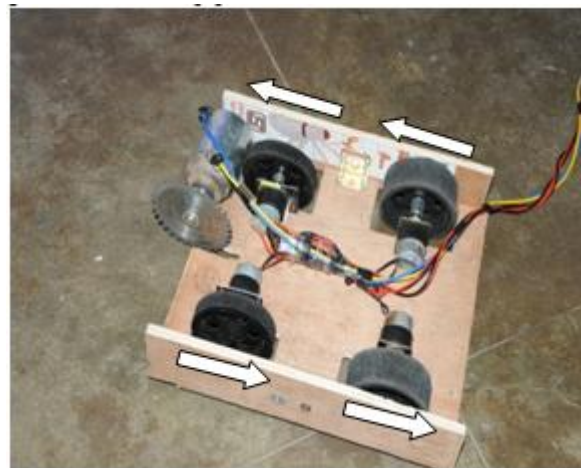
Transformer for Weapon's motor: The weapon's motor needed 24V with 14A input. We resolved this problem by combining three transformers with parallel connection to increase the current value. We made a parallel connection of these transformers so we got an enhanced current value ($7+5+5=17A$) so the problem of current lacking is taken.

III. PREPARATION OF TRANSFORMER WITH ENHANCED CURRENT RATING

1. **Rectifying output:** We need to first convert the AC output into DC so we have to install a rectifier circuit at the output terminal of the transformer. For that we used two 6A PN junction diode and one 25 volt 4700 μ f capacitor.

2. **Combining Transformer:** The combination of transformer is based on the principle of parallel combination of circuit elucidated above. These three transformers have fed with common primary supply (230 volt AC) and the output is rectified and converted into DC current.

Wheels: Spike required four wheels that gave it a look of a wheel cart but the circular saw blade attached to its front face completely discarded that thought. The front 2 wheels were of thickness 1.5cm and of diameter 10cm whereas the rear wheels treasured the thickness ranging twice as compared to the front ones where as keeping the diameter balanced. This mismatch in the thickness of wheels helped us to conceive more friction at the rear end which helped in turning and defending against the opponent rapidly. If both the wheels are driven in the same direction and speed, the robot will go in a straight line. If both wheels are turned with equal speed in opposite directions, as is clear from the diagram shown, the robot will rotate about the central point of the axis [2].



Otherwise, depending on the speed of rotation and its direction, the center of rotation may fall anywhere on the line defined by the two contact points of the wheels.

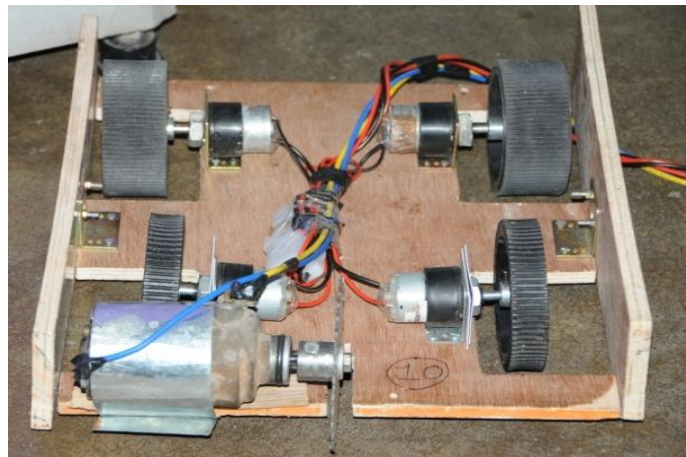
Differential wheeled robots are used extensively in robotics, since their motion is easy to program and can be well controlled. Virtually all consumer robots on the market today use differential steering primarily for its low cost and simplicity [1].

Weapon: A circular saw is a power-saw using a toothed or abrasive disc or blade to cut different materials using a rotary motion spinning around an arbor. A circular saw is a tool for cutting many materials such as wood, masonry, plastic, or metal and may be hand-held or mounted to a machine. Circular saw blades are specially designed for each particular material they are intended to cut and in cutting wood are specifically designed for making rip-cuts, cross-cuts, or a combination of both. The rotatory nature of the circular saw requires more power to operate but cuts faster because the teeth are in constant motion.



A Circular saw's processing typically involves that the material to be cut is securely clamped or held in a vise, and the saw is advanced slowly across it. Characteristics that allow the circular saw to be used as a weapon are:

1. Cutting is by teeth on the edge of a metal blade or by an abrasive wheel.
2. The cut has narrow kerf and relatively smooth surface finish.
3. Cuts are straight and relatively accurate.
4. The saw usually leaves burrs on the cut edge of metal and plastic.
5. Saw setting should be done geometrically.



IV. CONCLUSION

A Circular bladed wheeled robot has made us understand how beneficiary can a circular blade be. It is not limited only to chopping wood, metal etc; it can easily act as a lifter. Though it is very short range but it is a devilish weapon against slower enemies. This deadly efficient weapon can completely kill the opponent by cutting its wheels. Inclusion of multiple circular blades can undoubtedly result in the devastating end of the enemy.

FUTURE SCOPE: The design of the robot was selected so as to fulfill the conditions of the program, but the deadly weapon used in it can be more beautifully settled into or onto the skeleton of the robot, so as to perform best out of it. This type of robot can also be designed in such a way that it can; not just harm the opponent but also defend itself while doing so. It is correctly said that ‘prevention is better than cure’, so instead of getting damaged and then rebuilding a robot it would be a better to think out of the box and design the robot in such a manner that it attacks the opponent and defends itself at the same time.

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