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A MATLAB Simulated Gravity Lamp

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Abstract: Gravity light is a gravity powered lamp designed to be used as a replacement of common lamps to overcome the shortage of electricity in remote areas. The idea of gravity lamp was proposed by scientists Clay Moulton and Ruphan i.e., When a body descends from higher elevation to a lower elevation, its potential energy is converted into dynamic energy by straight movement. The dynamo generates power by converting linear motion into circular motion. It consists of a pulley mechanism and a ballast bag hanging through the chain or cord clamped on the shaft of motor, which slowly descends leading the shaft to rotate and hence the gravitational energy of heavy particle gets converted to electrical energy with the help of dc motor. This project aims on implementation and modification of gravity lamp to withstand the difficulty of repeatedly lifting the load manually.

I. INTRODUCTION

As a population of world is growing rapidly which results 20% of world's population do not able to get electricity.In many remote areas we still use kerosene which is expensive and polluting too. So most of these people are only left with option that is to use kerosene lamps to light their homes. These lamps are hazardous to environment and health also and constant require replenishment. To overcome this problem and bringing light to remote areas, Martin Riddiford and Jim Reeves decided to make very low cost solar Lamp for needy people and poor with no access to electricity. But in these couple of years lighting from solar - powered Lamps to wind devices and Rechargeable Batteries - all these equipments, PV-solar Cells are very expensive kit or physical efforts by the Skilled User.

All the other renewable sources like biomass, wind and solar etc. All these sources of power generation are only used for limited duration of time either day or night. So engineers decided to turn to another source of energy and get an amazing idea for generation of energy using gravity. The generation of power using gravity is one of the finest methods to generate power which compensate the energy demands and fulfill the requirement of the power. Now invention of Gravity light or also named as gravity bulb which do not require any fuel, battery or solar cells. It simply requires a weight. Gravity is a universal force that exists everywhere. Even on the highest peak and the lowest trough. The purpose of this report is to explain a design of a machine that can somehow utilize gravitational force to rotate the dynamo and generate electricity that can be used to light our bulb charge batteries and even large enlighten CFL. Such a machine will continue to generate energy indefinitely without the need for inputs such as air, light, or fossil fuel. When the bucket is hanging, gravity converts the potential energy into kinetic energy as the bucket descends slowly. Light is produced as a result of the transformed energy. Before the bucket needs to be refilled, the gravity light can run continuously for 30 minutes. The light's intensity can be adjusted from bright to low-level brightness that lasts for a long time. A body has potential energy when it is at a specific height above the ground. The body goes down due to gravitational pull. Potential energy is transferred to kinetic energy in the form of torque in this process. This was then transformed into electrical energy with the help of a generator. The LEDs are provided with electrical energy, which is then transformed into light energy. Gravialamp and Gravity Generator both work in the same way.

The Main advantages of Gravity lamp are:

1) Illumination of LED or CFL will be done for free of cost Producing free electricity with the help of pendulum oscillations and gear mechanism without producing harmful gases and smoke.
2) Production of electricity with just a push of a pendulum.
3) Any kind of fuel should not be used, just using gravitational force and some mechanical energy.
4) The whole setup is cheap and can be easily manufactured.
5) This entire arrangement is portable and can be set up almost anywhere.
6) No special weather conditions are necessary; it can be used everywhere.

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There is no such big disadvantage of this project but there are certain limitations of this project that it can:

a) Depending on the size of the pendulum and the amplitude of the pendulum oscillations, generate low-wattage power.

b) The height on which the pulley is to be placed is undetermined.

II. LITERATURE SURVEY

According to R.S.Ambade, in the current situation, energy conservation has become the most pressing concern. Electricity demand is skyrocketing as a result of industrialization and modernization. The use of gravity power generation can meet this need internationally while having no negative impact on the environment. The availability of gravity as a source of energy is one of the reasons for employing it to generate power. As per Abhirama Rai K Gravity Light is a gravity-powered lamp designed for harnessing gravitational energy into useful electrical energy. It employs a bag packed with rocks or other heavy things tied to a cable that drops slowly, similar to a cuckoo clock's weight drive. This step activates a generator, which turns on an LED light bulb. Its core idea is conversion of potential Energy into kinetic energy in a smart way.

III. WORKING

A. A Hardware Model

The gravity light is made consisting of an LED bulb attached to an adjustable lamp that may be hung from a ceiling or mounted on a wall. It also comprises a pulley with the lamp which has a mechanism and a ballast bag hanging from it. The ballast bag is filled with up to 20kg of rock, sand or soil. The gravity light works on the same concept as weight-operated pendulum clocks. The ballast substance acts as a symbol for potential energy. The potential energy in the ballast bag is transferred by gravity when the bag descends slowly when it is hanging. Light is produced by the transformed energy. The gravity light can be operated for _20_ mins continuously before the bag fully descends. The light's intensity can be changed from bright to low-level lighting that lasts for a long time. The point at which the body goes descending from higher elevation to bring down one its potential energy get changed over into dynamic energy through straight movement. Dynamo produces; power changes over this linear motion into round motion. The conversion of mechanical to electrical energy takes place with the help of a DC Motor.

The energy stored in a body can be used to generate work. The system, however, must run in a cyclic mode to ensure continual work. A weight's potential energy can be employed to spin the wheel, but continuous work is impossible. When the weight falls to the ground, it must be manually raised again. The heavier the load, the faster it lowers, resulting in higher power but shorter run duration. Because the weight takes longer to descend at a higher height, the lighting time is extended.

B. Software (MATLAB) Model

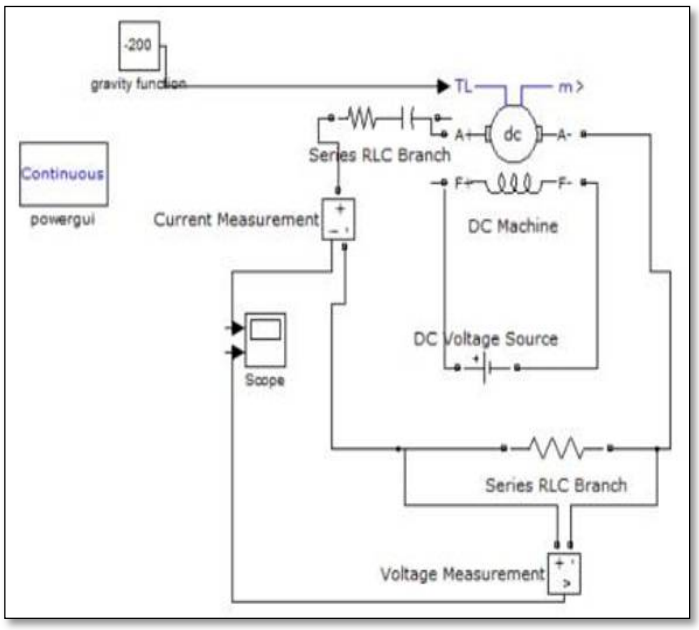


FIGURE 1: Simulate a simple circuit of gravity bulb in MATLAB software.

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It can be explained with following Block diagram

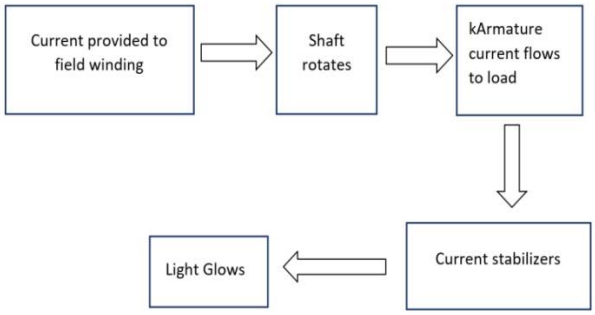


FIGURE 2: Block diagram of gravity bulb.

When a dc current is provided at the motor's field winding, mechanical force generates and due to this push shaft is rotated leading to armature current flowing through the load i.e., bulb and hence it lights up. A stable current is obtained using current stabilisers.

C. Advantages of a Stable Current

As a load for a transistor or vacuum tube gain element, one can use a continuous current source. This approach achieves extremely high voltage gains, far exceeding what a resistive load can achieve.

Another application is for a signalling circuit in which the connecting resistance is variable or unknown. This is how archaic 'Teletype' signalling circuits were constructed. Many industrial control applications still employ this technique.

In a series circuit, a third was used for area street illumination. It employed an arc lamp, which necessitated a very high initial voltage. As the arc started, the voltage across each lamp decreased, keeping the current constant.

There are many other uses of a constant current source, such as stabilizing the bias of an integrated circuit operating parameters, especially in linear circuits but here the current is of very small amount and here we can use it as a battery.

IV. MATLAB COMPONENTS

There are different components available in MATLAB which are used in GRAVITY LAMP among these are the:

1) DC Machine
2) In your library, use wound-field or permanent magnet DC machines.
3) Machines Description
4) A winding field or permanent magnet DC machine is implemented with the DC Machine block.

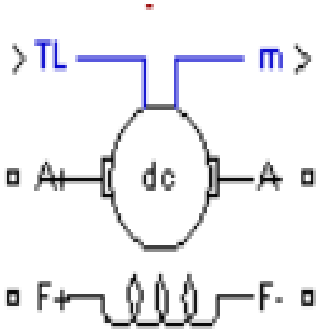


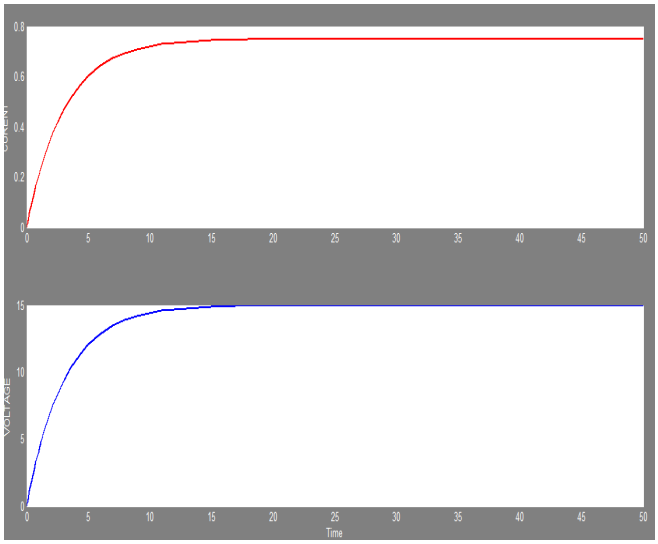
Figure 3: DC Machine

A. Mechanical Part

1) Series RLC Branch
2) Implement series RLC branch
3) Library
4) Elements
5) Description

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V. RESULT AND ANALYSIS



Value of torque load(Nm)	-200 Nm
Output Voltage	15Volt
Output Current	0.8 Amp
Output Power	12 Watt

We have successfully completed the project on software with a few assumptions.
Earlier Matlab model was based on the applying a positive torque, but we it had disadvantages i.e., time decay, also height on which the pulley is mounted is not calculated and an unstable current was obtained.
But the major setback of earlier model was unable to show gravitational action through a gravity component or gravity block.
These drawbacks led to few changes via applying a negative torque so that we can control the weight and acceleration of the gravity bulb but the height of the object is still undetermined as per software we assumed it infinite which is practically not possible for implementation of hardware so there is still the scope of modification in the project.
Previous projects represented a finite height but the output was merely 2-3V, however according to our model the output is about 15V and a stable current of around 1A.

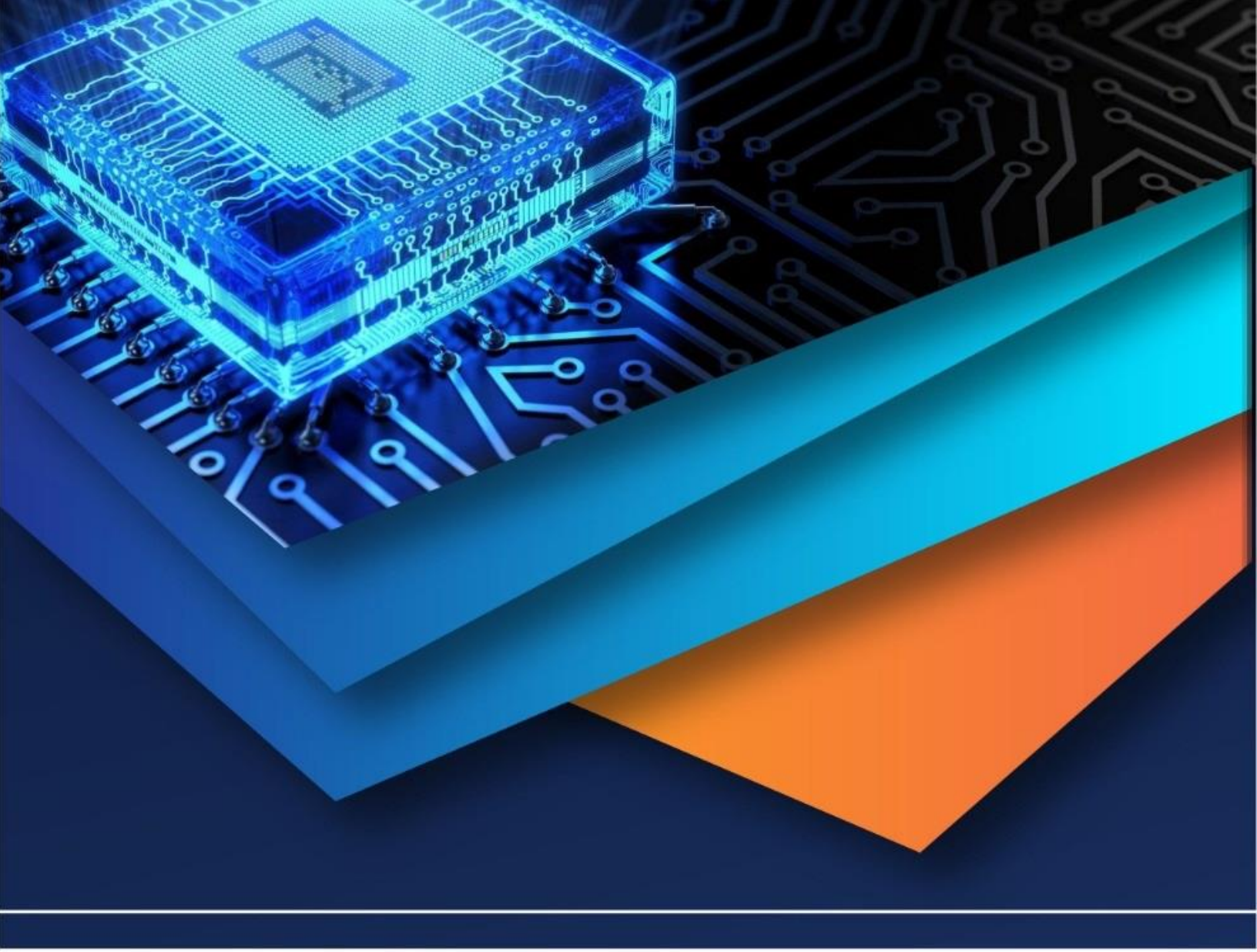
VI. CONCLUSION

Millions of people in underdeveloped nations lack access to electricity and rely on kerosene lamps, which are hazardous to their health. But after the gravity lamp they have chance to live pollution free life. In future we are moving ahead for the renewable sources of energy which generates energy in the form of DC but in remote and hilly areas it is not feasible to establish high voltage lines of DC. Hence, gravity lamp could be used as an alternative. We are trying to modify it for more running time so it can be used for longer periods.

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