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Effective Power Generation Using Foot Step and Road Hump For Intelligent Street Light

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Abstract— In the present day scenario, power is a major need for human life. There is a need to develop non- conventional sources for power generation due to the reason that our conventional sources of power are getting scarcer day by day. Non-conventional energy using foot step and road hump method does not require any input power to generate the output of the electrical power. This paper emphasizes on the idea that the kinetic energy getting wasted while vehicles move and when a person walks on foot path can be utilized to generate power by using a special arrangement called "foot step and road hump" method. This generated power can be used for general purpose applications like streetlights, traffic signals. In addition, we could also have solar panels and batteries, which would satisfy our power needs, when there is no vehicular and human being movement.

Keywords— Non-conventional energy, foot step, road hump, kinetic energy, streetlights, solar panels.

I. INTRODUCTION

In the present day scenario power has become the major need for human life. Energy is an important input in all the sectors of any countries economy. The day-to-day increasing population and decreasing conventional sources for power generation, provides a need to think on non-conventional energy resources. Walking is the most common activity in day to day life. When a person walks, he loses energy to the road surface in the form of impact, vibration, sound etc., due to the transfer of his weight on to the road surface, through foot falls on the ground during every step. This energy can be tapped and converted in the usable form such as in electrical form. In South Africa during the electrical crisis, the foot power was implemented to light up small villages. Power generation using the mechanical energy produced by the pedestrians is used in London. The energy is generated and can be stored in batteries. A storage module like an inverter will have to be fitted to each rumble strip to store this electricity.

II. SYSTEM DESCRIPTION

This paper is the combination of both footstep and road hump method to generate power for street lights. To increase the power generation, solar power is utilised using solar panels. An electro-mechanical unit known to be power-hump utilises the kinetic energy for power generation. While moving, the vehicles possess some kinetic energy and it is being wasted. The kinetic energy can be utilised by using a special arrangement called Power Hump. All the mechanism can be housed under the dome, like speed a breaker, which is called Hump. It utilises both mechanical technologies and electrical techniques for the power generation and its storage. Whenever the vehicle is allowed to pass over the dome its gets pressed downwards, then the springs that are attached to the dome are compressed and the rack, which is attached to the bottom of the dome moves downward in reciprocating motion. Since the rack has teeth connected to gears, there exists conversion of reciprocating motion of rack into rotary motion of gears but the two gears rotate in opposite direction. A flywheel is mounted on the shafts whose function is to regulate the fluctuation in the energy and to make the energy uniform. So the shafts will rotate with certain rpm. These shafts are connected through belt drive to the dynamics, which converts the mechanical energy into electrical energy. The conversion will be proportional to the traffic density. The electrical output can be improved by arranging this POWER HUMP in series. This generated power can be amplified and stored by using different electrical devices.

III. HARDWARE IMPLEMENTATION

A. Light Dependent Resistor (LDR)

A Light Dependent Resistor (LDR) is special type of resistor that reacts to changes in light level. The resistance of the LDR changes as different amounts of light falls on the top 'window' of the device. This allows electronic circuits to measure changes in light level. This kind of sensor is commonly used in light sensor circuits in open areas, to control street lamps. In this case the LDR is used in a potential divider with a standard resistor. The value of the standard resistor sets the 'threshold value'. For miniature LDRs a suitable

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value is 10k, for larger ORP12 type LDRs 10k is also appropriate. If desired the fixed resistor can be replaced by a variable resistor so that the threshold value can be 'tuned' to different light values.

B. Light Emitting Diode (LED)

A Light Emitting Diode (LED) is an electronic component that gives out light when current passes through it. An LED is a special type of diode. A diode is a component that only allows current to flow in one direction. LEDs only require a small amount of current to work, which makes them much more efficient than bulbs. The LED requires a small amount of current to operate; it is directly connected between the microcontroller output pin and 0V (with the series protection resistor).

C. Infrared Radiation Sensor

An infrared sensor is an electronic device that emits and/or detects infrared radiation in order to sense some aspects of its surroundings. Infrared sensors can measure the heat of an object, as well as detect motion. Many of these types of sensors only measure infrared radiation, rather than emitting it and thus are known as passive infrared (PIR) sensors. A PIR Sensor is a Passive Infrared Sensor which controls the switching on/off of the lighting load when it detects a moving target. The built in sensor turns on/off the connected lighting load when it detects motion in the coverage area. It has different working principle during the day time and the night time. During the day, the built in photocell sensor saves electricity by deactivating the lighting load connected to the sensor. During the night the connected lighting load is turned on by adjusting the luminosity knob (LUX). An adjustable time knob lets you select how long the light stays on after activation.

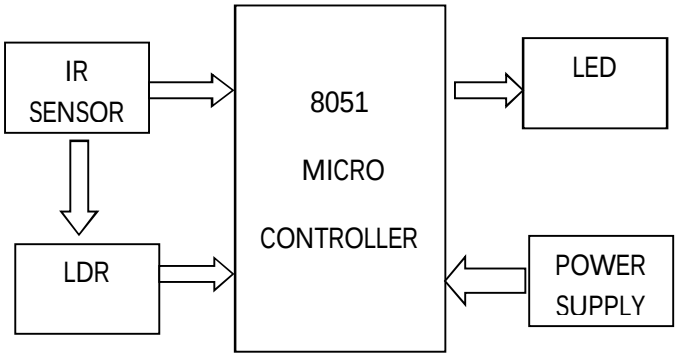


Fig.1: Block Diagram of Street Light

The PIR Sensor senses the motion of a human body by the change in surrounding ambient temperature when a human body passes across. Then it turns on the lighting load to which it is connected. The lighting loads remain on until it senses motion. Once the motion is seized it switches off the lighting load. During the night, the adjustment knob allows you to adjust the luminosity based on which the lighting load will either switch on/off automatically.

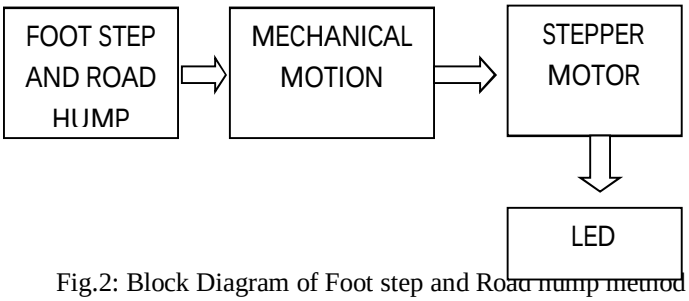


Fig.2: Block Diagram of Foot step and Road hump method

D. Stepper Motor

A stepper motor is an electromechanical device which converts electrical pulses into discrete mechanical movements. The shaft or

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spindle of a stepper motor rotates indiscrete step increments when electrical command pulses are applied to it in the proper sequence. The motors rotation has several direct relationships to these applied input pulses. The sequence of the applied pulses is directly related to the direction of motor shafts rotation. The speed of the motor shafts rotation is directly related to the frequency of the input pulses and the length of rotation is directly related to the number of input pulses applied.

1) Advantages:

The rotation angle of the motor is proportional to the input pulse.

Excellent response to starting/stopping/reversing.

Very reliable since there are no contact brushes in the motor. Therefore the life of the step motor is simply dependent on the life of the bearing.

The stepper motors response to digital input pulses provides open-loop control, making the motor simpler and less costly to control.

It is possible to achieve very low speed synchronous rotation with a load that is directly coupled to the shaft.

E. MAX 232

The MAX232 is an integrated circuit that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals.

1) Features:

a) Superior to bipolar
b) 120kbits/sec Data Rate
c) Low Power Shutdown Current
d) Designed for RS232 and V.28 Applications
e) Three state TTL/CMOS Receiver Outputs
f) Meet or Exceed TIA/EIA-232-F and ITU
g) Recommendation V.28
h) Operate With Single 5-V Power Supply
i) Two Drivers and Two Receiver
j) ±30-V Input Levels

The MAX232 is a dual driver/receiver that includes a capacitive voltage generator to supply EIA-232 voltage levels from a single 5-V supply. Each receiver converts EIA-232 inputs to 5-V TTL/CMOS levels. These receivers have a typical threshold of 1.3 V and a typical hysteresis of 0.5 V, and can accept ±30-V inputs. Each driver converts TTL/CMOS input levels into EIA-232 levels.

F. Microcontroller

A microcontroller is an integrated circuit or a chip with a processor and other support devices like program memory, data memory, I/O ports, serial communication interface etc integrated together. 8051 is a widely used micro controller. Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems.

1) Features:

a) 8051 is a 40 pin IC.
b) 8051 is an 8-bit Microcontroller.
c) 128 bytes of RAM.
d) 4K bytes of inbuilt ROM.

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e) One serial port i.e. UART.
f) Four parallel ports i.e. P0, P1, P2 and P3.
g) Two 16-bit Timers i.e. Timer0, Timer1.
h) Five sources and six Interrupts.
i) Four Register Banks (Bank0-3).
j) 16-bit Program Counter.
k) DPTR (16-bit).
l) 8-bit stack pointer (sp).
m) External code and data memory up to 64KB.
n) 8-bit PSW (program status word).

In the 8051 there are four ports for I/O operations. It has 40 pins, a total of 32 pins are set aside for the four ports P0, P1, P2, and P3, where each port takes 8 pins. The rest of the pins designated as Vcc, GND, XTAL1, XTAL2, RST, EA, ALE/PROG and PSEN.

IV. CONCLUSION

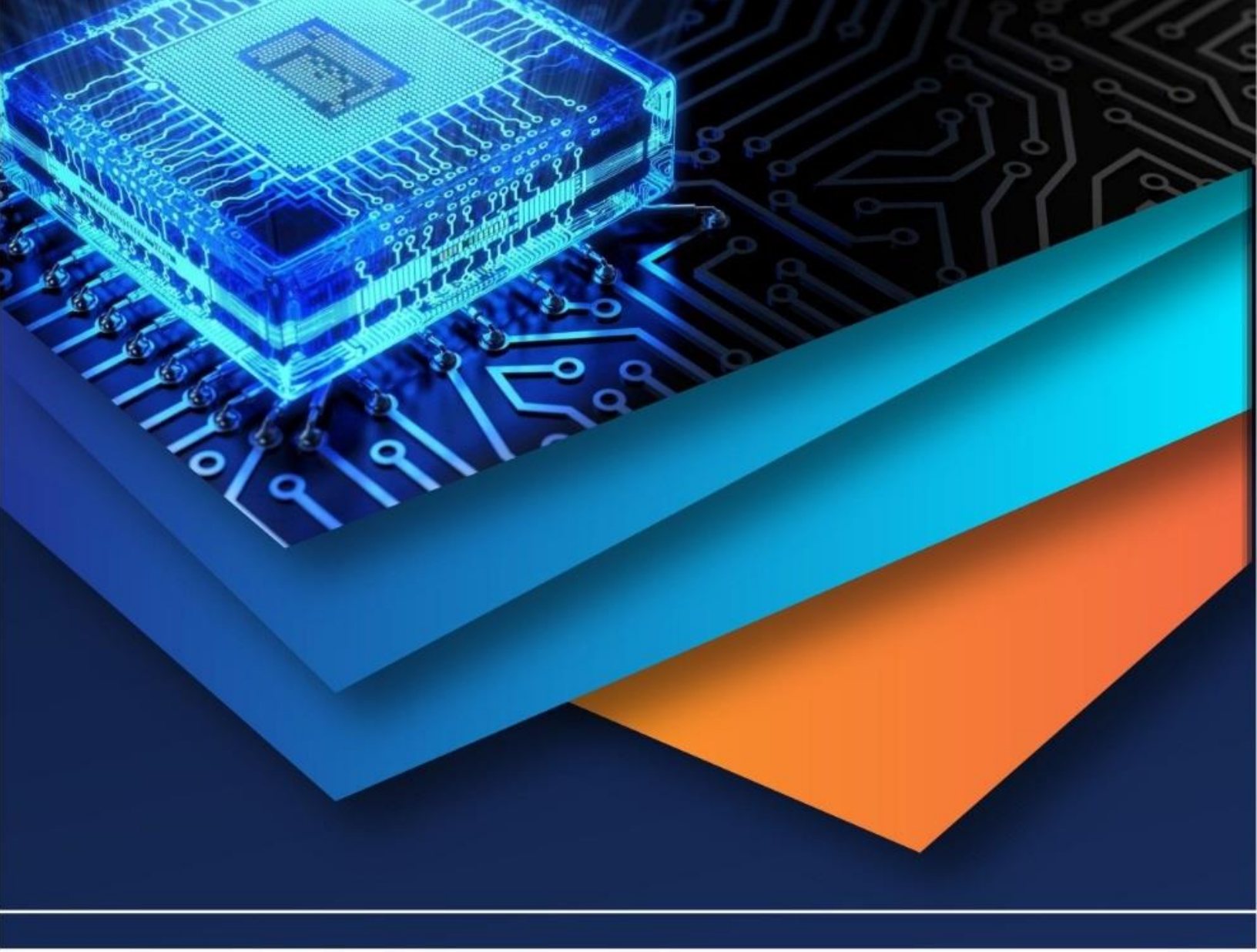
Proposal for the utilization of waste energy of foot power with human locomotion is very much relevant and important for highly populated countries like India and China where the roads, railway stations, bus stands, temples, etc. are all over crowded and millions of people move around the clock. This whole human/bio energy being wasted if can be made possible for utilization it will be great invention and crowd energy farms will be very useful energy sources in crowded countries. In coming days, this will prove a great boon to the world, since it will save a lot of electricity of power plants that gets wasted in illuminating the street lights. As the conventional sources are depleting very fast, then it's time to think of alternatives. We got to save the power gained from the conventional sources for efficient use. So this idea not only provides alternative but also adds to the economy of the country.

Vehicular traffic in big cities is more, causing a problem to human being. But this vehicular traffic can be utilized for power generation by means of new technique called "power hump". It has advantage that it does not utilize any external source. Now the time has come to put forth these types of innovative ideas and researches should be done to upgrade their implication.

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