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DESIGN AND IMPLEMENTATION OF GO POWER

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***Abstract*— In today's life, where health has been our main concern , we have tried to make a system which aims to reduce the health risks in order to lead a healthy life. This risk is overcome by one of the simplest solutions , that is walking. In this project we have tried to generate power using piezo discs and solar panels which in turn will charge our gadgets and at the same time it will help in making our shoes a prototype of a smart shoe. This is the beginning of new kind of wearable devices . It not only charges our mobile phones but also gives us our heartbeat along with number of steps taken and his particular location.**

***Index Terms* — Self-sustainable, Renewable, Solar, Piezo sensor, Charger, Smart shoe.**

I. INTRODUCTION

In the current era, which is witnessing a skyrocketing of energy costs and an exponential decrease in the supplies of fossil fuels, there arises a need to develop methods for judicious use of energy which lay emphasis on protecting the environment as well. One of the novel ways to accomplish this is through energy harvesting. Energy harvesting, or energy scavenging, is a process that captures small amounts of energy that would otherwise be lost as heat, light, sound, vibration or movement. It uses this captured energy to improve efficiency and to enable new technology, like wireless sensor networks. Energy harvesting also has the potential to replace batteries for small, low power electronic devices. Solar energy is radiant light and heat from the Sun that is harnessed using a range of ever-evolving technologies such as solar heating, photovoltaic, solar thermal energy etc[1]. The large magnitude of solar energy available makes it a highly appealing source of electricity. Solar panels Piezoelectric materials can be used as a means of transforming ambient vibrations or energy into electrical energy that can then be stored and used to power other devices. With the recent surge of micro scale devices, piezoelectric power generation can provide a convenient alternative to traditional power sources used to operate certain types of sensors/actuators, telemetry, and MEMS devices. The advances have allowed numerous doors to open for power harvesting systems in practical real-world applications. Much of the research into power harvesting has focused on methods of accumulating the energy until a sufficient amount is present, allowing the intended electronics to be powered.

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We have cited implementation of piezoelectric materials in harvesting energy from tapping of keys of keyboard and use it for various application like charging the mobile phones. The best known energy harvesting collectors are large solar panels and piezo sensors [2], [3] which have become major alternative energy sources for the power grid. But small embedded devices must rely on energy scavenging systems that can capture mill watts of energy from light, vibration, thermal, or biological sources. Thanks to ultra-low-power MCUs these micro power energy harvesters can greatly extend the life of batteries in consumer, industrial, and medical applications where battery replacement may be difficult, expensive, or even impossible. With careful design, energy harvesting devices can even replace batteries altogether in some applications.

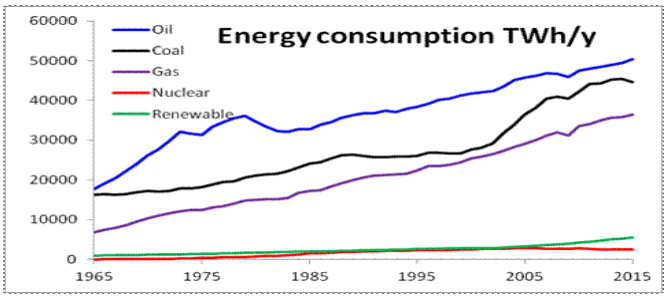

Fig. 1: Energy consumption using various sources

The solar panels containing photovoltaic cells convert light to electric energy using photovoltaic effect. this energy can be used to power any electronic device which in our case happens to be the micro controller. this solar energy is complemented by piezo electric effect. Piezoelectricity is the electric charge that accumulates in certain solid materials such as crystals, in response to applied mechanical stress. The word piezoelectricity means electricity resulting from pressure. The pressure developed while walking generates electric energy to power the controller with solar energy.

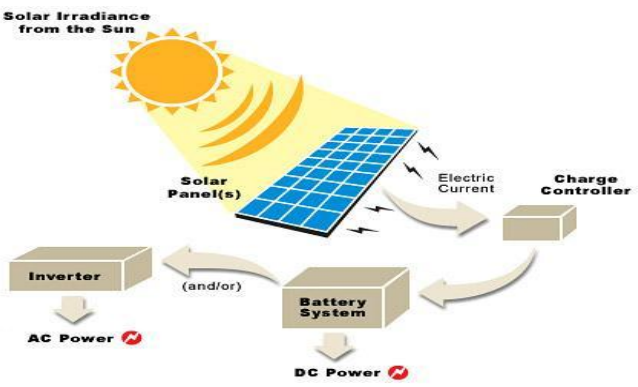

Fig. 2: Generation of Solar Energy

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II. LITERATURE REVIEW

In this report we aim to choose the appropriate technologies and methods in which implement a walking charger based on solar energy and piezoelectricity. To do this is will look at current walking charger based products and the technologies that are currently available for creating the same. We will also look at other technologies which I feel will be appropriate for my project that might improve on the existing systems available. An example is the SolePower [4] which generates energy, takes each step and converts it into usable electrical power. As the user swings their leg and steps down energy is created, the insole then captures this energy and stores it in an external battery. A two and a half mile walk generates enough energy for a solid Smartphone charge. This product is designed so as to generate energy for charging a mobile phone which requires the user to walk a considerable time or distance to get significant charge for a mobile phone. The drawback of this product is that it needs the user to walk a lot without which the phone cannot be charged and it requires a lot of piezo discs to be installed in the circuitry to generate significant energy.

III. BLOCK AND CIRCUIT DIAGRAM

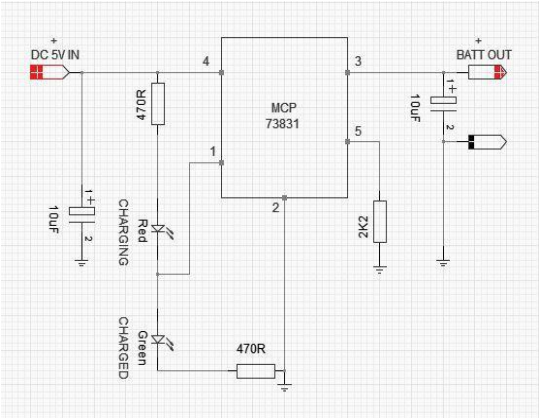

Fig. 3: Charging circuit

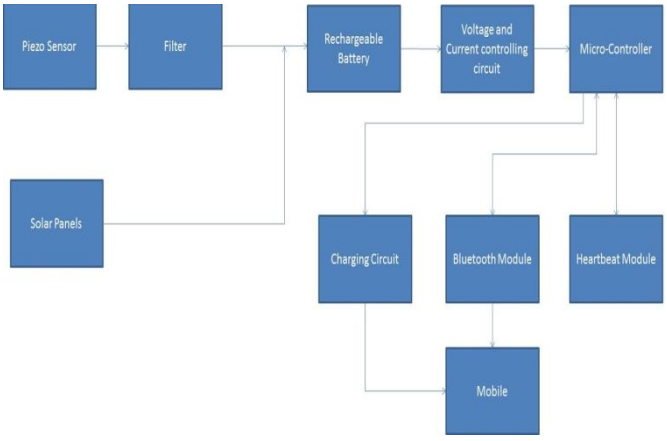

Fig. 4: Block daigram of the project

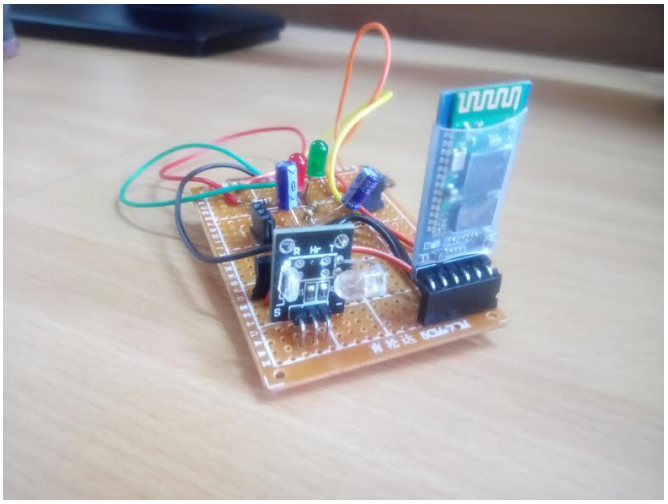

Fig. 5: Working Circuit

IV. WORKING

Our project works on the basic law that "Energy can neither be created nor be destroyed'. So in this project we are actually converting energy from one form to another. In this system we are using piezo discs and solar panels as our transducers which convert different types of energy to electrical energy, and then this energy is used to power or run our arduino board which in turn controls different parts of this project. We have used two solar panels [6] in series with each giving 6 volts and 400mA along with two piezos in series which gives a maximum of 0.5 volts filtered output. This combination of piezos and solar panels is connected in parallel. The output of this combination is given to the rechargeable battery which can be recharged to maximum 7.4 volts. This rechargeable battery further powers the Arduino uno.

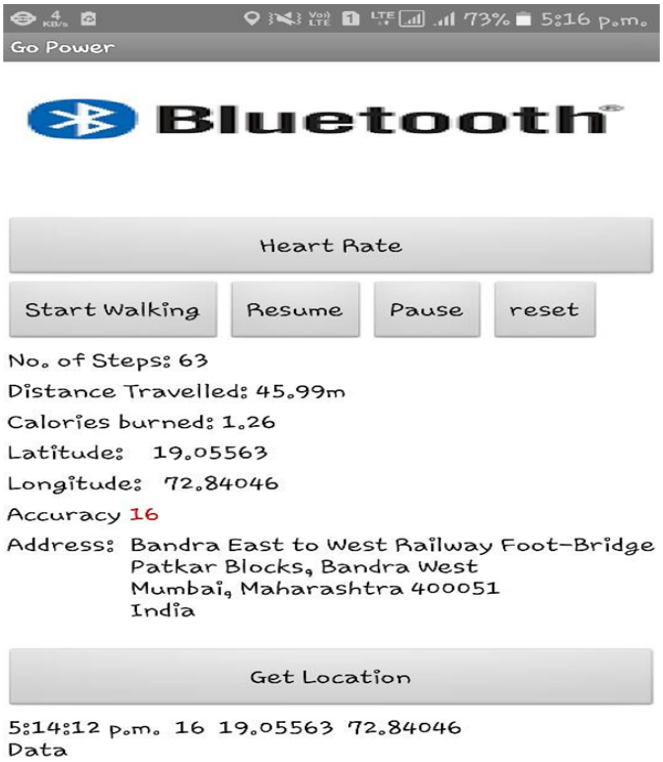

Fig. 6: Application

In this project we are using arduino to control, monitor, and power different modules in the system. From the controller we power and control heartbeat sensor whose data will be sent to our mobile over bluetooth and along with this we will have a charging circuit which is used to charge [5] any device or gadget simultaneously. Our charging circuit uses the Mcp73831 ic. The bluetooth communication will work only when a particular data is asked that is it will only give output if it receives a input first. This increases the efficiency of system along with reducing transfer of garbage data continuously. In our project we have also build an mobile app which will display the heartbeat of that person along with the number of steps taken by that person and we have also tried to give the particular location of the person along with the accuracy of that location. While every function has the ability of text to speech and in this system if the heartbeat of user increases the particular threshold, there will be a buzzer which will give an alarming sound to the person to slow down. Therefore this system works as a charger along with a smart shoe which puts it in the category of wearables.

V. ADVANTAGES

1. Convenience

Life, and sometimes traffic can make it difficult to be home, in this case the GO POWER acts as a boon providing energy to charge battery of our fast draining Smart phones even when the person cannot be at home. It requires either solar light or the user to walk a certain number of steps to generate electricity on the go.

2. Energy Management & Savings

When used properly, it saves energy costs at home as this product is self sustaining and generates electricity on its own. It only requires the one time installation or buying cost that helps save money and energy in the long term.

3. Environment friendly

Go Power is environment friendly as it uses only solar energy and the impulse of a person walking. There is no fuel usage or wastage of any resource or any kind of pollution. It uses the abundant and infinite solar energy.

4. High output and Transient response

The output provided by GO POWER is high and sufficient enough to charge the rechargeable battery and in turn power on the micro controller. The micro controller has enough power to drive a whole charging circuit and charge a mobile phone.

VI. DISADVANTAGES

1. Equipment and installation cost

Power generation is widely related to the financial costs. The total cost depends on the equipment you install in your shoe and on how much it takes to install. The more advanced the system; the cost of the system will be very high as it has the more advantages and more new features. As there is a gradual growth in developing the renewable power generation devices price the cost is going to reduce. But as of now cost of such devices is very high.

2. System crashes due to damage in the interconnection

If there is any damage due to rupturing of cables or the fibres the entire system gets crashed. Here there will be a problem of signal receiving. The wiring of the system results in crash.

VII. CONCLUSION

The design proposes an energy conservation system for mobile phones. The design presented here will be quite effective in providing an alternate means of power supply for the mentioned devices during emergency. Further, the approach presented in this paper can be extended to many other applications where there is scope for similar kind of energy conservation.

Our Product has a main controller which gets turned ON by the energy generated by the solar panels and piezo disc impulse collectively. The controller here requires about 5v to turn ON. This controller in turn controls a bluetooth module that connects to our phone and also a heartbeat module that sends data via the bluetooth module on the app created on the phone. It also controls the most important section of the project which is the charging circuit. This charging circuit provides an output enough for our mobile phone to charge. Hence this project provides power on the go by reducing energy cost, pollution and non-renewable resources. It eliminates the need of a portable charger which has become a daily necessity for everyone to keep their Smartphone batteries charged.

VIII. APPLICATION AND FUTURESCOPE

Foot step generated power can be used for agricultural, home applications, street- lighting. Foot step power generation can be used in emergency power failure situations. Metros, Rural Applications etc. Electric cigarette lighter: Pressing the button of the lighter causes a spring-loaded hammer to hit a piezoelectric crystal, producing a sufficiently high voltage that electric current flows across a small spark gap, thus heating and igniting the gas. Can be installed in shoes and store up the energy or charge in the rechargeable battery that can be used whenever necessary. This can help save the scarce non-renewable resources which are on a decline and use the abundant and infinite renewable resources.

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