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Advanced Footstep Power Generation System Using RFID for Charging

K.Pithamber[1], Ch.chandrika [2], Y.Lakshmi Tejaswi[3], S.Sai Poojitha[4] , P.Ram Charan[5]

Assistant Professor, Department of ECE, Sri Vasavi Institute of Engineering & Technology, Nandamuru, A.P, India[1]

U.G. Student, Department of ECE,, Sri Vasavi Institute of Engineering & Technology, Nandamuru, A.P, India[2]

U.G. Student, Department of ECE, Sri Vasavi Institute of Engineering & Technology, Nandamuru, A.P, India[3]

U.G. Student, Department of ECE, Sri Vasavi Institute of Engineering & Technology, Nandamuru, A.P, India[4]

U.G. Student, Department of ECE, Sri Vasavi Institute of Engineering & Technology, Nandamuru, A.P, India[5]

ABSTRACT: Day by day, the population of the country is increasing and the requirement of the power is also increasing. At the same time the wastage of energy is also increasing in many ways. So, reforming this energy back to usable form is the major solution. So, in this footstep power generation project, we are generating power with the help of humans footsteps either by walking or running. It uses the piezoelectric sensors. To generate a voltage from footstep the piezo sensors are mounted below the platform. Also, it consists of a USB mobile phone charging point where a user may it connect cables to charge the mobile phone from the battery charge. The current is distributed using (Radio-Frequency Identification) RFID cards so that only an authorized person can use the generator for charging. Thus we charge a battery using power from footsteps, display it on LCD using a raspberry pi circuit and allow for mobile charging through the setup

KEYWORDS: Raspberry pi 3, Force sensor, Piezo Sensor,RFID cards.

I. INTRODUCTION

Our project model cost is effective and Easy to implement and also it is green and not harmful to the environment. This system can be installed at homes, schools, colleges, where the people move around the clock. It can be used for charging devices e.g. laptop, mobile, etc. To generate maximum output voltage the sensors are placed in such an arrangement. This is then forwarded to our monitoring circuitry. The circuit is the raspberry pi based monitoring circuit that allows users to monitor the charges and voltage a connected battery to it and this power source has many applications. It also displays the charge generated by our footstep and displays on an LCD. The main aim of the project is to generate power from renewable energy sources; system makes use of Piezo. The system monitors the parameters coming from the piezo sensor, energy from piezo sensor values displayed on the LCD. The energy from the piezo sensors is used to charge the mobile. Using RFID technology to charge the mobile phone battery with the help of USB point. It is useful only authorized persons. A piezoelectric sensor is a device that uses the piezoelectric effect, to measure changes in pressure, acceleration, temperature, strain, or force by converting them to an electrical charge. The prefix piezo- is Greek for 'press' or 'squeeze'.

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II.METHODOLOGY

The main working criteria for this project is the piezoelectric effect which is achieved by using piezoelectric sensors that develop electrical energy by converting applied pressure. The source of pressure can be from the weight of the people walking over it. The output obtained from piezoelectric material is not stable and its not direct current. Hence, we are using rectification circuits to convert the generated voltage into dc voltage for the constant voltage / constant current. We will use lithium charging module and this module is made for charging rechargeable lithium batteries. The raspberry pi will monitor all the activities of power generation. The details of the battery power ON and OFF are

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display on LCD display. In order to protect the system by unauthorized access we are implementing RFID cards. To get access the users has to register and need to get the RFID cards. After the successful access to the system, the user can charge their mobile by selecting proper USB cable.

2.1BLOCK DIAGRAM:

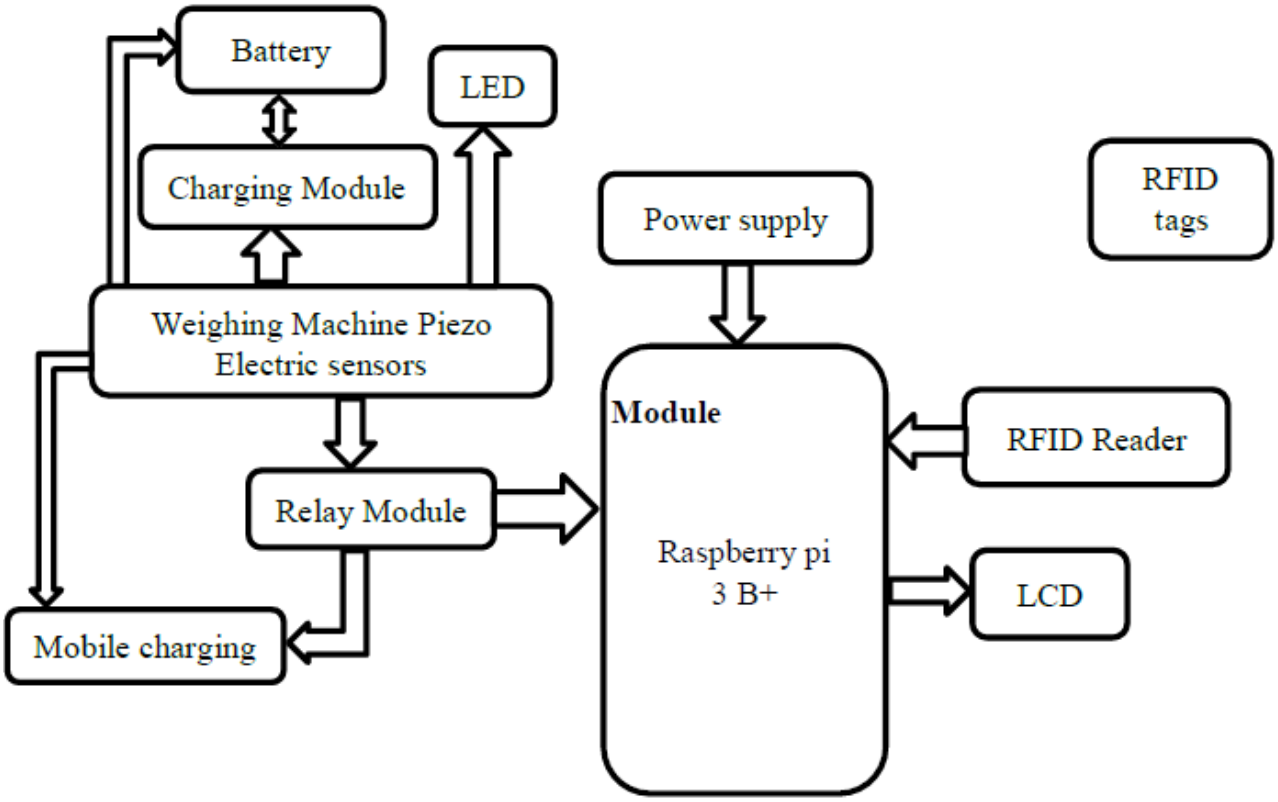

Fig.1.Proposed system Block Diagram

2.1 Hardware Components

RASPBERRY PI 3B+:

Raspberry pi is a series of small single-board computers (SBC is a complete computer built on a single circuit board, with microprocessors, memory, input/output and other features required ofa functional computer) developed by the Raspberry Pi foundation as shown in Fig.2.2. All models feature a broad com system on chip (SoC) with an integrated ARM compatible CPU and on-chip graphics processing unit (GPU). The foundation provides Raspbian (OS for Raspberry pi) based Linux distribution for download, as well as third-party windows10 IoT core, RISC OS, and specialized media center distributions. It promotes Python and Scratch as the main programming languages

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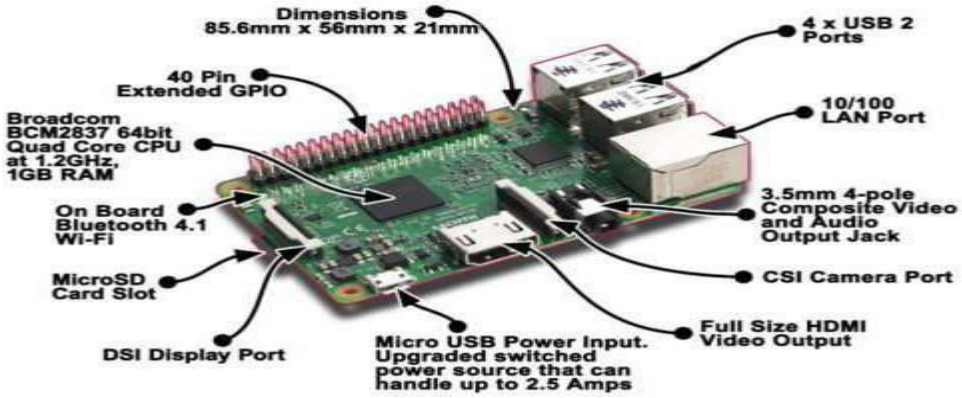

Fig.2: Structure of Raspberry pi 3B+

2.2.RFID:

An RFID system consists of two separate components: a tag and a reader. The tag contains an antenna connectedto a small microchip containing up to two kilobytes of data.

- Reader always transmit electromagnetic waves, communicating with tag antenna.
- Host manages Reader and issues Commands.
- Reader and tag communicate via RF signal.
- Carrier signal generated by the reader.
- Carrier signal sent out through the antennas.
- Carrier signal hits tag.
- Tag receives and modifies carrier signal.

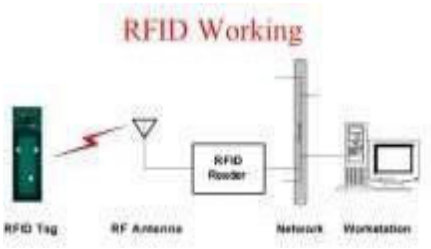

Fig.3.: Working Of RFID

PIEZO ELECTRIC SENSORS:

The most unique trait of this effect is that it works two ways. You can apply mechanical energy or electrical energy to the same piezoelectric material and get an opposite result.

1. A piezoelectric crystal is placed between two metal plates. At this point the material is in perfect balance and does not conduct an electric current.
2. Mechanical pressure is then applied to the material by the metal plates, which forces the electric charges within the crystal out of balance. Excess negative and positive charges appear on opposite sides of the crystal face
3. The metal plate collects these charges, which can be used to produce a voltage and send an electrical current through a circuit.

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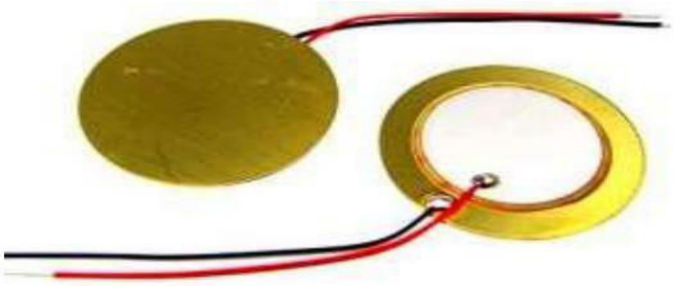

Fig. 4: Piezoelectric plates

That's it, a simple application of mechanical pressure, the squeezing of a crystal and suddenly you have an electric current. You can also do the opposite, applying an electrical signal to a material as an inverse piezoelectric effect**.** It works like this:

1. In the same situation as the example above, we have a piezoelectric crystal placed between two metal plates. The crystal's structure is in perfect balance.
2. Electrical energy is then applied to the crystal, which shrinks and expands the crystal's structure.
3. As the crystal's structure expands and contracts, it converts the received electrical energy and releases mechanical energy in the form of a sound wave.

III.RESULTS

This project presents effective way of generating power. The result shows that higher sensitivity and accuracy is indeed achieved using this project. This made the project more user friendly and reliable. The proposed method is verified to be highly beneficial for the users. This application provides the optimum solution in the most feasible way. We have presented the approach for power generation by using human footstep. We have successfully implemented a project using raspberry pi 3B+.

After giving supply to the kit/module when any accident occurs the accelerometer sensor detects the vibration and motion of the vehicle and sends signals to raspberry pi and shows the message of the accident detected is shown in Fig..5

After applying mechanical pressure by using footstep but battery power is OFF by using RFID Tag is shown in the fig 6.a After applying mechanical pressure by using footstep and battery power is ON by using RFID Tag then mobile gets charged as shown in the fig 6.b

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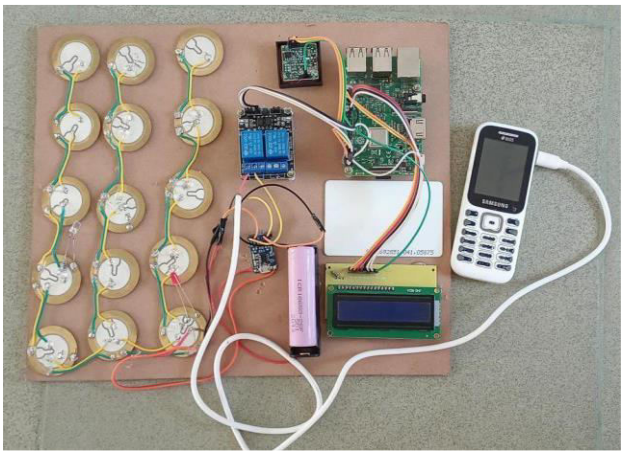
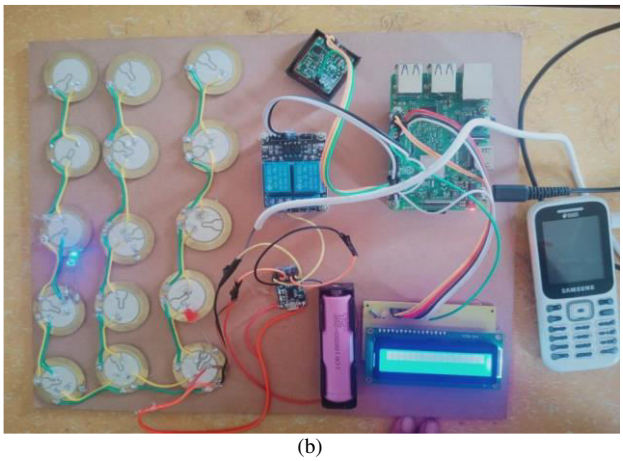
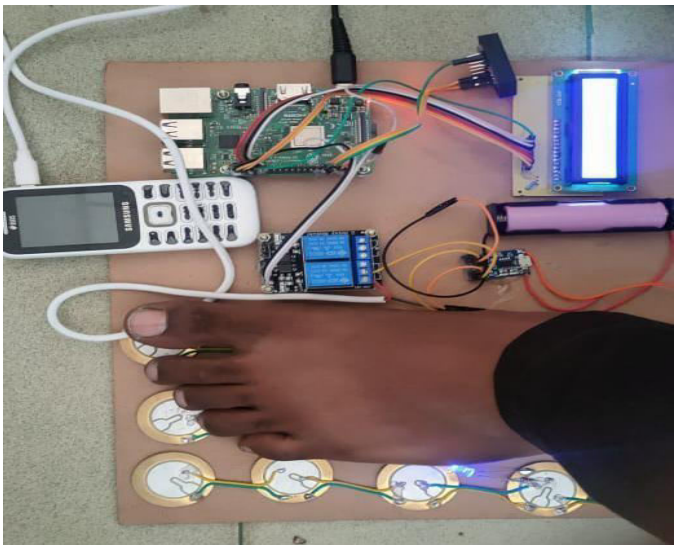


(a)

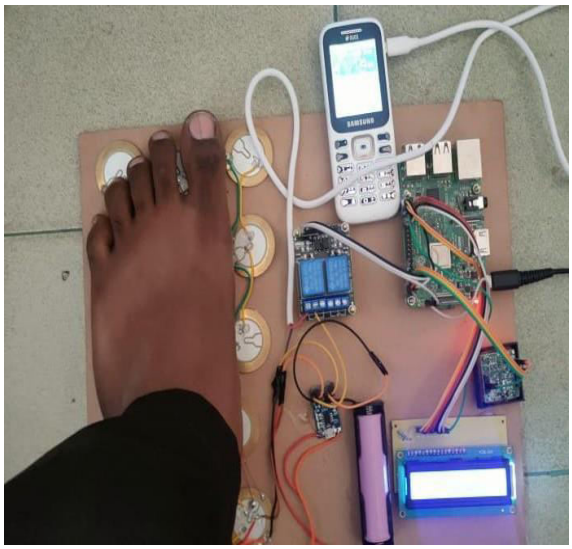


(b)

Fig.4.(a).System witout power supply (b) System with power supply



(a)



(b)

Fig. 6 (a) without RFID (b) With RFID

If any vibration sensed by the accelerometer sensor and it is minor accident then we can stop the sending message by pressing the push button switch and it sends the signal to raspberry pi then message sending is cancelled and it is shown Fig.6

IV. CONCLUSIONS

The project "ADVANCED FOOTSTEP POWER GENERATION SYSTEM USING RFID FOR CHARGING" is successfully tested and implemented which is best economical
affordable energy solution to common people.This can be used for many applications in rural areas where power availability is less or totally absence. As india is a developing country where energy management is a big challenge for

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huge population. By using this project we can drive both AC as well as DC loads according to the force we applied on the piezoelectric sensors

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