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IoT Based Footstep Power Generation for Mobile Charging

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Abstract: Energy has always been a basic need in everyone's life. Humans are dependent on electric energy in various ways and are surrounded by electronic gadgets. These gadgets require electrical energy to be operated, hence we came up with a way to produce electrical energy in a non-conventional way. Energy demand is increasing day by day. As we walk, we produce kinetic energy which is not utilized in an efficient way. To make use of that energy, we have designed a circuit consisting of piezo electric sensors, IR sensor and a Relay. Whenever force is applied on piezoelectric sensors, the mechanical energy is converted into Electrical energy. Voltage generated by the circuit will be displayed on the LCD connected to Arduino Uno, which converts analog input to digital output. This generated energy can be used for mobile charging and various other low energy demanding devices. We are setting up an application to know the location of the mobile charging points.

Keywords: Piezoelectric, Arduino Uno, LCD, IR sensor, Relay, mobile charging.

I.INTRODUCTION

The Internet of Things (IoT) depicts the organization of actual articles "things" that are inserted with sensors, programming, and different advancements to associate and trading information with different gadgets and frameworks over the web. As innovation is created and the utilization of contraptions, electronic gadgets has likewise expanded. Things empowered with IoT can help in ordering the different gadgets associated through voice or actions. So by utilizing these IoT gadgets are created which can change over kinetic energy into electrical energy and use it in a proficient manner.

II.RELATED PAPERWORK

We referred around six papers with respect to our project that is "IoT based Footstep Power Generation for mobile charging".

[1] The interest for electrical energy is supposed to rise consistently in not so distant future. Contemporary techniques for producing electrical power are destructive to the climate. Footstep power generation is one of the maintainable electric energy generation strategy which is climate well disposed. India can take advantage of its huge populace, to create footstep ability to fulfil the developing interest for power. This paper has proposed a smart footstep power generation framework which separated from creating and putting away electric energy, gives the office of remote checking and controlling. ANN is utilized to recognize the sensor area which is flawed. The framework can charge a 12V lead battery totally in the span of 10 minutes utilizing a solitary individual footstep. This battery then, at that point, further drives two burdens - a DC fan and LED for roughly 30 minutes. Charging voltage can be effectively increased by expanding the quantity of piezoelectric sensors. An Android portable application has been created to remotely screen and control the framework. The ANN can identify area of the flawed sensor with 74% exactness. At the beginning, fostering a maintainable power producing framework with shrewd capacities is a significant commitment of this paper.

[2] To play out an activity in our life, we really want some outside energy. So burning through sum on effort is important in our everyday life. Creating energy with any supply or outer source is the significant thought and best advancement in our future. So with assistance of piezoelectric sensor, we'll have the option to create power with our footsteps. The primary thought is with the piezoelectric tiles, we can deliver energy that can be put away in a rechargeable battery, so we can involve it for our later purposes and it tends to be additionally positioned out in the open spots like streetlamp, portable charging and so on. How much energy put away can be shown in a LCD.

[3] The paper contains about at present, enormous amount of electrical power is being utilized by streetlamps, which

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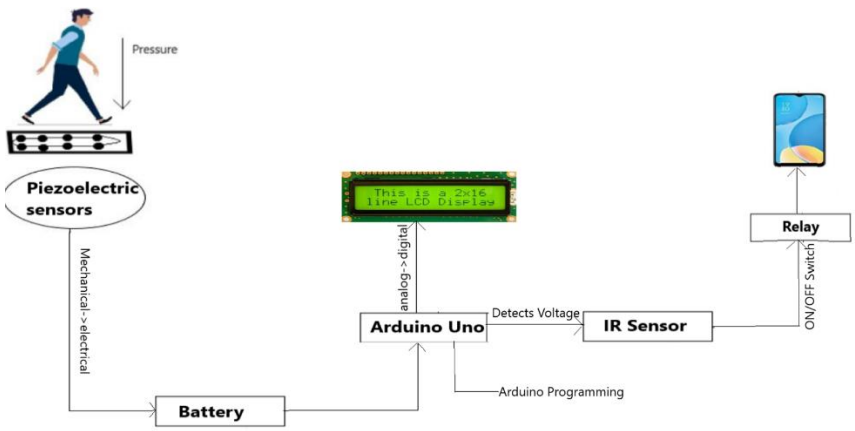
remain turned ON over the course of the evening. This causes a tremendous wastage of electrical power across the entire world and it ought to be limited. The fundamental reason for carrying out programmed streetlamps is that lights will turn ON with full power just when there are vehicles or walkers out and about and stay off in any case. The streetlamps can be fuelled by the electrical energy created through the tension applied by strides and vehicles. So we don't have to give capacity to the streetlamps independently. The programmed streetlamp framework involves DC lights, lux meter, PIR sensors, piezoelectric sensors, LDR and ultrasonic sensor. Our principal design is to make such a streetlamp framework in which power of streetlamps increments when a vehicle draws nearer to it and diminishes when it creates some distance from the light shaft.

[4] In this period of innovation improvement, creating new energy sources are the superb concern. One of the areas that have acquired a lot of interest is gadgets that can change over surrounding energy into electrical energy. The motivation behind our project is to foster such a gadget that can change over tension into electrical energy in view of the piezoelectric component. This venture will likewise show that the presence of waste vibration energy may have a quality to be utilized. The arrangement of this energy producing project incorporates the transformation of constant pressure of floors by human tension across piezoelectric materials into electrical energy.

[5] In huge urban communities, strolling movement is exceptionally high, particularly in the focal point of local area exercises, for example, exchange focuses, workplaces, and instruction. In this manner a decent common office is required in regards to somewhere safe and secure, solace, and excellence. In any case, presently the walker office for the most part turns into a five-times exchanging region or indeed, even a spot to establish overhanging trees and furthermore made as a stopping area. The reason for this exploration is to plan the walkway plan with the most recent development, to draw in people in general to utilize the walkway to stroll, by making the road as an autonomous power source by applying Piezoelectric Sensor Technology as energy change media, ascertaining the typical power in each and every progression passer-by, and the typical number of walkers. The aftereffects of this study should be visible that with the plan of the walkway so as to get, for each 1 stage balance delivers a voltage of 6.8 V and power 0.000319 Watt at the point when given 441 N style, the voltage will keep on expanding as the power gets heavier in providing for piezoelectric, in this plan the creator utilizes 4 bits of piezoelectric organized lined up in one-pieces media, with a normal of 3207 stages each moment required to have been a wellspring of energy.

[6] The plan of power age utilizing stride in light of accessible piezoelectric sensors. Human race requires energy at exceptionally fast rate for their living and prosperity from the hour of their appearance on this planet, on account of this reason power assets have been exhausted and debilitated. Proposition for the business and use of extreme energy in foots of human is especially to the reason for very populated countries like China and India. Where the roads, rail and bus stop are over inhabited and pressed tight as can be moving nonstop. Along these lines, utilizing such idea the power can be profited and conveyed by changing over mechanical energy to electrical energy.

III.PROPOSED FRAMEWORK



The main working of this project depends on piezoelectric effect, which converts pressure into electrical energy. Here we have placed a piezoelectric tile which consists of piezoelectric sensors connected in series and parallel. Here, pressure is taken as input and it is converted into electrical form. The Arduino UNO acts as heart of system which transforms analog values into digital values. Whenever force is applied on piezoelectric sensor that force is converted into Electrical energy. The LCD will then display the amount of voltage generated by the circuit. The highest voltage generated in this project

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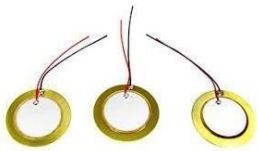
is 8.29 V. We have utilized IR sensor to identify the presence of an individual. When an individual is distinguished by the IR sensor the produced energy by the piezoelectric sensors will be utilized to charge a mobile phone. Then, the voltage generated by the piezoelectric sensors can be used to charge the mobile phone. The results shown that this footstep generation system is very important for utilization in today's world. We have designed an application to know the location of the mobile charging points.

IV. SPECIFICATIONS

A) PIEZOELECTRIC SENSORS



A piezoelectric sensor is a gadget that utilizes the piezoelectric effect to quantify changes in pressure, acceleration, temperature, strain, or power by switching them over completely to an electrical charge. The high modulus of flexibility of piezoelectric materials is tantamount to that of numerous metals and goes up to 106 N/m^2.Piezoelectric sensors are adaptable devices for the estimation of different cycles. They are utilized for quality affirmation, process control, and for innovative work in numerous ventures. Despite the fact that piezoelectric sensors are electromechanical frameworks that respond to pressure, the detecting components show right around zero avoidance. This gives piezoelectric sensors roughness, a very high normal recurrence and a fantastic linearity over a wide amplitude range. Two fundamental detecting materials utilized for piezoelectric sensors are piezoelectric ceramic (like PZT fired) and single-crystal materials (like quartz). The responsiveness of artistic materials is higher than that of regular single-crystal materials, however their high sensitivity degrades over time. Piezoelectricity, additionally called the piezoelectric effect, is the capacity of specific materials to produce an AC (exchanging flow) voltage when exposed to mechanical pressure or vibration, or to vibrate when exposed to an AC voltage, or both.

B) ARDUINO UNO

Arduino UNO is a minimal expense, adaptable, and simple to-utilize programmable open-source microcontroller board that can be coordinated into different electronic ventures. The Arduino is a little board with a microcontroller that could be redone and can be modified utilizing C or C++.The Arduino/Genuino Uno has various offices for communicating with a PC, another Arduino/Genuino board, or other microcontrollers. The ATmega328 gives UART TTL (5V) sequential communication, which is accessible on computerized pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this sequential correspondence over USB and shows up as a virtual com port to programming on the PC. Every one of the 14 computerized pins and 6 simple pins on the Uno can be utilized as an info or result, under programming control (utilizing pinMode (), digitalWrite (), and digitalRead () capabilities). They work at 5 volts. Each pin can give or get 20 mA as the suggested working condition and has an inward draw up resistor (detached naturally) of 20-50K ohm. A limit of 40mA should not be surpassed on any I/O pin to keep away from extremely durable harm to the microcontroller. The Uno has 6 simple information sources, named A0 through A5; each gives 10 pieces of goal (for example 1024 distinct qualities). Naturally, they measure from ground to 5 volts, however it is feasible to change the upper finish of the reach utilizing the AREF pin and the analog Reference () function.

C) IR SENSOR

An infrared (IR) sensor is an electronic gadget that actions and identifies infrared radiation or intensity in its general

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climate. In a characterized point range, the sensor components identify the intensity radiation (infrared radiation) that changes over the long haul and space because of the development of individuals.IR Sense cilk identifies the temperature of items and individuals moving. It can likewise identify a human body that stays still. In this way, it separates heat no matter what the reality whether an article is moving. An infrared sensor (IR sensor) is a radiation-delicate optoelectronic part with an otherworldly responsiveness in the infrared frequency range 780 nm … 50 µm. IR sensors are currently broadly utilized moving locators, which are utilized in building administrations to turn on lights or in alert frameworks to recognize unwanted visitors. In a characterized point range, the sensor components distinguish the intensity radiation (infrared radiation) that changes over the long haul and space because of the development of individuals. Such infrared sensors just need to meet moderately low necessities and are minimal expense efficiently manufactured things. InfraTec doesn't supply such items, InfraTec creates, delivers and sells pyroelectric identifiers.

D) LCD (Liquid Crystal Display)

LCD (Liquid Crystal Display) is a kind of level board show which involves fluid precious stones in its essential type of activity. LEDs have an enormous and fluctuating arrangement of purpose cases for shoppers and organizations, as they can be ordinarily found in cell phones, TVs, PC screens and instrument boards. LEDs have a huge and differing set of purpose cases for buyers and organizations, as they can be usually found in cell phones, TVs, PC screens and instrument boards. Liquid Crystals don't emanate light straightforwardly, rather utilizing a backdrop illumination or reflector to deliver pictures in variety or monochrome. With no voltage applied between straightforward anodes, fluid precious stone particles are adjusted in lined up with the glass surface. LCD uses a liquid crystal to produce a visible image. Since LCD screens don't utilize phosphors, they seldom endure picture copy in when a static picture is shown on a screen for quite a while, e.g., the table casing for a carrier flight plan on an indoor sign. LCDs are, notwithstanding, defenseless to picture persistence. [3] The LCD screen is more energy-effective and can be discarded more securely than a CRT can. Its low electrical power utilization empowers it to be utilized in battery-controlled electronic gear more effectively than a CRT can be. By 2008, yearly deals of TVs with LCD screens surpassed deals of CRT units around the world, and the CRT became out of date for most purposes.

E) BATTERY

A lead acid battery comprises of a negative terminal made of elastic or permeable lead. The lead is permeable to work with the arrangement and disintegration of lead. Lead corrosive battery is the most ordinarily utilized battery. This profoundly exergonic cycle additionally makes up for the enthusiastically ominous arrangement of Pb2+(aq) particles or lead sulfate (PbSO4(s)). This makes a compound response that considers energy to be put away. Overflowed Lead-Acid batteries are the most well-known assortment of lead-corrosive batteries. Fixed lead corrosive batteries can have a plan life of somewhere in the range of 3 - 5 years as far as possible up to 12+ years relying upon the assembling system of the battery. There are many elements that influence the assistance life of the battery including temperature, for more data if it's not too much trouble, view our specialized manual.

F) RELAY

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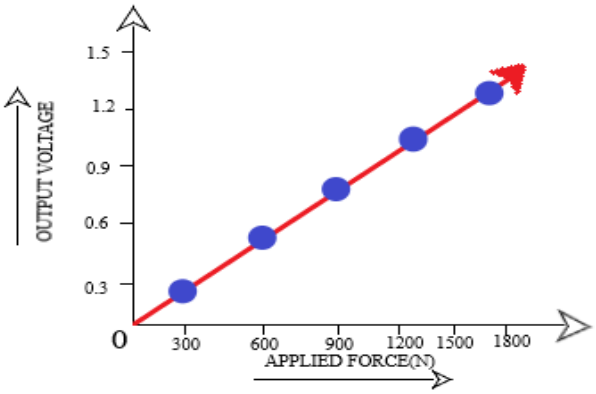
A relay is an electrically worked switch. It comprises of a bunch of info terminals for a solitary or different control signals, and a bunch of working contact terminals. The switch might have quite a few contacts in various contact structures, for example, make contacts, break contacts, or blends thereof. Relay is one sort of electro-mechanical part that capabilities as a switch. The relay coil is stimulated by DC so that contact switches can be opened or shut. A solitary channel 5V transfer module for the most part incorporates a loop, and two contacts like regularly open (NO) and ordinarily shut (NC). This article talks about an outline of the 5V transfer module and its working yet prior to going to examine what is hand-off module is, first we need to realize what is hand-off and its pin design. The relay module with a single channel board is used to manage high voltage, current loads like solenoid valves, motor, AC load & lamps. This module is mainly designed to interface through different microcontrollers like PIC, Arduino, etc.

V. RESULTS



No Of Piezoelectric Sensors	Voltage(V)
1	0.520
2	0.612
4	1.15
6	3.05
8	4.85
10	6.67
12	9.67
15	12.58

VI. CONCLUSION

We hereby conclude after surveying the published papers that, in this task, we are creating electrical power as non-conventional strategy by basically strolling or running on the streets. Non-conventional energy framework is extremely fundamental as of now to our country. Non-conventional energy utilizing footstep is changing over mechanical energy into the electrical energy. By utilizing this energy preservation hypothesis and Piezoelectric sensor we are proposing another technique for power generation. Proposition for the use of waste energy of foot power with human velocity is especially applicable and significant for exceptionally populated nations like India and China where the streets, railroad stations, bus stands, malls and so on are all over swarmed and a large number of individuals move nonstop. The model is planned so that it changes over mechanical energy into electrical energy. In this manner it uses the generated energy in a valuable manner. Thus, it uses the power delivered by the model for re-charging the mobile phones. We are setting up an application to know the location of the mobile charging points.

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