



# A PIEZOELECTRICITY ENERGY INTEGRATION IN GARDEN

Sakshi Divedi<sup>#1</sup>,

Zeal Vyas<sup>#2</sup>

Guide: Asst.Prof.Gauri Ansurkar

Keraleeya Samajam's Model College, Dombivli East, Mumbai, Maharashtra, India

Abstract-Man has required and involved energy at a rising rate for the food and prosperity since days of yore. Because of this a great deal of energy assets have been depleted and squandered. Proposition for the use of waste energy of foot power with human motion is especially applicable and significant for exceptionally populated nations like India where the rail line station, sanctuaries and so on, are stuffed by and large nonstop. While the deck is designed with piezo electric innovation, the electrical energy created by the strain is caught by floor sensors and changed over completely to an electrical charge by piezo transducers, then, at that point, put away and utilized as a power source. What's more, this power source has numerous applications as in horticulture, home application and road lighting and as energy hotspot for sensors in far off areas. This paper is tied in with creating power when individuals stroll on the Floor. Contemplate the powers you apply which is squandered when an individual strolls. The thought is to switch the weight energy over completely to electrical energy The Power producing floor expects to make an interpretation of the active energy to the electrical power. Energy Emergency is the central concern of world nowadays. The adage of this examination work is to confront this emergency some way or another. However it won't meet the prerequisite of power yet indeed on the off chance that we can plan a power creating floor that can deliver 100W on only 12 stages, then, at that point, for 120 stages we can create 1000 Watt and in the event that we introduce such sort of 100

stories with this framework, it can create 1MegaWatt. Which itself is an accomplishment to make it critical.

keywords: Piezoelectric sensor, Stride, distant area, power and strain, power age

## I. INTRODUCTION

Step by step, the number of inhabitants in the nation expanded and the prerequisite of the power is likewise expanded. Simultaneously the wastage of energy likewise expanded in numerous ways. So, transforming this energy back to usable structure is the significant arrangement. As innovation is created and the utilization of contraptions, electronic gadgets additionally expanded. Power age utilizing moderate strategies becoming lacking. There is a need emerges for an alternate power age technique. Simultaneously the energy is squandered because of human movement and numerous ways. To conquer this issue, the energy wastage can be changed over completely to usable structure utilizing the piezoelectric sensor. This sensor changes the tension on it over completely to a voltage. So, by utilizing this energy saving strategy that is the stride power age framework we are creating power. This undertaking is utilized to produce voltage utilizing stride force. The proposed framework fills in as a medium to produce power utilizing force. This venture is extremely valuable openly puts like transport stands, theater's, rail route stations, shopping centers, and so forth. Thus, these

frameworks are put in broad daylight spots where individuals walk, and they need to go on this framework to traverse the entry or exists. Then, these frameworks might produce voltage on every single step of a foot. For this reason, piezoelectric sensor is utilized to quantify power, strain and speed increase by its change into electric signs. This framework involves voltmeter for estimating yield, Drove lights, weight estimation framework and a battery for better exhibit of the framework. In another manner, we are additionally saving normal energy.

## II. LITERATURE SURVEY

Prior advancements in the piezo electric hardware included fixation on little vibrations and thus little strains. Likewise, not many of them required outside voltage supply and there were number of misfortunes in the framework which adds up to low voltage yield. In December 1929, researchers in U.S Naval force performed different explores on piezoelectric gems. Their emphasis was essential on the elements of gems. This examination demonstrated that by changing the aspect and direction of precious stone the result. impressively different. They planned the precious stone named 'Curie cut' or 'Zero Cut considering the progressions made in the points of the gem. Hence, this demonstrates that the precious stones planned with such aspects are powerful in controlling motions of a 50watt vacuum tube. In this way, they go about as a voltage controlling gadget as well. In 1985, the idea of involving penmanship elements for electronic recognizable proof was acted in Sandia Research centers A piezoelectric sensor pen for getting the pen point elements during composing was examined. Plan conditions were inferred, and subtleties of a working gadget were examined. Common result waveforms got from the activity of the pen and showed the dissimilarities between elements of a veritable signature and an endeavoured imitation. Along these lines, this likewise shows high awareness of Piezo material towards peripheral strain change. In 2000, different uses of piezoelectric in remote detecting was considered and tested. Various modern and military applications require remote detecting of different machine and gear working boundaries where customary

power sources may not be accessible and extensive stretches of unattended activity are required. Regularly, nonetheless, some wellspring of Vibrating energy might be available in activity of the machine being referred to. Consequently, a piezoelectric source is effectively used to create power for the activity of a microcontroller and radio transmitter secure inspected machine information. Different methods for the productive change, use and capacity of piezoelectric power are found and utilized in an overall energy reaping information transmitter plan. In 2005. US Protection Advance Exploration Venture Organization (DARPA) started a creative undertaking on Energy reaping which endeavours to control combat zone gear by piezoelectric generators implanted in officers' boots. In any case, these energy reaping sources put an effect on the body. DARPA's work to tackle 1-2 watts from persistent shoe influence while strolling was deserted because of the uneasiness from the extra energy consumed by an individual wearing the shoes In this undertaking the fixation is basically on utilization of the piezoelectric gems and movies in high vibration framework with productive course of action to get higher effectiveness. In addition, the enhancement level planned will be with the end goal that the result rating of framework will be extensively higher than past framework

## III. NEED OF Framework

The Usage of the Waste Energy foot Power With human movement is vital and exceptionally populated nations. India and chine where the streets railroad stations, sanctuaries and so forth, are all over swarmed and a huge number of individuals move nonstop.

## IV. PIEZOELECTRIC SENSOR

A piezoelectric sensor is a gadget that utilizes the piezoelectric impact to quantify changes in pressure, speed increase, temperature, strain, or power by switching them over completely to an electrical charge At the point when a power is applied to a piezoelectric material, an electric charge is produced across the essences of the gem. This can be estimated as a voltage relative to the strain (see graph to the right). A given

static power brings about a comparing charge across the sensor.

Flex movements, contact, vibrations, and shock estimation all utilization piezoelectric sensors. They are utilized in areas like medical services, aviation, customer gadgets, and atomic instrumentation

A piezoelectric sensor changes over actual boundaries - for instance, speed increase, strain or tension into an electrical charge which can then be estimated. They are exceptionally delicate and tiny in size making them appropriate to regular articles.

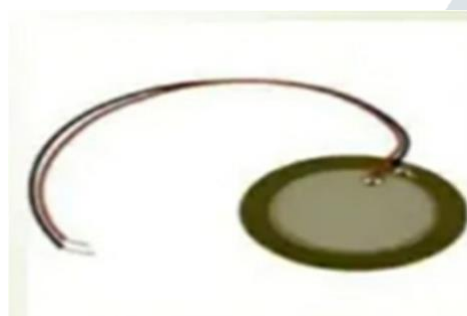
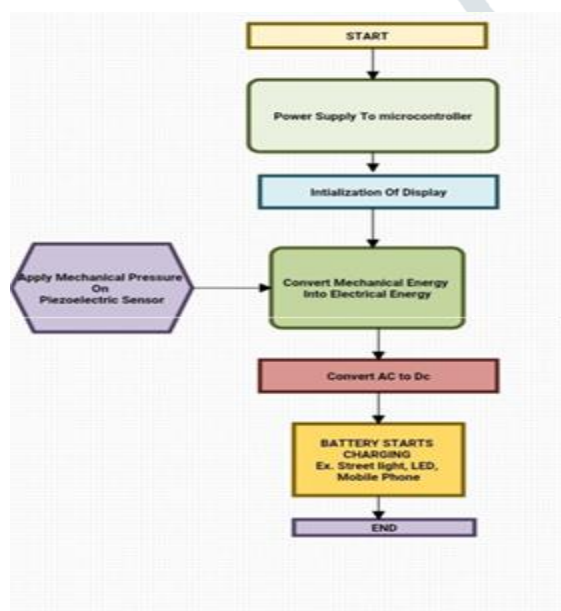
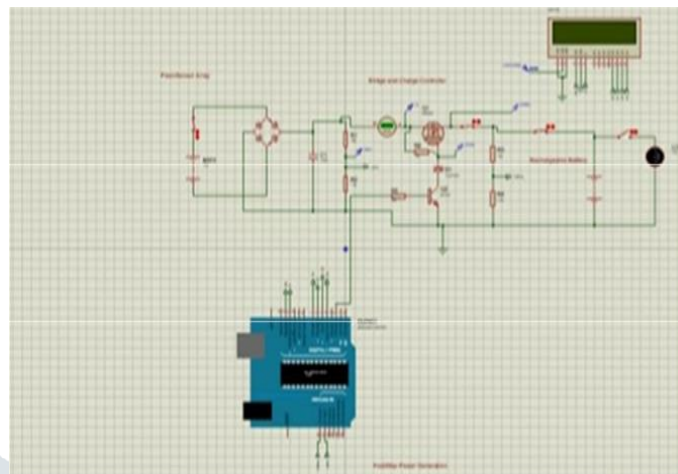


Fig 1. Piezoelectric Sensor

## V. TREE DIAGRAM



## VI. SIMULATION DIAGRAM



## VII. WORKING

The primary parts of the framework incorporate piezoelectric sensors, voltage sponsors, voltage controller, PIC microcontroller, battery, LCD show, LDR and an attachment for versatile charging. Here in this framework, right away, the result from a variety of piezoelectric sensors is taken care of into voltage promoter. In the framework, two voltage promoters are utilized to support the voltage to get the ideal result. The result from piezoelectric sensor is in the scope of 3 V to 4 V. It must be supported to a scope of 9 V to 12V with the assistance of voltage promoters. A consistent result voltage independent of vacillations will be kept up with by a voltage controller. This controlled voltage is put away in the battery and is taken care of to the microcontroller. The LCD which is communicated with the microcontroller thusly shows how much charge put away by the battery. In this framework the power produced has been utilized for two applications like lighting a streetlamp and charging a cell phone. A LDR is utilized to show the streetlamp application. A ringer is utilized to caution when the battery voltage falls beneath the expected voltage for charging the microcontroller. For PIC microcontroller 5 V is expected for its working. The portable charging attachment likewise requires 5 V for its activity. A draw down resistor is utilized in the attachment to pull down the voltage to 5 V. The power is produced by basically strolling over a stage. The framework needn't bother with any fuel input for its working this is a non-regular framework where battery is utilized to store the created power. Despite the fact that the power is utilized to produce power, the framework is appropriate to specific spots. Mechanical moving parts utilized in the framework are enormous there by



expanding the expense. The power age utilizing strides can be executed really in schools, universities, film theaters, shopping edifices, sanctuaries and numerous different structures.

#### A. Microcontroller Unit

The vitally controlling unit of the whole framework is a microcontroller. The contribution of the microcontroller is the result from the voltage generator. For the task PIC8F4520 is utilized the channel utilized eliminates the air conditioner parts from the result voltage of the sensor. It behaves like a short out for ac voltage and open circuit for dc voltage. A LCD show is interacted with the microcontroller



Fig 4. Controller Unit

#### B. Voltage Booster

It is a DC-to-DC converter and result voltage more noteworthy than the info voltage. The gadget has basically to semiconductors and one energy stockpiling component. It is a class of exchanged mode power supply



Fig 5. Voltage Booster

#### C. Recreation Result

The recreation some portion of the task is done with the assistance of delicate products like Mikro C and Proteus. LCD Show With the assistance of the block graph the circuit configuration has been begun. As the whole undertaking has been constrained by the microcontroller; the plan has been begun from the regulator IC PIC. The fundamental plan currently finished is the interacting of PIC with the LCD show. Here, we are utilizing a 16\*2 LCD show. After the fulfilment of this initial phase in circuit plan, the

working is confirmed utilizing the Proteus Programming and coding has been composed utilizing Mikro e program for PIC.

#### D. Portable Charging

Planned the outside circuit association the according to the block outline by utilizing PIC16F677. The contribution of the PIC is given from the piezo electric gem. The result from fifteenth pin of the PIC is given as an attachment input. The result from the attachment is 5v which can be utilized for a portable charging

### VIII. FUTURE SCOPE

The piezoelectric gems have been started better use with the positive outcome. In China and Japan, most extreme public development is seen in rail line station, air terminals and shopping centers. Thus this spot can be utilized for piezoelectric gems for age of electric power. Aside from every one of the above place's endeavours are made to foster energy from our regular routine by initialling piezoelectric in shoes in this manner in each step piezoelectric precious stone can be compacted which can turned sufficient ability to charge a cell phone, mp3 player and so on. Through this we can create electric power and involved that for little electronic devices.

### IX. USE OF PROPOSED SYSTEM

From days of yore, human controlled transport has been in presence in structures like running, strolling and so forth machines prompted the upgraded utilization of human power in a productive way. Energy of human motion can be switched over completely to electrical energy with the assistance of promising advances. In this framework, there is a sub flooring block of piezo electric gems, which confers an electrical flow when individuals stroll across it. The strain spellbinds the precious stone there by isolating the focuses of positive and negative charges. Utilization of voltage on the precious stone produces mechanical contortion of the material. Direct piezo electric impact, which is the peculiarity of age of voltage under mechanical pressure is utilized in the framework. The use of mechanical pressure creates an electric polarization which is relative to the pressure. In the event that the gem is short-circuited, stream of charge can be seen during stacking.

**XI. ADVANTAGES AND DISADVANTAGES**

**A. ADVANTAGES**

1. Power age is just strolling on step
2. No need fuel input
3. There is a non-ordinary framework
4. No moving parts long help life
5. Reduced at this point profoundly awareness
6. Self producing no outside power required

**B. DISADVANTAGES**

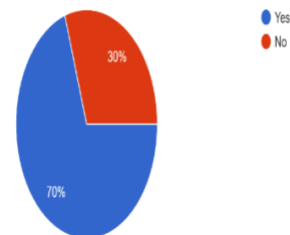
1. Just pertinent for the specific spot
2. Intial cost of the plan is high
3. Yield impacted by temperature varieties
4. Precious stone is inclined to break whenever overemphasized

**8.1 Questionnaire**

- 1) What is your age?
- 2) Have you heard about piezoelectric technology before?
- 3) Is energy production sustainable via piezoelectricity?
- 4) Practical ways of applying piezoelectricity in renewable energy?
- 5) What are the advantages of piezoelectricity?
- 6) What are disadvantages of piezoelectricity?
- 7) Is piezoelectric good for the environment?
- 8) Would you be interested in incorporating sustainable energy solutions in your garden?
- 9) How often do people visit your garden?
- 10) Are you open to the idea of installing piezoelectric elements to capture energy from foot traffic?
- 11) How important is environmental sustainability in your garden design choices?
- 12) Would you be willing to invest in a piezoelectric integration for long-term energy savings

2) Have you heard about piezoelectric technology before?

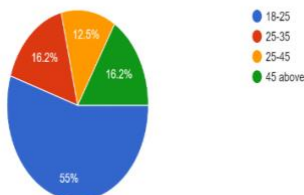
Have you heard about piezoelectric technology before?  
80 responses



**Result 8.2**

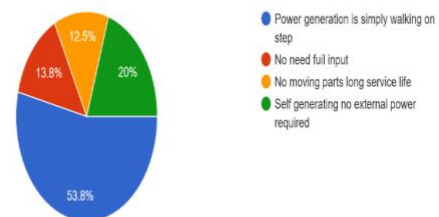
1) What is your age

Age  
80 responses



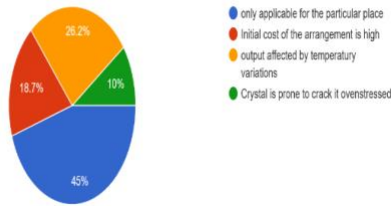
3) What are the advantages of piezoelectricity?

What are advantages of piezoelectricity  
80 responses



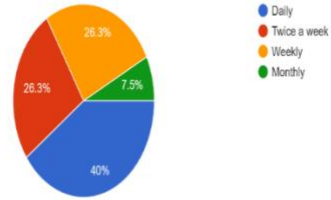
4) What are disadvantages of piezoelectricity

What are disadvantages of piezoelectricity  
80 responses



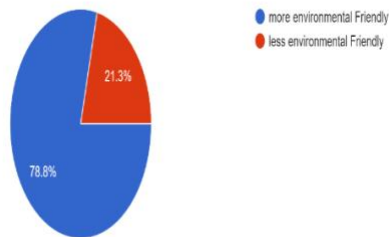
7) How often do people visit your garden?

How often do people visit your garden?  
80 responses



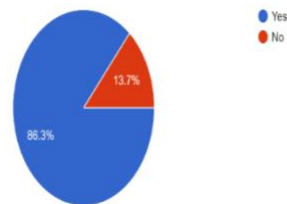
5) Is piezoelectric good for the environment?

Is piezoelectric good for the environment  
80 responses



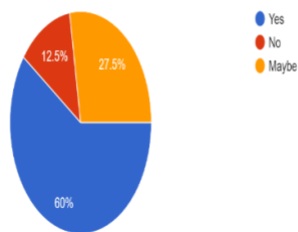
8) Are you open to the idea of installing piezoelectric elements to capture energy from foot traffic?

Are you open to the idea of installing piezoelectric elements to capture energy from foot traffic?  
80 responses



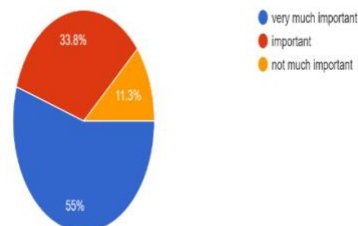
6) Would you be interested in incorporating sustainable energy solutions in your garden?

Would you be interested in incorporating sustainable energy solutions in your garden?  
80 responses



9) How important is environmental sustainability in your garden design choices?

How important is environmental sustainability in your garden design choices?  
80 responses



### HYPOTHESIS TESTING

Hypothesis testing is a sort of statistical reasoning that includes analysing data from a sample to derive inferences about population parameter or probability distribution. First, a hypothesis is created regarding the parameter or distribution. This is known as the null hypothesis, abbreviated as  $H_0$ . After that, an alternative hypothesis

(denoted  $H_a$ ) is defined, which is the polar opposite of the null hypothesis. Using sample data, the hypothesis-testing technique determines whether or not  $H_0$  may be rejected. The statistical conclusion is that the alternative hypothesis  $H_a$  is true if  $H_0$  is rejected.

For this paper,

Sr.no	Name	Age	Grade of Interest
1	Surya	18-25	Interested
2	Abhishek	18-25	Interested
3	Sarvesh	18-25	Interested
4	Deepika	18-25	Not Interested
5	Jayesh	18-25	Not Interested
6	Dinesh	18-25	Not Interested
7	Archana	25-45	Interested
8	Sonam	25-45	May be
9	Pallavi	25-45	Not Interested
10	Vaibhavi	25-45	Interested
11	Vaishali	Above 45	Interested
12	Sahil	18-25	Interested
13	Karthik	18-25	May be
14	Rahul	18-25	Not Interested
15	Devyani	Above 45	Interested
16	Manisha	Above 45	Not Interested
17	Mahesh	Above 45	Interested
18	Deepak	Above 45	May be

Null hypothesis ( $H_0$ ): Piezoelectricity energy integration in gardens can be trusted

Alternative hypothesis ( $H_a$ ): Piezoelectricity energy integration in gardens cannot be trusted

### TEST (STATISTICS)

There are 3 tests available to determine if the null hypothesis is to be rejected or not.:

1. Chi-squared test
2. T-student test (T-test)
3. Fisher's Z test.

A t-test is an inferential statistic that determines if there is a significant difference in the means of two groups that are related in some manner.

Level of significance

A significance level of 0.05, for example, means there's a 5% probability of discovering

difference when there isn't one. Lower significance levels indicate that more evidence is required to reject the null hypothesis.

Level of confidence

The confidence level indicates the probability that the location of a statistical parameter (such as the arithmetic mean) measured in a sample survey is also true for the entire population.

	Interested	Not Interested	Maybe	Total	
18-25	4	4	1	9	1
25-45	2	1	1	4	1
Above 45	3	1	1	5	1
Total	9	6	3	18	8
P	4.5	3	1.5	9	
					5.558
				H0 accepted	

Level of significance = 0.05 i.e. 5%  
 Level of confidence = 95%

The chance of rejecting the null hypothesis when it is true is the significance level

A t-score (t-value) is the number of standard deviations away from the t-mean. distributions.

The formula to find the t-score is:

$$t = (x - \mu) / (s / \sqrt{n})$$

where x is the sample mean,

μ is the hypothesized mean,

s is the sample standard deviation, and n is the sample size.

The p-value, also known as the probability value, indicates how probable your data is to have happened under the null hypothesis. Once we know the value of t, we can find the corresponding p-value. If the p-value is less than some alpha level (common choices are .01, .05, and .10) then we can reject the null hypothesis

and conclude that Piezoelectricity energy integration in gardens cannot be trusted.

Calculating t-value:

Step 1: Determine what the null and alternative hypotheses are.

Null hypothesis (H0): Piezoelectricity energy integration in gardens can be trusted

Alternative hypothesis (Ha): Piezoelectricity energy integration in gardens cannot be trusted

Step 2: Find the test statistic.

In this case, the hypothesized mean value is considered 0.

$$t = (x - \mu) / (s / \sqrt{n}) = (85.67 - 0) / (7.9789 / \sqrt{11}) = 3.2373$$

$$t\text{-value} = 3.2373$$

Calculating p-value:

Step 3: Calculate the test statistic's p-value.

The t-Distribution table with n-1 degrees of freedom is used to calculate the p-value. In this paper, the sample size is n = 11, so n-1 = 10.

Step 4-To Calculate Chi Squared value The formula is =CHIINV(0.05,2)

Where 0.05 is the level of significance and 2 is the degree of freedom (3-1)\*(2-1)=2  
 CHIINV(0.05,2)=19.3452

Since this Chi Squared-value is greater than our chosen alpha level of 0.05, we can accept the null hypothesis. Thus, we have sufficient evidence to say that piezoelectric energy integration in garden is a good energy source.



## CONCLUSION

In this task, we are producing electrical power as non-traditional technique by essentially strolling or running on the stride. Nonconventional energy framework is exceptionally fundamental as of now to our country. Non-regular energy utilizing stride is changing over mechanical energy into the electrical energy. By utilizing this energy protection hypothesis and Piezo sensor we are proposing another technique for power age. Proposition for the use of waste energy of foot power with human motion is particularly pertinent and significant for exceptionally populated nations like India and China where the streets, rail route stations, transport stands, sanctuaries, and so on are all over swarmed and a huge number of individuals move nonstop

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