

Hong Kong Student Science Project Competition 2023

Template of Extended Abstract (Invention Design Proposal)

(Word Limit: 1,600 words, Pages: 3 pages only)

Team Number: SCPE130

Project Title: Siu

Project Type: Invention Design Proposal

To our best knowledge, there are * similar works in the market; (if there are,) related product links are as below:

<https://www.instructables.com/Experiment-With-Piezoelectric-Sensor/>

The enhancement our project proposed / the difference with related products are:

We have more functions that can help people, the LED in front of the shoe can help light the way for the user.

**Please delete if not applicable. The competition values the originality of works. Students must do enough literature research to ensure that their works are unique and list relevant reference materials before starting research or invention.*

I. Background

We want to utilize the energy generated from a simple tedious task which is done frequently. Siu are shoes which can generate electricity from the kinetic energy of a walking user. Using electricity from a clean renewable energy source like this means, we can relinquish harmful sources such as fossil fuels or nuclear energy.

In addition, we can help those left-behind children and mountain children living in rural areas to overcome discrete electric sources for them. Our shoes aim to provide a more comfortable environment to the poor people around the world.

II. Objective(s)

1. Introduce a new sustainable and renewable energy source from the kinetic energy from the motion of walking.
2. Provide an emergency light source with an electricity generator from shoes.
3. Reduce pollution produced by other energy sources such as burning fossil fuels.
4. Provide a low-cost solution for the concept.
5. Provide an environmentally friendly solution.

III. Methodology

We will conduct an experiment for generating electricity by piezoelectric method.

Steps:

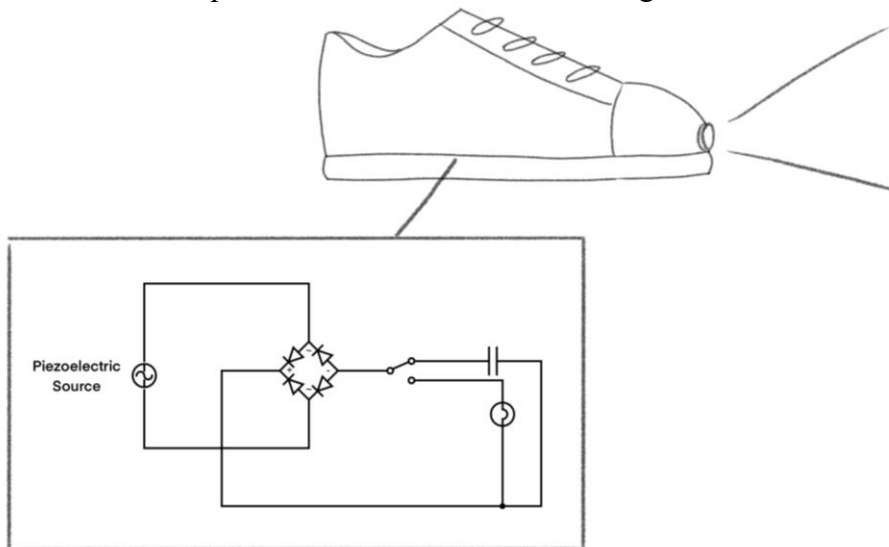
1. Make a diode rectifier bridge on the breadboard.
2. Connect wires to complete the circuit.
3. Test the circuit by hooking up the LED.
4. Connect a capacitor, switch and LED to the circuit.
5. Use a multimeter to measure the energy in the capacitor.
6. Test the circuit again by compressing the piezo element.

When the user walks with the shoes, the foot will slam into the piezo crystals. The piezo crystals will be compressed and due to the piezoelectric effect, this mechanical stress will generate an AC voltage.

IV. Design of Invention

We used a nickel metal hydride battery (NiMH battery) as an energy-storing device. It does not require a charge controller or voltage regulator like lithium ion batteries, is cheaper in terms of final cost, and they have higher capacity for batteries of the same price.

An LED will be in the front of the shoe with a switch to turn it on and off. When the piezo element is compressed, the voltmeter reading across the capacitor increases, which means that the capacitor is storing energy. When the LED is switched off, the current will flow into a power bank. The electricity will be stored and can be used to power an LED torch or other things.



If the LED is switched on, the energy stored in the NiMH battery can flow to the LED and light up the LED bulb. If there is not enough energy, the energy generated when the piezo crystals are pressed can also be used to light up the bulb.

V. Application / Market Need**Market need**

The left-behind children and mountain children in developing countries have no consistent source of electricity due to poverty and the poor conditions of the area in which they live. When they are walking in the dark, the light on our device can help them see their path. Moreover, it can be provided to some NGOs that are related to protecting the environment. They can share our product and promote a more sustainable living style to more people.

Area of application

Due to poverty in areas like India, power theft is a serious issue. Some people have to steal electricity from underground cables. This is extremely dangerous as it can cause electrical shocks and fires, even power surges.

Limitation

If the shoes wear down or an electrical component is damaged. It would be difficult to repair.
The cost of the shoes can be high, making it difficult to sell to the poverty-stricken people who need it.
The battery capacity will be limited.
Besides, if the shoes are not waterproof, when in contact with rain water or puddles, it risks leakage of electricity.

**VI. If your team will compete the Social Innovation Award, please list the target group or social issue the project focuses on, and provide justification for competing for this award.
(Word limit: 300 words)**

Our project focuses on improving the environmental issue through our innovation, Siu. We aim to utilize the energy generated from walking to generate electricity and store it as an energy source for other uses. The electricity generated by Siu is much cleaner and more environmentally friendly than other energy sources such as burning fossil fuels and using nuclear energy. We generate electricity from the kinetic energy of a walking user. Through this process, we can lessen the production of harmful substances and hope we can alleviate the problem of global warming and environmental pollution. In addition, we could also help those left-behind children and mountain children to overcome discrete energy sources. Our shoes aim to provide a more comfortable environment to the poor around the world.

VII. Conclusion

Siu improves our living standard, creates a greener and more ideal world. It lights up the mountain children and Left-behind children, brightens their future, which could light up their life. The mountain children and Left-behind children could also have a chance to become successful and meet more opportunities. This could build a better society with more talents.