

Stepspark 2.0

With the energy sector producing over 75% of global emissions, climate change is accelerating, making clean energy solutions more urgent than ever. So, I decided to create a way to generate power from something people do daily: walking. My innovation, Stepspark 2.0 is a backpack that generates electricity from the movement of one's feet. The electricity produced can be stored in a battery for later use, powering small devices via a USB port. By introducing a new source of energy, this innovation will not only help combat climate change but provide power for devices on the go — benefitting anyone who walks daily, and/or uses their devices regularly. This project is a continuation of one from last year, but there have been significant improvements in the electricity generated, as well as the overall design.

The more recent design works by having a string hooked onto the back of one's shoe. By stepping forward the string will get pulled, spinning a pulley mechanism inside the backpack, which then rotates the shaft of a small hand crank generator and generates electricity. The pulley mechanism and generator is inside a shoebox rather than the backpack itself; this way the innovation can be easily placed inside any backpack. While the installation does involve cutting a small hole at the bottom of the backpack for the string to run through, it's a small price to pay for generating electricity.

Inside the shoebox, because the string isn't strong enough to spin the generator shaft, it's connected to a bicycle chain and sprocket. This makes the pulley mechanism not only a lot more durable, but also strong enough to spin the generator. A custom part was 3D printed in order to attach the bicycle sprocket to the generator. The sprocket has a freewheel attached, which is a mechanism that only allows the generator to spin one way. Stepping forward the generator will spin, but on the way back the chain can retract without being affected by the generator's resistance. This generator also has a built-in USB port, and can directly charge any devices that are plugged in. The voltage can be controlled, from 3 volts to 15 volts, although most devices that use USB ports need 5 volts.

For demonstration purposes a light was attached to the generator so it's clearer that each step generates electricity, however in the future there will be a battery to store the charges over time. As of now the voltage is too inconsistent to charge phones as the electricity is being generated in short bursts, however this can be fixed using capacitors.

Stepspark 2.0 holds the potential to reduce reliance on traditional energy sources, while providing a convenient way to power small devices on the go. Designed to fit seamlessly into daily life, it still allows users to carry their belongings, remaining highly practical. This could be especially useful for hikers, students, or commuters who are often on the move without easy access to power. Although there are challenges to overcome, with future improvements this innovation can help with reducing environmental impact, empower individuals to generate their own energy, and become a part of everyday life — one step at a time.

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