

Renewable energy is a relatively recent industry that's growing by the day. There's a common trend with many of the main sources of renewable energy, and that's converting kinetic energy into electricity, whether it be the spinning or movement of a wind turbine, or hydro dam. But, a lot of things move in our daily lives, from cars, to bicycles. So, why don't we find ways to generate electricity off of these things that move everyday? This inspired us to make Stepspark 2.0, a backpack that takes the movement of your feet when walking to generate electricity. Not only does this innovation help combat climate change, it allows for a portable battery for everyday devices on the go.

We've made several prototypes, each one better than the last. The first design used the back and forth motion of your legs through a stick tied to the back of your thigh, which would move a rack and pinion back and forth on the inside of a shoebox, spinning a gear attached to a generator. This design took up a lot of space, and the energy generated from just thighs was not very significant.

We decided that instead of utilising the back and forth of the thigh, we would use a string attached to the back of the foot, as it had a wider range of motion. The string would also pull on a rack and pinion attached to a spring so it would retract, which again, spins a generator. Just like before, we used a shoebox as the frame, and attached it to our backs via a strap.

For our third and most recent design, we directly attached the string to the generator like a pulley, which spins due to friction. On one end there's a rubber band tied to the string to retract, and the other end is where one would attach it to the back of the foot. When one steps forward, this will pull on the string which spins the pulley/generator, and when the foot steps back, the rubber band retracts the string. Again, everything is stored on the inside of a shoebox attached to the user's back, but to make sure the rubber band will always retract and maintain tension, we have a paperclip attached to the string on the outside of the box to stop the rubber band from fully contracting.

In the end, we successfully created a working prototype that generates electricity from walking, although the exact amount of energy is still being tested. However, every step taken lights up an LED light that requires at least 2 volts. We have proven that it's possible to generate electricity off the movement of your feet, using something strapped to your back. Not only can it generate electricity, but it can be used as a normal backpack, making it a possibly essential everyday item.

In the future we hope to sew it directly into a backpack, which also correlates to making the contraption smaller and lighter. We plan to use better, more lasting materials such as aluminium instead of plastic, as well as stronger string to reduce the risk of breaking. We also plan to utilise more and higher quality generators to ultimately be able to comfortably charge your phone.

We would like to acknowledge our parents, who supported us and helped fund the materials used for the product. We would like to thank our teachers, who helped guide us in this project and reviewed all our work, and lastly we would like to thank our peers, who cheered us on throughout this project.

#### Bibliography

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