Shoe Charger for Cell Phones: Generating Sufficient Battery Power through Everyday Walking

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A common source of frustration for many cell phone users is having that device run out of battery, especially in a location without available outlets. Existing solutions that provide temporary battery power are either impractical (e.g., labor-intensive, hand-crank generator) or inconvenient (e.g., the bulkiness of an extra battery pack). This project aimed to use a human's daily walking motions to comfortably generate sufficient battery power that can be used to charge small electronic devices. After much research, the student created a design using a mechanical gear system to rotate a generator through the foot's downward pressure of each step. The prototype system consists of plastic components that were designed with the Autodesk Inventor Professional 3-D CAD software and then created using a 3-D printer, as well as custom-made wood parts. The parts were assembled to produce two working prototypes. Voltage readings were recorded per downward push of each prototype and compared. Based on an ideal design, calculations indicate that the device is capable of charging an iPhone 5 to over 100% battery power in a day (depending on the user's mass and steps taken per day). Due to resource limitation (e.g., the student's consumer-quality 3-D printer can only make bulky, plastic parts instead of precise metal parts), the final prototype cannot charge a cell phone. However, it is able to charge a smaller electronic device such as a calculator as proof of the concept. The design was also compared to an existing generator to evaluate practicality. Through experimental implementation, the student researcher created a design along with a primitive working prototype that utilizes daily walking motions to generate sufficient battery power for mobile devices.

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