

# **PROJECT STRIDE – SELF-SUSTAINING POSITION TRACKING FOOTWEAR**

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## **Project Summary**

Project Stride aims to provide a means for caretakers to have peace of mind while offering users freedom in the form of a location reporting shoe that is completely sustained on the excess kinetic energy a human generates by walking. Our smart shoe is an innovative solution to an ongoing problem of people going missing and the costs involved in finding them. A person suffering from memory loss or a child gone missing can induce stress on to loved ones who are working their hardest to find these individuals.

Our device functions by using the voltage generating properties of piezoceramics and converting this energy to usable energy to the low powered electronic components placed inside our shoe. The microcontroller would record and transmit GPS locations with the user's mobile phone through an android application and Bluetooth. This device will obtain the GPS values and allows users to view the route on Google maps using an android application. The shoe contains every module needed for location tracking, data transmission, and energy generation and storage.

## **Problem and Need**

The current problem that exists in part of society are missing persons, from children to elders. Missing persons cause distress for multiple parties, the person lost as well as the party searching for said person. Each year billions of dollars are used in search of lost individuals such as Alzheimer patients and children. At least 450,000 annual accounts of missing children have been reported [1] and over 2.5 million total cases of Alzheimer patients being lost have been reported [2] as well. The solution that needs to exist is a device that can function without special upkeep, with the ability to track the position of the wearer and report their location to a caretaker.

## **Significance**

Project Stride strives to create an intuitive low power system that users of all age ranges can use. By utilizing the kinetic energy leftover from walking, we can assure that the energy needed to power the microcontroller never runs out, with the only limit to connectivity the battery life of their caretaker's phone. Those with elderly or young dependents can rest assure that the unobtrusive system wouldn't be left behind like a phone or accessory as using our product is as reflexive to use as putting on your shoes.

## **Goal**

Project Stride strives to aid caretakers of individuals who suffer memory issues or are easily lost. Project Stride is a self-sufficient low maintenance device, able to transmit user locations to the caretaker. This is achievable by placing energy harvesting materials within the insole of the shoe, a shoe was chosen as there is vast amounts of kinetic energy to harvest as well as the point that many users are assumed to wear shoes when walking in public.

## **Customer/User Analysis**

Two user profiles exist when using the product, the immediate user that wears the shoes and the caretaker that receives all necessary information transmitted by the wearer. Each shoe contains a microcontroller that is attached to wireless transmission device (Bluetooth/FM Transmitter) that will send information from the connect GPS module to an Android device, that will then decipher that information to show where the user. For the setup, the wearer will only need to wear their shoes that will automatically connect to their phone and alert the second user profile, the caretaker with all necessary information.

## Deliverables

Project Stride aims to deliver a shoe that can convert kinetic energy to electrical energy by using the voltage generating properties of the piezoceramics. This shoe will be self-sufficient and will house low powered electronic modules that can track user's locations and relay this information to loved ones. Our project can be broken down into two main components, the hardware of the self-sustaining shoe and the software location tracking system.

The hardware component of this project's overall goal is being able to power a microcontroller through moderate user activity. This power must be able to sustain itself within 1 hour of sustained walking and must be rated at a minimum of 380 milliwatts to power all modules in the design. The hardware components will fit within a 2-centimeter-thick sole that is of comfortable wear. This is an additional specification as our shoe should be comfortable for the user.

The software side of the project must prove that it is able to send notifications of the user's location to the caretaker. This notification can either be in the form of an SMS or in-app notification but must notify the caretaker of the user's coordinates from a 10-meter distance away for the proof of concept. The GPS will obtain location readings every 60 seconds and store them in the microcontroller. It will send out the location via Bluetooth when the caretaker requests the location.

## Terminal Objective

The primary goal for this project is to construct a shoe with the ability to generate and harvest electrical energy by converting kinetic energy from the movement of walking. This energy harvested will be used to power a microcontroller that can relay the location of the user to an android application of either a caretaker or a loved one.

## Overview Diagram

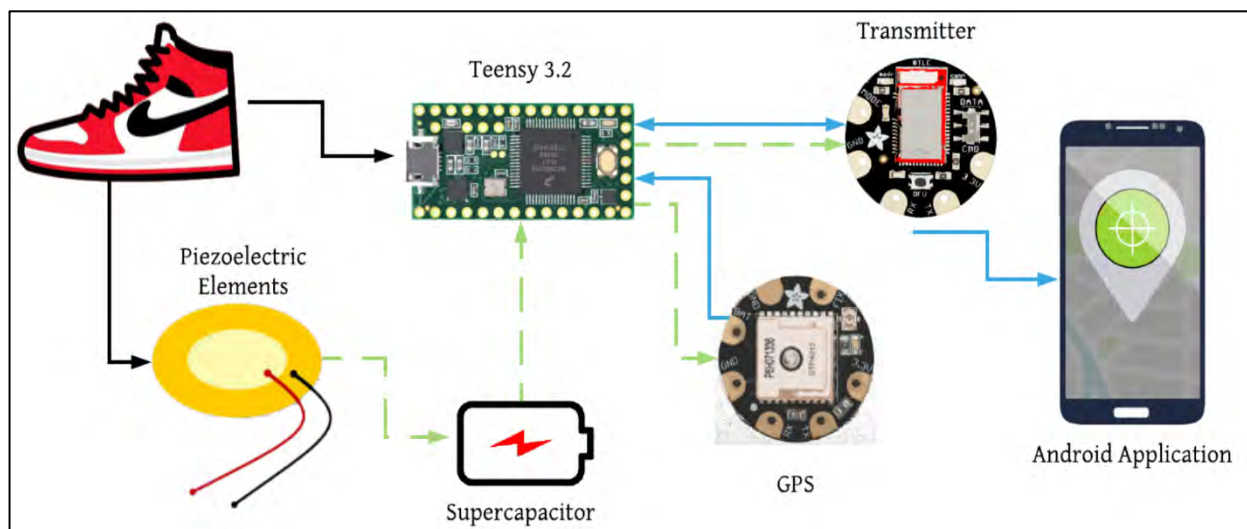


Fig. 1. The overview diagram for this project featuring the low powered system with all the modules and the communication functionalities. The arrows with a solid line indicate the flow of information and the dashed line indicate the flow of energy.

## References

- [1] "Missing and Exploited Children." Key Facts about the National Center for Missing & Exploited Children, [www.missingkids.org/keyfacts](http://www.missingkids.org/keyfacts).
- [2] "Latest Alzheimer's Facts and Figures." Latest Facts & Figures Report | Alzheimer's Association, 29 Mar. 2016, [www.alz.org/facts/](http://www.alz.org/facts/).