

Project Silly Little Guy - Proposal

CMPE2965

Connor Marsh

Bryce Frey

Aurora Fraser

PURPOSE

This project aims to create a step-counting device that will encourage people to explore outdoors and exercise more frequently by gamifying the walking process. It will sense the user's taken steps as well as their physical position and convert that information into game data.

PROPOSED SOLUTION

The solution centers around an embedded system featuring a “virtual pet” style game. A sensor detects steps taken by the carrier during the day and stores them in a lifetime step count. The “stats” of the virtual pet will be manipulated in response to the user’s physical activity.

Geolocation hardware will record the position of the device and reward the user for visiting new positions. A clock system will track the current time.

A save system on the device will persistently store user data. The device will be able to interface with a desktop application where the user can view, store, and manage their data. Save data will be synced to a database. The app will offer a more high-definition interface for the data, including a scaled-up version of the pet, and a map showcasing explored positions.

SPECIFICATION

The team intends to include the following features:

- 1) The system features a game where the user takes steps to enhance interactions with a virtual pet.
- 2) The pet and their stats will be animated and displayed on a screen.
- 3) A small speaker with a limited range will enable the game to produce noise.
- 4) Small buttons will be able to control information displayed on the screen.

- a) The user may customize the default step goals to bring them in line with their personal goals and set the clock information to their current time.
- 5) A sensor will detect movement as steps and store them on the device.
- 6) A clock will track daily progress and will alter elements of the game based on the passage of time.
 - a) Step data will be stored in increments. A daily, weekly, and lifetime set of the data will be maintained, with the first two data sets resetting after the corresponding time increments have elapsed.
 - b) The pet's happiness will change depending on how much activity was achieved by the user during the day.
 - c) The pet will be able to grow and change ("evolve") when the user achieves their weekly goal.
 - d) The pet may express negative reactions if the user has been inactive for a long time.
- 7) The game save data will be persistent and can be archived externally in case of corruption.
 - a) The device will connect to a computer using a wired peripheral to accomplish this.
- 8) The device will utilize battery power.
 - a) The software will feature a low power mode to preserve battery life.
- 9) The device will be able to sense and display the user's current position using geolocation. The device will store the user's most visited positions and modify game elements to encourage the user to visit uncommon positions.
 - a) The pet may become bored if the user stays in one place for too long or goes to the same locations repeatedly.
 - b) When the user visits new places, the pet may become excited and receive an increase to its stats.
 - c) The user will be able to upload their location data to the computer application and see it displayed on a high-definition map.
 - d) Position tracking will be reset weekly, and tracking data will not be stored over the long-term unless the user chooses to in the desktop app.

INNOVATION STRATEGY

This project requires exploration of technologies not previously studied in CNT, such as:

- Pedometer technology
- Video game design and gamification

- Battery circuit design
- Geolocation technology
- Pixel art design

KNOWLEDGE AND SKILL GAPS

The team has the following skills:

- Circuit design
- Desktop software development
- Microcontroller software development
- Microcontroller communication protocols

The team is less experienced with the following skills:

- Game Design / Gamification
- Step Tracking
- Geolocation
- GPS Drift Management
- Pixel Art and Image Compression

Particularly, research into designing pedometer and GPS software is required for the project to be successful. Techniques for improving accuracy in step measurements and position measurements will need to be implemented.

Further knowledge of turning sensor data into tangible values is required. Defining what constitutes a step given sensor data and turning relative positional data into locational data when connected to a computer are examples of data transformations that need to be applied.

The intricacies of game design will require research as well, especially which development software to use and how to balance the game to make sure it remains enjoyable.

Members of the team will need to research prior implementation of similar concepts and would benefit from using existing reference materials where possible.

RESOURCE REQUIREMENTS

The following resources will be required for the project:

- Geolocator
- Step-tracking sensor
- Desktop computer with Windows
- Buttons
- Small speaker
- Batteries
- Casing to secure components
- Microcontroller
- Wired communication peripherals (to connect Silly Little Guy to PC)
- Screen

TIMELINE

The team's tentative schedule is as follows:

Week (THURS)	Activities
1	<ul style="list-style-type: none"> - Course introduced - Brainstorming started
2 (JAN 16)	<ul style="list-style-type: none"> - Brainstorming due - Project proposal start - Project Proposal Draft due Wednesday (January 15th)
3 (JAN 23)	<ul style="list-style-type: none"> - Project Proposal due Wednesday (January 22nd) - Proposal Presentation (January 23rd) - Technical Specification Draft due Friday (January 24th) - Verification Test Draft due Friday (January 24th)
4 (JAN 30)	<ul style="list-style-type: none"> - Technical Specification Revision due Wednesday (January 29th) - Verification Test Revision due Wednesday (January 29th) - Project Plan due Thursday (January 30th) - Start project synopsis - Build final technical report outline - Begin to populate research doc - Begin initial circuit design and part identification - Ordering and acquisition of parts
5 (FEB 6)	<ul style="list-style-type: none"> - Ethics Assignment due Thursday (February 6th) - Begin testing circuits - Begin interfacing with microcontroller - Begin development of microcontroller software - Initial gameplay loop development - Draft project synopsis - Build progress report outline

6 (FEB 13)	<ul style="list-style-type: none"> - Step tracking system - Draft progress report - Start geolocation development
7 (FEB 20)	- <u>READING BREAK (NO CLASSES)</u>
8 (FEB 27)	<ul style="list-style-type: none"> - Start building desktop app - Hardware interfacing with desktop app
9 (MAR 6)	<ul style="list-style-type: none"> - Project Synopsis due Tuesday (March 4th) - Progress Report due Thursday (March 6th) - Geolocation development done by start of week
10 (MAR 13)	<ul style="list-style-type: none"> - Step tracking and geolocation testing, refine code, increase accuracy - Game should be close to finished - Start 3D modelling the casing
11 (MAR 20)	<ul style="list-style-type: none"> - Go for a walk several times for testing purposes - Tweak achievable daily and weekly goals
12 (MAR 27)	<ul style="list-style-type: none"> - Final Technical Report Draft due Tuesday (March 25th) - 3D print finished by start of week - Finish desktop app and desktop communication with hardware
13 (APR 3)	- User Manual due Thursday (April 3rd)
14 (APR 10)	- Final Technical Report due Thursday (April 10th)
15 (APR 17)	- Presentation Rehearsals
16 (APR 24)	<ul style="list-style-type: none"> - Presentation Rehearsals - Presentation