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CSE 466

Activity Logger - Tran

**Purpose**

The purpose of this activity logger is to distinguish between standing, walking, and running activities and log/display the data. The LCD screen would display RED for standing, YELLOW for walking, and of course GREEN for running. Also there is a calorie counter that approximates the calories burned by the user bases on online calories charts and bases on a person with a weight of approximate 140 pounds.

**Directions**

**Setup** - To use the device first turn on the device by switching the external battery pack switch on. The LCD screen should turn on and there will be prompt mentioning tests are being run. Then half the screen should turn red. At that time let the device sit on the ground for 10 seconds for it to calibrate and settle.

**Usage** - Afterwards it’s ready for use. Take the deceive into one hand and stand up. You should see the “calories Burned” counter running for it will assume you’re standing be default. Stand normally with the device and it should register you as standing (RED). Start walking around with the device in hand and the RED portion will turn YELLOW indicating that you’re walking. Additionally the Calories Burned rate will increase. Lastly when you run with the device it’s the color indicator will turn GREEN meaning that you’re running and the Calories Burn rate will increase even more. Stand, walk, run as you like and the device will calculate the accumulated calories burned/ and automatically log your activity into a txt file in the SD card. There’s also a push button that toggles the LCD brightness from high to dim. Every 35 milliseconds the Teensy automatically logs the current activity (running, walking, or sitting) with the timestamp into the SD cards text file.

**Hardware**

Teensy was setup connected to the LCD screen which was connected to an SD card. Also the Teensy was connected to an IMU which had a gyroscope. The Teensy is the central control which controls system flow which is powered by an external battery. Data from the gyroscope is sent to the Teensy.

**For Classification -** The Teensy in turn interprets the data and derives three numbers representing the x, y, and z orientation and then logs the data into the SD card x, y, z, timestamp in CSV format.

**For Usage -** The Teensy classifies the data and logs it as either “standing”, “walking”, or “running” and a timestamp into the SD card.

Additionally there’s a push button which controls how dim the LCD screen is. This is done by using signal denouncing with the button signal to toggle a specified pin between high and low that’s connected to a transistor. When the pin is LOW the transistor allows more voltage to the LED in the LCD, and when the pin is HIGH the transistor allows less voltage to the LED making it dimmer.

**Theory of Operation**

**Classification** - Initially data was collected for classification of activities. The Teensy takes in gyro readings of x, y, z, timestamp and records it into the SD card. Data was collected for all three activities Standing, Walking, and Running into CSV format. There the data was parse with a python screen and classified based on the sum of distance between x, y, z and previous x, y, z in an approximate one second frame. With such data a mean and variance is computed. Also activities are assumed to be 70% standing/sitting, 25% walking, and 5% running.

**Operation** - The Teensy take in data from the gyro and calculated the posterior probabilities base off the classification values. The activity with the largest posterior value is chosen as the current activity and displayed. As mention calories burned is calculated by using online calories values based on a 140 pound person. Then the activity is logged into the SD card with a timestamp.