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Semantic Web Programming - Assignment #3
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Pedometer Data Analysis with Raspberry Pi and iOS HealthKit

The following demonstrates a rudimentary solution to visualize the number of steps taken throughout a given period using Python on the Raspberry Pi. The pedometer data is queried and serialized using a small iPhone application. Source code is included for both the iOS application and the python script that organizes and visualizes the data. The JSON serialize functionality is provided by an open source Objective-C library called JSONModel[1].

Though it's possible to query for dietary energy intake, workout properties, sleep analysis, and other health related data samples, this example deals only with step counts as it doesn't require as many data type (and domain) specific concepts to be pre-understood.

I originally intended to create a python based web server to allow for the iOS application to send the pedometer data as an http POST message, though the additional management duplicated data and other storage related overhead became more trouble than it was worth for the sake of the assignment. As a workaround, the application simply opens the iOS email app and attaches the JSON serialized data file to the email. The script can be executed with the given data file as the only argument as follows.

$ ./assignment3.py health_data_export.json

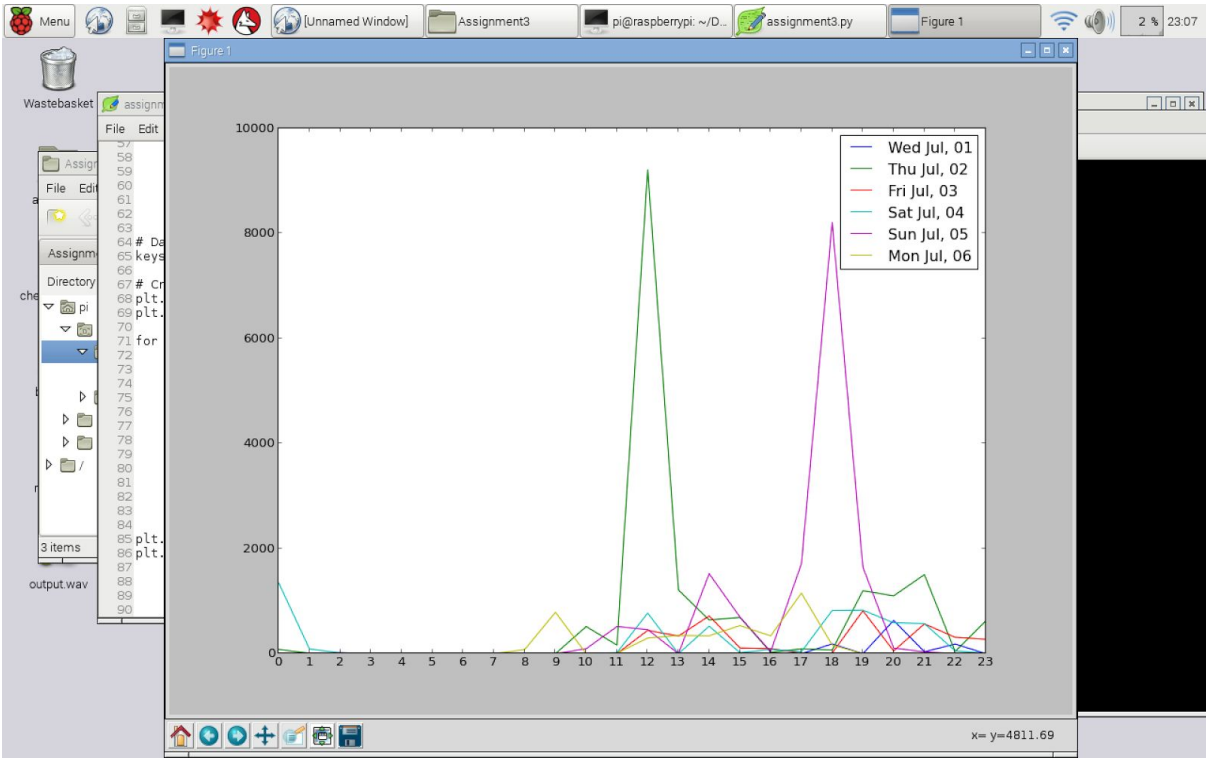
The iOS application requires a valid developer signing key and provisioning profile (not included) to be executed on a live device (the iOS simulator may not produce pedometer samples). The test file included encapsulates the past six days of pedometer data.

Pedometer samples are represented as simple objects with the following structure.

```
{
   "count": 19,
   "startDate": "2015-07-06T18:08:58-0400",
   "endDate": "2015-07-06T18:09:06-0400"
}
```

The python script reads the JSON file and organizes all pedometer samples into groups according to day and then totals number of samples for each hour in each day (according to the startDate property). The result is a twenty-four element list for each day that is plotted. This plot is as expected and aligns with my regular workout regimen. Thursday and Sunday were primarily cardio days that involve 2.5 mile power walks that run just under an hour as the graph shows.

The six day plot of my iPhone's pedometer registered steps, running on the Raspberry Pi. It's important to note that the hour marks along the x axis are UTC in 24 hour format (no Eastern offset).



A comparison to the line graph in the iOS Health application shows the same two spikes in step count, further validating the results of the Python script.

The same range of data viewed in the iOS Health app.

[1] JSONModel Framework for Objective-C [https://github.com/icanzilb/JSONModel] is distributed under the terms of the MIT License.