

Energy based Location Prediction

- **Group Members and their Tentative Roles:**

Shailesh Kelkar: Data Collection, Training model

Srihari Venugopalan: Data Collection, Training model

Gayatri Sivaraman: Data Collection, Energy Mapping

Jayant Bedwal: Data Collection, Energy Mapping

- **Description:**

What the group plans to do for the project and your approach

Location tracking is mainly based on GPS and GLONASS, which is incorporated in most of the smartphones today. We are planning to create and train a model using the sensors available in a smartphone. The model will consist of two modules, one for mapping the location based on GPS values, and another for calculation of energy of a person at that particular location. This energy will be calculated based on the values of accelerometer, barometer and gyroscope. The two modules together will give us a mapping between energy and location. Our aim is to use this energy map in order to predict the location of a person without depending on GPS data.

- **Motivation:**

GPS on smartphone drains a lot of battery life when continuously utilised for location tracking. Our motivation is to save energy by creating a model utilising only accelerometer, barometer and gyroscope values and discover the places of interest based on the energy level of a person. Though it is not as accurate as GPS, it could prove to be an alternative to locate a person based on his history.

- **Description of previous research in the area (with references):**

There has been a lot of research in predicting location using GPS data and using inertial sensors for energy expenditure prediction. But, there has been very less research in combining use of GPS and inertial sensors for location prediction. We are planning to exploit this area and come up with GPS independent accurate location prediction based on energy map.

1. A novel method for using accelerometer data to predict energy expenditure

Scott E. Crouter, Kurt G. Clowers, and David R. Bassett, Jr.

2. An Improved Calculation Method for Activity Energy Expenditure by using PNS

Yun-Hong Noh and Do-Un Jeong

3. Predicting Future Locations and Arrival Times of Individuals

Ingrid E. Burbey

4. Location Prediction With Sparse GPS Data

Ayush Jaiswal , Yao-Yi Chiang , Craig A. Knoblock , Liang Lan

- **Resources you may need (in terms of hardware, software, etc.):**

Hardware : Smartphone, Microsoft Band

Software : Sensus Application, Androsensor Application.

Programming Environment : Python for Machine Learning.

- **How do you plan to get these resources?**

Smartphone is a commonly available resource. We will be needing a Microsoft Band as an additional equipment.

- **Timeline**

Milestone 1 (October end) : Collection of smartphone sensors data of around 15 participants using Sensus and Androsensor application for 10 days.

Milestone 2 (November end): Training the model , creating the energy map and predicting the future location based on it.

- **Grading Criteria:**

What are the deliverables of this project that we should grade you

1. Data collection
2. Feature Selection and Generation
3. Model Training Approach
4. Outcome

- **References**

1. Sensus: A Cross-Platform, General-Purpose System for Mobile Crowd-sensing in Human-Subject Studies
Haoyi Xiong, Yu Huang, Laura E. Barnes, and Matthew S. Gerber
2. Determining Energy Expenditure from Treadmill Walking using Hip-Worn Inertial Sensors: An Experimental Study
Harshvardhan Vathsangam, Adar Emken, E. Todd Schroeder, Donna Spruijt-Metz and Gaurav S. Sukhatme
3. Applications and Challenges of Human Activity Recognition using Sensors in a Smart Environment
Jubil T Sunny, Sonia Mary George, Jubilant J Kizhakkethottam
4. Next Place Prediction using Mobility Markov Chains
Sébastien Gambs, Marc-Olivier Killijian
5. John Krumm Publications
<http://research.microsoft.com/en-us/um/people/jckrumm/#Publications>
6. Fitbit Web API Documentation - <https://dev.fitbit.com/docs/>
7. Machine Learning Tutorial - <https://github.com/justmarkham/scikit-learn-videos>