Hands-on Data Communications Project Background

- Non-Intrusive Load Monitoring (NILM)
  - enumerating the energy consumed by individual appliances given an entire house power meter reading
  - an estimated itemized energy bill from an individual smart meter
- Non-Intrusive Load Monitoring Toolkit (nilmtk)
  - http://nilmtk.github.io/nilmtk/master/index.html

- NILMTK's documentation
  http://nilmtk.github.io/nilmtk/master/index.html

Hands-on Data Communications Project Objectives

- What exactly I expect from this project?
  - Collection of data using the selected smart plugs for a novel application
  - Comparative study with respect to communication protocols, data correctness, channel noise, power line interference, plug and modem synchronization problem, plug & play setup etc.
  - Prepare a research project report
  - Overarching goal is to submit the findings to a workshop/conference for possible publication (optional)

- IEEE IGSC: THE Sixth INTERNATIONAL GREEN and SUSTAINABLE COMPUTING CONFERENCE (IGSC'15)
  - http://igsc15.eecs.wsu.edu/

What is my novel application?

- Your Novel application: Open Source Data from Smart Plugs
  - Make the collected data compatible with NILM tool kit
  - Follow the specific formatting guidelines to make the datasets universally adaptable and accessible to other users/researchers

Devices

- *Z-wave Smart Metering and Communication:*
  - *Z-Wave Smart Energy Power Strip*

- *Insteon Energy Metering and Communication:*
  - *iMeter Solo - INSTEON Power Meter (Plug-In)*
  - *PowerLinc Modem - INSTEON USB Interface (Dual-Band)*

- *Enmetric System for Intelligent Plug load Management and Power Telemetry Communication*
  - *Enmetric PowerPort*
  - *Enmetric Wireless Bridge*

Devices

- *SiteStage (previously was known as eMonitor)*
  - *Powerhouse Dynamics: Energy Management System*
  - *[SiteSage for Homes M-24h Energy Monitor (formerly eMonitor 4-24)](SiteSage for Homes M-24h Energy Monitor)*

- *The Energy Detective Electricity Monitor http://www.theenergydetective.com/*

- *Energy Hub http://www.energyhub.com/*

- *PeoplePower http://www.peoplepowerco.com/*

- *Nest Lab https://nest.com/*

More Devices

- Lucid — Makers of BuildingOS and Building Dashboard
  - http://www.luciddesigngroup.com/

- Panoramic Energy Management
  - http://www.panpwr.com/

Steps to Follow

- First browse many websites, spin-offs and companies in this building energy management area

- Decide and choose the smart plug device
    - Look into their website to find out how easy it will be to setup and collect data
    - I need to place the purchase order ASAP

- Decide on a tentative application
    - Send me your Hands on Data Project Plan with the device name, tentative title of the project and all team members name (a doc file is fine)
    - Finalize the application
    - Plan for the mid-semester project update after Spring break

Hands-On Data Communication Project Examples

- Can you help me to formulate a narrow topic? My research interest is activity recognition.
  - Use energy footprint of appliances in household for identifying ADLs (Activities of Daily Living)
  - Use energy signature to recognize activities of daily living (ADL) such as washing utensils, cooking, doing laundry, ironing, listening music, watching TVs, running on treadmill, studying etc.

- Can you help me to formulate a narrow topic? My research interest is HCI.
  - Create a database to store all the appliances energy data
  - Show their individual consumption in graphs, and include query for displaying the total consumption over a day, week or month etc.

More Hands-on Data Communications Project Example

- Open Source Smart Plug Data
  - Check NILMTK open source toolkit
  - Find out how your collected data could be integrated with this project

- Virtual Energy Auditing

- Faulty/Malfunctioning Appliance Detection

- Usability of Energy Disaggregation

Hands-On Project Immediate Deliverables

- Email me by the next class 2/24
  - A topic of interest with a tentative project title
  - Specific device you are planning to use
  - A cool application you have in mind
  - An abstract of the project (optional)
  - Please create a doc/pdf/text file

- Don't forget to include the name of all the team members

References

- Batra, N., Kelly, J., Parson, O., Dutta, H., Knottenbelt, W., Rogers, A., Singh, A., Srivastava, M. (2014). *NILMTK: An Open Source Toolkit for Non-intrusive Load Monitoring*. In Fifth International Conference on Future Energy Systems (ACM e-Energy 2014). Cambridge, UK. arXiv:1404.3878 DOI:10.1145/2602044.2602051

- Kelly, J., Batra, N., Parson, O., Dutta, H., Knottenbelt, W., Rogers, A., Singh, A., Srivastava, M. (2014). *NILMTK v0.2: A Non-intrusive Load Monitoring Toolkit for Large Scale Data Sets.* In The first ACM Workshop On Embedded Systems For Energy-Efficient Buildings at BuildSys 2014. Memphis, USA. DOI:10.1145/2674061.2675024 arXiv:1409.5908

- Kelly, J., etc. *Demo abstract: NILMTK v0.2: A Non-intrusive Load Monitoring Toolkit for Large Scale Data Sets*, ACM BuildSys 2014, Best Demo paper award, http://arxiv.org/abs/1409.5908