

Hands-on Data Communications Project Objectives

- What exactly I expect from this project?
 - Collection of data using the selected smart plugs/ wearable devices 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)

Steps to Follow

- First browse many websites, spin-offs and companies in this **Internet of Things, wearable computing, building energy management or smart health** area
- Decide and choose the device
 - Look into their website to find out how easy it will be to set up 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 (abstract)
 - Plan for the mid-semester project update after the mid term exam

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 terms of graphs, and include query for displaying the total consumption over a day, week or month etc.

Hands-On Project Immediate Deliverables

- Email me by the next class 9/29
 - 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

Possible R&D Projects

- Exploiting ANT Communication Protocol for ADL and Sleep Patterns Monitoring – **FitBit**
- Reception and Discovery of iBeacon Transmission Signals using a Smartphone – **iBeacon**
- Data Transmission Protocols and Feasibility for Keyboard Applications -- **Wireless keyboard**
- Monitoring Smoking Behavior at Scale -- **Smart Wristband such as Microsoft band**
- Monitoring eating/drinking behavior--- **Samsung Gear Live**
- Voice through Motion -- **Myo Armband**

Possible R&D projects

- Study on Power Consumption and Communication Protocols -- **iMeter Solo**
- Smartphone GPS Sensor System -- **Mobile Phone**
- AEOTECH Multi-sensor Feasibility Study -- **PIR sensor**
- Building Occupancy Management-- **Motion Sensor**
- Smartphones File Sharing: **NFC (Android) vs. Airdrop (iPhone)**
- A Comparative Study on different Data Communications Interfaces-- **Raspberry Pi**
- Intelligent Plug load Management and Power Telemetry Communication -- **Enmetric Plugs**

Possible R&D Projects

- Smart Plug Mental Health Monitoring and Suicide Prevention - **eMonitor (Sitesage)**
- Z-Wave Smart Energy Usage Meters – A Comparison and Accuracy Study -- **Z-Wave USB Dongle, Enerwave Switch, Aeon Labs Smart Switch**
- Energy Management using Building Occupancy – **Nest Thermostat**

Wearable Sensor

- Samsung Gear: Smart Wristwatch

<http://www.samsung.com/global/microsite/gear/>

- Features:

- Accelerometer, Gyroscope, Compass, Heart Rate monitor, Ambient Light sensor, UV sensor and Barometer.
- Watch is able to connect directly to the internet, make phone calls and send SMS's without needing a phone
- first wearable device to include Wi-Fi, Bluetooth and 3G connectivity

Wearable Sensor

- Intel Basis <http://www.mybasis.com/>
 - ultimate fitness and sleep tracker with up to 4 day battery life and water resistance
 - Sensors
 - Optical Heart Rate Sensor
 - Galvanic Skin Response
 - Skin Temperature
 - 3-Axis Accelerometer

Wearable Sensor

- Infra <http://infravitals.com/>
 - Blood Glucose Monitoring
 - Pulse monitoring
 - Blood Pressure Monitor
 - ECG - Professional Grade Heart Health Monitoring
 - EEG - Nervous System Measuring
 - Kidney Function
 - Alerts and Triggers
 - Live Data Portal
 - Integration with Peripheral Sensors

Ambient Sensors

- iBeacon <http://estimote.com/>
 - tiny wireless sensors
 - attach to any location or object
 - broadcast tiny radio signals
 - smartphone can receive and interpret
 - location and context awareness applications
- Texas Instrument Sensor Tags
 - supports Bluetooth Smart, 6LoWPAN and ZigBee
 - low-power sensors such as light, microphone and magnetic sensors
 - http://www.ti.com/ww/en/wireless_connectivity/sensortag2015/?INTC=SensorTag&HQS=sensortag

Energy 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*

Energy Devices

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