Isochronous Control of Sensor-Networks

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EECS 149/249A Project Charter, Fall 2014

Overview

The goal of this project is to introduce modularity in the existing sMAP architecture and achieve isochronous control over a collection of sensors. sMAP is a specification for a protocol which exposes and publishes time-series data from a variety of sensors.

Approach

The sMAP source, which is the component of sMAP architecture that handles communication with sensors, will be deployed on a lightweight microcontroller. A combination of the source and sensor is referred to as a sMAP source node. A group of such source nodes will be controlled isochronously though a zone controller.

Objectives

- **Modelling**
  - Create an effective model for communication between the sensor nodes and zone controller
- **Implementation:**
  - Establish isochronous control over source nodes through a centralized zone controller
  - Collect sensor data isochronously from sMAP sources and analyze time-series data
  - Dispatch optimized actuation signals to sensors to achieve overall energy efficiency

Schedule

10.21.2014 : Project Charter
10.25.2014 : Create isochronous communication model
10.30.2014 : Attempt deployment of existing sMAP driver implementation on Raspberry Pi
11.05.2014 : Decide on a specific microcontroller and related hardware for source node
11.12.2014 : Plan the design of zone controller
11.15.2014 : Finalize synchronization protocol for isochronous control
11.30.2014 : Implement sMAP on microcontroller, start implementation of zone controller
12.08.2014 : Implementation of zone controller, start implementation of isochronous communication
12.14.2014 : Analysis of sensor data, capability to dispatch actuation signals
12.15.2014 : Project Completion

Risks and Feasibility

- Deploying fully functional sMAP drivers on microcontrollers with limited capabilities may prove to be challenging
- Dealing with real-world sensors will give rise to calibration errors, and analysis results may not lead to fully optimized actuation signals
- Achieving isochronous control over microcontrollers at a high precision might prove to be infeasible