A Parking Guidance and Information System for TinyOS

CSE 521S Project Proposal

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Background

Some parking garages use inductive loop sensors to sense when a vehicle passes between floors.

We want to be more fine-grained.

Building a PGI System for TinyOS

Project Goals
- Cost effective, easily extensible parking lot management
- Monitor multiple spots' duration and metrics (headlights, engine running, etc.)
- Report back all information to base station and display in an easily readable format.

Method
- Three part project - Mote application/Sensors, networking, base station/software

Mote Application/Sensors

Mote Application
- Monitor parking spaces while minimizing power consumption.
- Maximize sleeps while providing near real-time monitoring performance.

Sensors
- Proximity sensor for detecting vehicles
  - Infrared Distance Sensor
  - Induction Loop Sensor
  - Sonar Proximity Sensor
- Light sensors for detecting headlights
- Heat sensors for detecting car engine (alerting drivers to lights/engine running)

Networking and Communication

We will implement a multi-hop network between motes using the included radio transmitter/receiver
Implement Collection Tree Protocol (CTP)
- Develop a standard packet configuration
- Don't need point-to-point, only point-to-sink, so CTP will suffice
- Robust enough to handle missing nodes

Concentrate on real-time vs. power concerns
- Must not drop information, as $ is involved.
- Must have near real-time information for accurate reporting.

Base Station

Bridge communication between mote network and end user software
Single mote, connected via USB, used to forward received packets to software.
- Will evaluate default base station vs. custom implementation

Presentation Software

✔ Collect sensor data
✔ Send and aggregate data

Turn data into information!

- Presentation depends on location
  - Far away vehicle wants approximation
  - Closer vehicles want more specific information
- Visitor or employee?

Equipment Needed

- 6 Tmote Sky/TelosB sensor nodes
  - o 2 for Sensor development and testing
  - o 4 for network development and a non-trivial topology
- Sensor to detect vehicle
  - o Infrared Distance Sensor
  - o Induction Loop Sensor
  - o Sonar Proximity Sensor

Conclusion and Expected Deliverables

We hope this makes a cost effective, easy-to-deploy solution!

First demo:
    Simple prototype

Second demo:
    Networked sensors

Final demo:
    Everything