Solar Skin Deployment

Team05 *eMBedRockers*

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Statement

Today, Lighting and HVAC (heating, ventilation and air conditioning) accounts for about 71% of the total electrical energy costs of a building. The goal of this project is to reduce this energy consumption by utilizing wireless sensor nodes to analyze the solar illumination and heat level patterns to actively suggest the control of lighting and HVAC systems of the building. Our efforts will be developing an efficient routing protocol to transmit sensor readings through the wireless nodes with least packet drop and at the same time be power efficient. The wireless sensor network should be redundant enough to overcome malfunctioning of some sensor nodes. The protocol will be using Berkeley Media Access Control (B-MAC) for the access of the shared communication channel and Dynamic Source Routing as the WSN protocol over the RT Link protocol.

Plan

- build battery operated nodes capable of recording solar illumination, radiation and temperature with wireless mesh network capability
- use DSR routing protocol on the top of RT Link protocol to handle large number of nodes and to get readings from all sensor nodes at the Gateway node
- analyze the data recorded and plot on 3d sketchup model to visualize the temperature cycle
- based upon pattern recorded on normal day along with real time readings suggest day-ahead, hour-ahead and short-term lighting and HVAC controls
- use feed-forward control strategy to cool the respective zone based upon time of penetration of heat inside the building
- record any shadow effects caused due to surrounding buildings to turn off cooling for that zone at particular time of the day
- design a front-end dashboard that gives live feedback of the temperature profiles based on readings from sensor nodes

Timeline and Deliverables

Milestone	Due Date
● sensor nodes running nanoRK and RT Link ● able to record sensor readings in offline mode	Nov 5
● get the casing for sensor nodes ready with sensors mounted in proper directions ● choose the wireless board and get it working properly ● start designing the networking protocol and packet structure	Nov 12
● get network routing protocol to work with atleast 5-6 nodes over RT Link	Nov 19
● Scale the protocol to handle large number of nodes ● include energy efficiency along with sleep modes and optimizations ● deploy the nodes in a building and build a temperature profile from the data obtained	Nov 26
● Demo Rehearsal	Nov 27
● building front end dashboard ● Final demo and presentation	Dec 4
● final presentation and report	Dec 9

References:

http://en.wikipedia.org/wiki/Dynamic_Source_Routing
http://www.touchstoneenergy.com/efficiency/bea/Documents/Retail.pdf