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SUPERB-IT
Center for Hybrid and Embedded Software Systems

Multihop Routing Simulation of TinyOS-based Wireless Sensor Networks in Viptos

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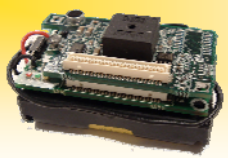
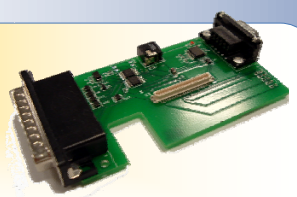
Abstract:

Wireless Sensor Networks are a burgeoning area of research and application in embedded systems. The purpose of this project is to understand and further develop Viptos, a TinyOS simulator, by adding the capacity to display radio communication links. A key piece of the TinyOS simulator is the ability to simulate a network topology. Viptos extends these capabilities to allow simulation of heterogeneous networks. In addition the ability to analyze routing algorithms is essential for research and the development of wireless sensor networks. Visualization of communication between nodes is fundamental to this goal.



Mica2 Mote with sensor board attached



Mica2 Programming Board

Process:

- Explore physical demo of multihop networks
- Explore simulated demo of multihop networks
- Create an entity which analyzes the packets sent between motes & draws a line to represent communication.
- Create a demo in Viptos similar to existing physical and simulated demos.

Viptos

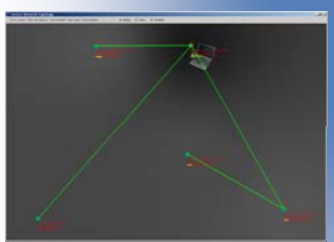
- An interface between TinyOS and Ptolemy II
- Integrated graphical development and simulation environment.
- Allows users to construct block and arrow diagrams to create TinyOS programs

Ptolemy II

- Modeling and simulation environment for embedded systems.
- Has a graphical user interface called Vergil

TinyOS

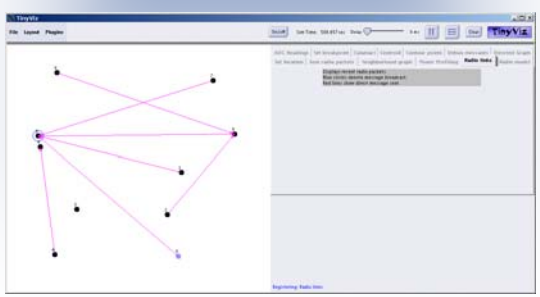
- A component-based, event-driven runtime environment designed for wireless sensor networks



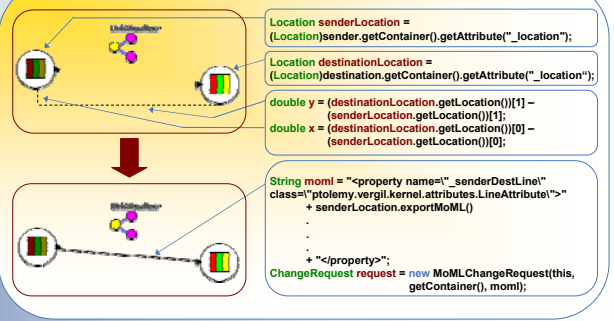
Live Surge demo using serial forwarder & java GUI

Surge Demo

- Motes are given ID numbers
- Base mote ID set to 0
- Motes retain information on their parent mote & depth within the tree
- At regular intervals motes update parent & depth if needed



Simulated Surge demo using TOSSIM & TinyViz



Contributions:

- Addition made to Viptos code to allow visualization of communication between motes.
- Creation of tool for development and research of wireless sensor networks.

Discussion:

- Simulation of wireless sensor networks can be easily enhanced by including visual link entity.
- Expands on concept of visual links between communicating nodes with use of Viptos heterogeneous network capability.

For More Information:

- **Viptos:** http://ptolemy.berkeley.edu/viptos/
- **Ptolemy:** http://ptolemy.eecs.berkeley.edu/ptolemyII/
- **TinyOS:** http://www.tinyos.net/

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