

GENI Educational Kits for Wireless Sensor Networks

a.k.a. SensorKits

Spiral 4 – Quarter 2 Report

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I. Major accomplishments

A. Milestones achieved

1. Developed and delivered a lightweight implementation of the KanseiGENI aggregate manager for Benchtop mini-Array Kits (BAKs). It has shrunk from 12GB as in KanseiSensorNet to 4GB, which conveniently fits in a DVD.

B. Deliverables made

1. Tested and demonstrated virtual machine images (for both VirtualBox and VMWare) that contains all the functionality of KanseiGenie in DVD.

2. Six BAK testbeds were installed in a lab at IIIT-Allahabad, for use in courses on Wireless Sensor Networks and on Embedded Systems.

3. A wiki page for integrating BAK/PAK software into lab-based STEM education, <https://sites.google.com/site/stemsensors/>.

4. Radar-pendulum software as part of lesson plan on lab-based Physics education, and distributed temperature-light map collection software as part of lesson plan on lab-based empirical science.

II. Description of work performed during last quarter

A. Activities and findings

1. Roadmap for creation of a lightweight KanseiGenie that fits onto a regular benchtop machine. Selection of future KanseiGenie component technology so footprint can support running server on laptops, nodebooks, and potentially PDAs/smartphones.

2. Reduced the footprint of the KanseiGenie software from 12GB to 4GB. Substantial further reduction is feasible and planned.

B. Project participants

1. OSU faculty members and graduate students from Computer Science and Institute of Sensing Systems (Profs. Arora and Ramnath, Mike McGrath, Wenjie Zeng), Physics (Prof. Andrew Heckler), Education (Prof. Dean Cristol), Mathematics Education (Prof. Hae-Jin Lee), and College of Engineering (Dr. Howard Greene).

2. STEM program members, including high school teachers from excellent and disadvantaged school districts.

C. Publications (personal and organizational)

1. Wiki <https://sites.google.com/site/stemsensors/>.

D. Outreach activities

1. STEM meetings

PI's Arora, Ramnath, and student McGrath held four meetings from January through March to develop lesson plans for the BAK/PAK kits. The meetings brought together experts on teacher training, secondary school educators, and leaders who have successfully piloted STEM education initiatives. The meetings have focused on identifying STEM lesson plan and pilot project steps and are building toward local pilots of using the BAK/PAK prototypes in classrooms.

The group has identified relevant STEM standards and opportunities. The group is building spiraled lesson plans around sensing experiments at may be expanded based on education level. This new phase of outreach will extend GENI project resources to end-users in middle schools and high schools through the use of BAK and PAK sensor experimentation kits.

2. Science Symposium

The PI participated in a [Nobel Laureate Science Conclave](#) at IIIT-Allahabad in November 2011, where he interacted with a large number of undergraduate and high school students and their teachers. He had three sessions where he demonstrated science experiments using wireless sensor networks. (The specific sensors leveraged were low power radars, temperature and light sensors.) He also conducted live tutorials on the use of the BAK kits.

IIIT-Allahabad volunteered to adopt the kits for use in their lab-oriented courses. This led to their installation of the six BAK testbed in their microelectronics department labs. OSU provided support in the process. The installation took a few hours, as compared with the nearly week long porting effort it has taken in the past to create clones of the full scale KanseiGenie testbeds. It is our goal that the installation time be reduced to much less than an hour.

E. Collaborations

1. STEM

Secondary school teachers from Thomas Worthington High School and Columbus West High School attended curriculum development meetings. The educators provided input regarding possible mathematics and physics experiments.

2. Capstone

Four undergraduate students are building a smartphone application to be used in conjunction with the PAK. The cellphone application will be a tool used by researchers to create and monitor experiments.

F. Other contributions

Student Mike McGrath participated in GEC 13.