

GENI Educational Kits using Wireless Sensor Networks

a.k.a. SensorKits

Spiral 4 – Quarter 3 Report

Technical Contact:

Anish Arora

Professor, Department of Computer Science and Engineering

Co-founder, Institute of Sensing Systems

Ohio State University

anish@cse.ohio-state.edu

www.cse.ohio-state.edu/~anish

395 Drees Laboratories

Columbus, OH 43210-1277

+1 (614) 264-8771

+1 (614) 292-2911 (fax)

I. Major accomplishments

A. Milestones achieved

1. Refactored the aggregate manager actor to support BAK kits; it is currently deployed at OSU and representing the BAK sensor resources in the custom KanseiGenie ORCA control framework.
2. Pilot-tested training materials are available for download by kit operators and users. Local kit caches include the Temperature and Light Carrier application; additional applications may be manually downloaded from the "Science Experiments Apps Store" and placed in the local kit cache via the web interface. Data collected from attached sensors is stored in the local kit cache when users run experiments from the kits, and retrievable via the Dashboard. A training session was held at IIIT-Allahabad; planning for additional training sessions at local adopter sites is in progress.

B. Deliverables made

1. Kit installation instructions, a link to tutorials for using the KanseiGenie web portal, and initial lesson plan offerings are available at <http://sites.google.com/site/kanseilite/>
2. Lesson plans for "Intensity of Sound", "Speed of Sound", "Reflection of Sound" are available for pilot use. Software for "Temperature Carrier", and "Pendulum Properties", and "Intensity of Sound" is available for pilot use.

II. Description of work performed during last quarter

A. Activities and findings

1. Investigated different technologies for pairing sensor motes with smartphones. An Android-OS cellphone has been software-modified to recognize a mote attached via USB but not yet control the mote.
2. The undergraduate web services capstone team developed a baseline version of the Portable miniArray Kit software; parts of this code will be used in creating the PAK.
3. The STEM Sensors working group created microphone-based lesson plans that address national STEM standards.
4. Software for the Intensity of Sound lesson plan based on a MATLAB-backend now complements the Temperature Carrier app written in TinyOS/PHP/MySQL and Radar-Pendulum app written in .Net Micro Framework and C#.
5. Refactored the ORCA Site Authority and identified other areas of the KanseiGenie ORCA control framework to be enhanced for PAK kit integration.

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, Adam Stohs), 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.

3. Undergraduate capstone team members.

C. Publications (personal and organizational)

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

2. Adopter site <https://sites.google.com/site/kanseilite/>

3. The GEC14 curriculum workshop presentation and demo poster are available on the GENI wiki.

<http://groups.geni.net/geni/attachment/wiki/GEC14Agenda/Curriculum/Arora%20-GEC14-DCeducation-Summary-2012.pdf>

http://groups.geni.net/geni/attachment/wiki/GEC14Agenda/EveningDemoSession/GEC14_SENSORKITS_Poster.pdf

D. Outreach activities

1. STEM meetings

PI's Arora, Ramnath, and student McGrath held two full meetings and three teleconferences from April through July 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. This second quarter of meetings focused on creating example lesson plans in accordance with steps outlined in the previous quarter. The microphone sensor was identified by high school science and mathematics teachers as key; development began on both a new high-fidelity microphone daughter card for motes and a proof-of-concept "Intensity of Sound" lab using older hardware.

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 build 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

PI Anish Arora presented at GEC14's Curriculum Workshop and the July 9 Curriculum session. PI and student Mike McGrath presented the BAK virtual machine and Temperature/Light carrier demo at GEC 14's Demo Session.