Development of portable battery-operated wireless devices for environmental monitoring
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Abstract
This project is to develop a portable wireless computing device for environmental monitoring. The main function of the device is to measure such factors like noise, temperature, relative humidity, atmospheric pressure, and soil moisture through sensors and perform logging data for a month long period.

The research carried the first stage of the whole project. Since this is the long-term project, the main achievement of this summer period is to stream video & audio wireless over the internet.

Method
Equipment used:
- Computer Development Board running Linux OS
- HD Webcam &USB WiFi adaptor

Software used:
- VLC media converter/player
- MJPG-Streamer & avconv audio streamer

How we carried:
- MJPG-Streamer was used to generate a Real-Time HTTP mjpeg format video stream that can be accessed from Internet browsers by connecting to this wireless device
- Avconv was used for creating the RTP audio streaming
- The VLC software was used for receiving live audio stream

Results
- Audio & video streaming succeeded over wireless network on-campus and off-campus range.
- The audio streaming has a delay of approximately 1 second.
- The HTTP video stream with MJPG-Streamer can stream with the frame rate of 15fps.

Conclusions & Future Work
- From this summer research, the first stage of the main project is completed. Audio and video streaming was successfully tested.
- The big challenge during the project was the ARM processor dev. board had to reach its limit to stream both audio and video at the same time.
- In the future, a faster and more functional development board will be used. Also, a battery with a solar panel will be attached to this device in order to make this device portable.
- This device will be attached with a sensor to measure such factors like, temperature and relative humidity.
- From this research we learned overall design processes ranging from a literature search to realization with realistic constraints.

References
- Jas Hacks, “Hackberry A10 – Compiling a kernel (armhfs), Blogspot,” <http://jas-hacks.blogspot.com>

Faith and Engineering
As Christians, we are caretakers for God’s creation. By designing this device, we ease the process of surveillance in wildlife so that people could monitor the condition of wildlife environment more efficiently and safely.

Problem Statements
Needs
- Retrieving environmental monitoring data can be inefficient, and wired connection would increase the cost of operation due to the amount of wires dispersed in the environment.
- Various devices exist that monitor data such as temperature and pressure, but not very much on video and audio.

Objectives
- Our goal is to develop an environmental monitoring wireless device that monitors not only informational data but also data that includes video and audio.

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Figure 1: Application Diagram
Figure 2: Development Setup and Results of Live Streaming Video & Audio