

The background is a deep blue gradient with several glowing white circular spots. Wavy, light blue lines sweep across the frame. Binary code (0s and 1s) is scattered throughout, following the curves of the lines and appearing to float in the air.

Smart Phone Control and Data Acquisition of Resource Effective Bio-Identification System Battelle

Introductions

- **Jake Sawicki - Team Manager**
 - **Kevin Gleason – Web**
 - **Phillip Horny – Document Prep**
 - **Thamer Alajlan – Presentation**
 - **Andreas Dixon – Lab Coordinator**
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- **Dr. Christopher Ball – Sponsor**
 - **Professor Tongtong Li – Faculty Advisor**

Background

- Battelle Laboratories
 - Non-profit organization that performs R&D for Government and Industrial clients
 - Based in Columbus, Ohio
 - Project sponsored by the Advanced Sensor Systems Group

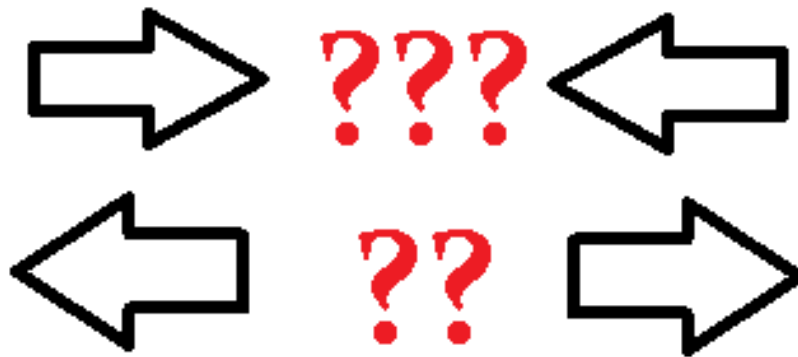
Background

- Previous Project Scope
 - Used WI-FI communication to transmit raw data to a smart-phone
 - Developed an application that processed the information transmitted to the smart-phone
- Our Project Scope
 - Expand upon the previous team's application to allow commands to be sent from the smart-phone to the sensor using a more universal communication system

Overview

- Main Goal
- Conceptual Design Description
- Design Objectives
- Trade Study
- Selection Matrix
- Proposed Design Solution
- Software
- GUI
- Hardware
- Risk Analysis
- Budget

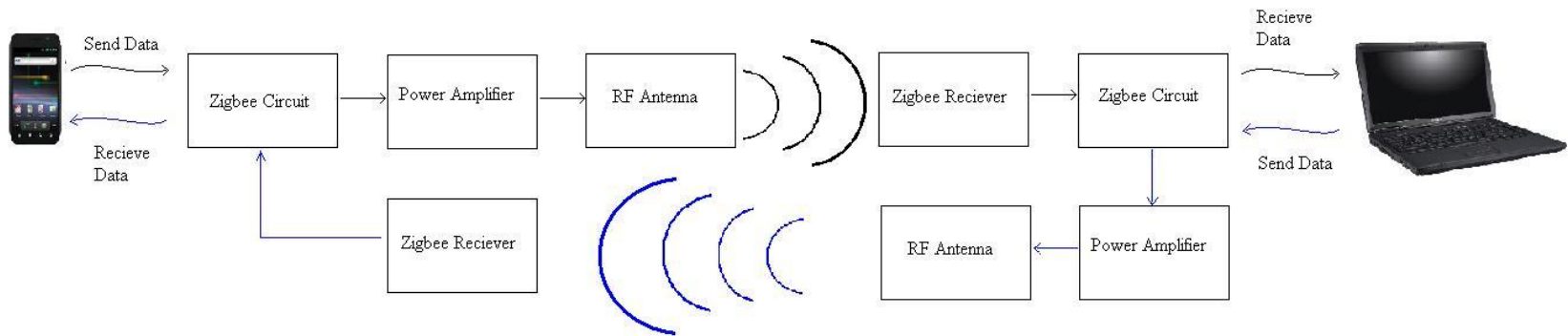
Main Goal



**Simulated
Sensor**

Conceptual Design

Single Sensor Block Diagram



Design Objectives

1. Research communication systems
2. Develop communication module
3. Design smart-phone Application for Sensor control
4. Create software simulation of actual Sensor
5. Assess key performance parameters of smart-phones

Trade Study

Cons:

RF Circuitry

- Relatively expensive
- Large circuitry
- External power possibly needed
- Time consuming to tune circuit
- A/D Conversion

Wi-Fi

- Network needed

Bluetooth

- Short range (20-30m).

Zigbee

- Low data rates
- New technology

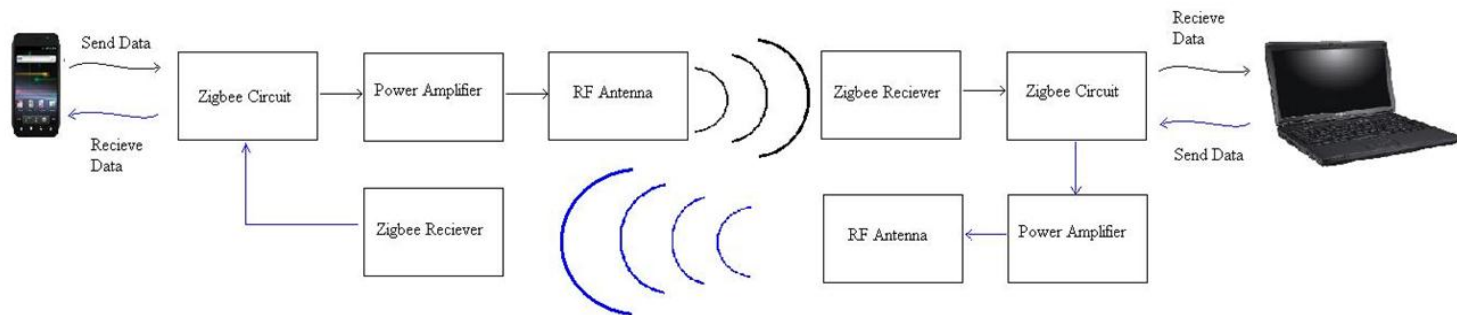
	Wi-Fi	Bluetooth	ZigBee	PRF
Frequencies	2.4GHz and/or 5GHz	2.45GHz	915MHz(US) 868MHz(EU) 2.4GHz (global)	900MHz(US) 868MHz(EU) or 2.4MHz (global)
Channels	16 @ 2.4GHz 80 @ 8GHz	79	10 @ 915MHz 26 @ 2.4GHz	16 to 79 (can be customized)
Range (Indoor)	70m	Class1=1m Class2=10m Class3=100m	20m	1000m
Range (Outdoor)	160m	100m	100m	40 miles (with high-gain antenna)
Data Rate (Max)	54Mbits/s (with12Mbits/s typical)	3Mbits/s	250Kbit/s	721Kbit/s to 72Mbit/s
Transmission Scheme	DSSS	Adaptive FHSS	DSSS	FHSS or DSSS
Power Sources	Wired	Battery/ Wired	Battery/ Wired	Battery/ Wired (industrial power source compatible)
Uses	Cable replacement, large data transfer, networking	Short distance cable replacement	Monitoring and Controlling	Cable replacement, Monitoring, Controlling, Data Transfer
Max Nodes	32	8	>64,000	Variable
Stack Size	1000KB	720KB	250KB	Variable
Transmit Power (Max)				1W

Selection Matrix

Criteria	Importance	Possible Solutions		
		WI-Fi	RF	Zigbee
Power	5	9	1	9
Size	1	9	3	3
Range	5	3	9	3
Speed	1	9	9	1
Adaptability	5	1	9	9
Complexity	1	9	1	3
Cost	2	9	3	3
EMI	3	9	1	9
		137	117	145

Proposed Design Solution

- Zigbee integration to computer simulated sensors
- Zigbee integration to Phone transmission and reception
- Antenna Boosting for Zigbee Signal
- GUI development
- Possible additions
 - Mesh network
 - Moving sensor
 - External power
 - FFT from spring project



Software

- Java
- Android SDK
- Eclipse IDE



Android GUI

- Very Simple and User friendly.
- Screen with sensor controls.
- Screen with status updates.



Hardware



Risk Analysis

External transmission technology

- Access to the data
- External hardware
- Not a focus for phone developers

Software

- Code adaptability from Spring
- Code adaptability on future phones

Budget

Proposed Budget			
Items	Amount	Price (Each)	Price (total)
XBee Starter Kit	1	\$307.62	\$307.62
USB to Mini-USB (OTG)	1	\$15	\$15
Amplifier Parts	1	Minimal	Minimal
Android Smart-phone	1	\$0	\$0

Total Cost \$325

The background is a deep blue gradient with several wavy, light blue lines flowing across it. Scattered throughout are strings of white binary code (0s and 1s) that follow the curves of the waves. There are three bright, out-of-focus white light sources: one in the top left, one in the top right, and one in the bottom right.

Finished

Questions?