**Bluetooth Diagnostic Utility**

**Collaborators:** Irving Rivas, Rahul Tandon, Robert Schultz

**Overview of Bluetooth Technology and its Importance**

Bluetooth is a wireless technology standard for exchanging data over short distances from fixed and mobile devices, and building short distance networks. Bluetooth operates in the frequency bandwidth between 2.4GHz and 2.485GHz. The networks built through Bluetooth are full duplex. As a standard the prevalence of Bluetooth is due to its wire free information transmission, its low power consumption, and low production costs of transceivers.

Many devices now are Bluetooth enabled such as microphones, computer peripherals, and watches. There is also much room for research and development as the communication standard has been around since 1994.

**Relevant Coursework and Learning Objectives**

This research allows a further understanding in a number of electrical engineering and computer engineering classes and topics:

* Digital Signal Processing
* Wireless Communications
* Computer Architecture
* Software Engineering
* Computer Networks
* Scientific and Technical Writing

Currently established learning objectives are to:

* Apply relevant coursework in real world setting
* Extend knowledge in agile software development
* Conduct independent research in wireless technology
* Collaborate in a multidisciplinary engineering team
* Document research findings in a scientific report

**Our Research**

The ubiquity of Bluetooth technology makes it an interesting subject matter. One issue we notice with Bluetooth connections is when a disconnection occurs, no prompts are given to the user saying what specifically caused the error; only that there was one. There are a variety of issues that can cause a Bluetooth disconnection.

*The objective of our research is to develop a background utility that will alert the user to a Bluetooth disconnection with a description of the issue along with a solution based upon specific event analysis.*

**Specific Research Set Up**

During our research we will test Bluetooth disconnections with a specific set of scientific variables and controls using our background utility.

The variables of our research will be the devices that interact with our computer communicator, the distance between the devices and computer communicator, Bluetooth versions, and possible interference from local objects / wireless devices.

One of the controls of our research will be the MacBook Pro we use as the computer communicator. Another control will be our testing within the same room under optimal “open area” conditions.

Using our software, we will test the disconnection cases to see which parameters set off specific errors such as low device battery, distance, and interference.

**The Diagnostic Utility GUI**

The graphical interface will be created in Java Swing as this framework works in multi- platform environments. Additionally there is a dynamic API for Bluetooth interaction that would allow us to develop the utility quickly and efficiently.

All relevant code will be uploaded on a GitHub repository. We will use an agile approach for parallel software development. We will also document high level specifics and our findings using the Overleaf LaTex writing tool.

**The Diagnostic Utility’s Use and Purpose**

The utility will run as a background GUI that displays prompts in error cases. The data represented in the error prompt will be distance, connection strength, data stream (bits/s), device specific information, the error itself, and a solution.

Solutions may include resyncing or re-pairing the connection, recommending rebooting, or relocalizing closer to the bluetooth device. There may be alternative solutions found during development.

**Responsibilities**

Our research team consists of three members. Irving Rivas, Rahul Tandon, and Robert Schultz.

Irving Rivas will act as team lead and the point of contact for progress within this research. Irving will also conduct research relevant to the signal processing and communication theory relevant to the project. Irving will also be responsible for organizing the technical report that will be produced at the conclusion of the research.

Rahul Tandon will act as a software developer for the desktop utility. Rahul will develop quality assurance techniques and test scripts for the software. Rahul will also lead laboratory testing for the utility.

Robert Schultz will act as lead software developer for the desktop utility. Robert will develop quality assurance techniques and test scripts for the software. Robert will also lead the agile software development meetings and oversee GitHub repository management.

Responsibilities may increase as needed through development, and will be discussed in weekly meetings. Agendas for each meeting are created to keep track of development goals, design, and testing.

**Conclusive Statement**

Bluetooth technology is an increasingly popular communication standard with many benefits. We hope our research will assist in improving the system by solving the issue of unspecific disconnection prompts.