Background Information

Assignment 4

Patrick Jan Greg Kaminski Frank Mischin Justin Rue

Assignment Responsibilities

Each member of the group researched a different key aspect of the project to gain a better perspective of the finer details. The various parts in this project that were researched are as follows; Bluetooth capabilities, Android platform requirements and limitations, USB and 3.5 mm jack input specifications, and OBDII specifications. Each member was responsible for gathering a resource and explaining some significance or concern in regards to the overall design to the project. We also looked at some alternative devices and designs to open our options and possibilities. By also looking into other solutions, we are able to see a broader picture of what works well with our project design.

	Jan, Patrick	Kaminski, Greg	Mischin, Frank	Rue, Justin
Percent Effort:	25%	25%	25%	25%

Information Summary

A large portion of this project revolves around the use of an Android powered device. In order for this project to be successful, we will need to be able to create an application that can be run on the Android platform. Android is a great tool to use because it is open source. This is beneficial because the android programming community is very large, so plenty of help and resources are available. However, it is limiting in the sense that we have to use a Java programming language, as well as using Eclipse for the IDE and compiler. The Android environment is a good choice because once the application is installed, it only has access to the resources needed to run the s application. This makes the environment secure and safe.

In order to work hand-in-hand with the Android OS and UI, we have decided to utilize the On-board Diagnostic (OBD) port present in all automobiles. Use of this port provides the primary benefit of a unified standard, which means this functionality can be implemented in any cars manufactured after 1980. Although this technology would be marketed toward newer cars, it does provide the ability for retrofitting older cars, provided this port is used.

Since this application is going to be created for devices with the Android OS, it will have to be designed to fit the framework of the Android User Interface so as to keep the application consistent with the Android theme. The main portion of the application is the content area, which will display all of the readings and data that the OBD sensor will gather from the car and

output to the Android device. The application must also contain a main action bar, split action bar and view control with which users will be able to navigate the different views of the app content. For example, these features will be used to allow users to do things like navigate from one reading type to another, display graphical representations of the data, change the application's settings in the menu, etc. The UI is an extremely important aspect of an applications development; an app can be the most functional app on the market, but if it isn't user-friendly and easy to navigate then it won't be successful, so one of the main goals of this design will be to ensure that the app is optimized for both functionality and ease-of-use.

Another important part of this project is the communication from the OBDII to the android device using Bluetooth. Bluetooth signals will need to be sent back and forth from the android device and the OBDII Bluetooth transmitter. Using Bluetooth instead of a serial connection, or USB connection, will allow us to free up ports on the android device which can be used for other activities and functions within the project. The device can only be communicating on one Bluetooth channel at a time. Therefore, it is very important not to allow other communications, such as Bluetooth communication between the android device and a phone, or Bluetooth audio.

Using a USB 2.0 connection allows for a high transfer rate, while using a connection that does not require host device. This allows for a simpler and sleeker design that can be universally used. This port also allows for device charging capabilities, which is perfect for the on-the-go design of the model. This USB 2.0 connectivity will also give developers or others the ability to troubleshoot and upgrade applications on the tablet without the need for a signal. Also, it is possible to then develop a way for mechanics to then access the OBDII diagnostics to a similar way that they would with an OBDII scanner.

A big part of this project also involves transmitting audio over the car's speakers from the android powered device. This can be achieved in a few ways, such as over Bluetooth, or by using a 3.5mm audio jack and breaking it out to the car's speakers. Due to the fact that we are using our Bluetooth communication for the OBDII port, using a 3.5mm audio jack will better suit our situation. A benefit to using a 3.5mm jack is that this can be wired to an external amplifier which will allow for higher quality audio playback.

The android tablet is a very important part of this project. A tablet that is small enough to fit into most car dashboards as well as powerful enough to handle our programs needs to be chosen. The tablet that we decided to go with is the Google Nexus 7. It is a 7 inch tablet which should be able to fit into most cars, has 1GB of RAM, and an NVIDIA Tegra 3 quad core processor. This should be enough to handle anything that we decide to run on it. Another benefit of this tablet is that is hard a fairly large hard drive, either 16 or 32 GB so we have a good amount of storage space to play with. This device also supports NFC, as well as most

wireless radios which will allow us to use data on the tablet. This device is running android 4.2, or Jelly Bean, which is a very refined version of the OS with a lot of features that will benefit our production.

In addition to the performance-oriented benefits of including the Nexus 7 tablet, the ability for the owner to remove the tablet from the car is provided. This affords the operator the ability to transfer data between the tablet and his/her computer, syncing both media and performance data.

Key Features Outlined

Key Bluetooth Features

- Possibility for BLE (Bluetooth low energy) protocol
- Cost-reduced chips, enabling highly integrated, compact systems
- Simple device discovery
- Point-to-multipoint data transfer
- Secure, encrypted connections
- Improvements to audio host controller interface

Key USB 2.0 Features

- Maximum signal rate of 480 Mbit/sec
- On-the-go functionality, not requiring a host device
- Battery charging capabilities
- Link power managements, creating a third connection state, sleep, in addition to the original "enabled," and "suspended" states
- Troubleshooting capabilities
- File transfer

Key USB 3.0 Features

- Maximum transfer rate of 4.8 Gbit/sec

Key On-Board Diagnostics (OBD-II) Features

- Standardized hardware interface
- Mandated easily-accessible interface port
- Diagnostic and Performance information of vehicle

Android System Requirements

- Operating Systems
    - Windows XP (32-bit), Vista (32- or 64-bit), Windows 7 (32- or 64-bit)
    - Mac OS X 10.5.8 or later (x86 only)
    - Linux
        - GNU C Library (glibc) 2.7 or later required
        - On Ubuntu Linux, version 8.04 or later is required

- Eclipse IDE
    - Eclipse 3.6.2 (Helios) or greater
    - Eclipse JDT plugin
    - JDK 6
    - Android Development Tools plugin

References and Additional Resources

Bluetooth 4 Specification

https://www.bluetooth.org/Technical/Specifications/adopted.htm

USB 2.0 (High Speed) Specification

http://www.usb.org/developers/docs/usb_20_110512.zip

USB 3.0 (Super Speed) Specification

http://www.usb.org/developers/docs/usb_30_spec_021813.zip

Android Development Specifications

http://developer.android.com/guide/components/fundamentals.html#Manifest

Android UI Specifications

http://developer.android.com/design/get-started/ui-overview.html

Google Nexus 7 Tablet Specifications

http://www.google.com/nexus/7/specs/

EPA OBD Outline

http://www.epa.gov/obd/