



# Written Progress Report:

## Multifunction Intelligent Headphone System

### PROJECT TEAM

Leo Jiang  
Simranjit Sidu  
Frank Zhu  
XiaoPeng He  
Afrin Chowdhury

### CONTACT PERSON

Leo Jiang  
jhj1@sfu.ca

### SUBMITTED TO

Dr. Andrew Rawicz – ENSC 440  
Steve Whitmore – ENSC 305  
School of Engineering Science  
Simon Fraser University

### ISSUED DATE

March 19, 2012



## OVERVIEW

Over the last few months, Sound Tech Inc. has been working diligently on the development of the multifunction intelligent headphone system (MIHS), a headphone that detects noise and gives valuable feedback to the user. All the components of the MIHS have been tested and are working as expected. We are currently at the integration phase, where individual components are connected together to ensure they function properly and interact with each other.

## TECHNICAL DEVELOPMENT

MIHS has evolved since the original proposal. The initial proposed component, the SmartVR development Kit, is now changed to using a voice recognition module, the EasyVR, and a smaller microcontroller, the Arduino Nano. The other components remain the same. The overall block diagram seen in our design specifications is based on the new components and has stayed the same from what is proposed.

### Hardware

There are 4 main components for the MIHS, the microcontroller, the voice recognition module, the volume controller, and the noise cancelling headphone. The testing of the microcontroller, the voice recognition module, and the volume controller component is completed, and is listed below.

#### **Microcontroller (Arduino Nano)**

The testing of the microcontroller involves testing its input and output, and its compatibilities with the volume controller and the voice recognition module. In testing the microcontroller, we wrote a simple program to light up some LEDs in accordance to different push buttons connected to the microcontroller. Once the program is working with the LEDs, the program is modified so that it can control the volume controller.

#### **Voice Recognition Module (EasyVR)**

The testing of the voice recognition module took the longest time, and a week is wasted on the testing the module because the part was found to be defective. In testing the voice recognition module, we make use of the component's website, posting on forums, as well as asking SFU lab assistant for help. As soon as we found out the module is defective, we ordered 2 voice recognition module to make up for the time lost. And they are tested to be working properly.

#### **Volume Controller (DS1869)**

The testing of the volume controller involves adjusting its value to control the music on the headphone. This was tested to be working and the volume controller is working well together with the microcontroller.



## Software

The software consists of programming the microcontroller in accordance with the voice recognition module and the volume controller. The voice recognition module will communicate with the Arduino Nano microcontroller, which then controls the volume controller by the C code developed by the software team. The module is trained to recognize sounds, words, and noises provided by the user.

In the integration stage, we are writing a program which controls all the recognition process and sends the appropriate signal to the microprocessor to perform the action. The voice recognition module will capture the noise, and the programs will call its special functions to determine if the noise matches the one that is trained. The skeletal code for the program is on the way, and is expected to finish when the integration stage is completed.

## BUDGET

The development of the Multifunction Intelligent Headphone System has gone over the initial budget of \$650. This is a result due to some of the parts that are mis-ordered and some are defective. So far, approximately \$450 is spent on the development stage. This amount does not cover the noise-cancelling headphone, one of the main components of the project. The headphone itself cost around \$300, however members of Sound Tech Inc. are willing to contribute to the total remaining costs.

The \$450 spent on the development stage includes 2 microcontrollers, 2 voice recognition module, and multiple digital potentiometers. Having the duplicate components allowed Sound Tech Inc. to divide into two teams to work in parallel. This is to make up for the time lost during the component testing stage.

## TEAM DYNAMICS

The members of Sound Tech Inc. are still maintaining a healthy work environment. Group members are actively communicating with each other through emails, and weekly meetings are held to discuss the progress of the different stages and any concerns the team has.

## ACTION ITEMS

There is a huge set back on the component testing stage, but the members of Sound Tech Inc. is working harder to make up for the time lost. We hope to have completed the integration phase by 3<sup>rd</sup> week of March and finish testing and debugging the MIHS by early April. April 5<sup>th</sup> is the demo day for our product, we are confident that we will have a working prototype by then.