The Lazy Man’s MP3 Player

First Semester Report

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Abstract

Life is strenuous. Everyday, you wake up, go to work, come home, and then there’s more work. Technology helps to ease the workload throughout your day. New technology is invented everyday to lighten the load that we carry each day. The car gets to our destination so we do not need to walk; the microwave makes instant dinners so we do not need to slave over a stove; Cell phones keep people easily connected. Technology not only lightens our daily work load, but it also makes life a lot easier. You could even say that it makes people LAZY.

Lazy, that is the keyword for what our project is about. Not saying that we are lazy people who are lazy with our project. Our project is built especially for the lazy man. We have a device for a lazy music lover. Our device is not only controlled by your hand, but also by your voice. Yes, our MP3 player will be controlled by one’s voice, freeing up their hands to be able to do other things. The average person loves to multitask. Although it is less efficient, it does seem to get a lot done at once. Our device is all about the multitasking. It lets you use another part of your body that is not normally used to get tasks done, unless you have a slave or butler that you use your voice to command to get things done. Think of our MP3 player as your very own music butler.

There are recently developed advances in technology that have incorporated our idea to some extent. The new Microsoft Sync that is placed in new Ford vehicles have a semi-hands free approach to navigate through songs and function through voice commands. By “semi-hands free” I am meaning that the voice is inputted into the system when a button is pushed. However, since you are in your car, the distance from your mouth to the microphone is relatively close. With our MP3 player, the idea of a person needing to be close to the microphone defeats the whole “lazy” factor. Background noise also is a humongous factor when you distance the microphone and the person. Our design plans to bring the two together in order to make the ULTIMATE LAZY MAN’S DEVICE!!!!
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Chapter I – INTRODUCTION

The MP3 Player, presently one of man’s highly used piece of technology in the USA. Almost everywhere you go you can find an MP3 Player. Some examples would be a car, cell phone, computer, PDA, sunglasses, home theatre systems. Our group decided to take on this task of not adding to the list of MP3 systems, but making life easier for a music lover at home. Current home MP3 systems have navigation. Their navigation is so simple that you would have to manually cycle thru a list of songs in order to play the desired song you want to listen to. If your MP3 is set up correctly you could have an easier time cycling thru songs, but what if your songs are not organized well. Most people just throw songs on their device with no organization. Our MP3 Player will make it much easier to navigate thru songs without having to get out of your seat. Another problem is that everyone is lazy nowadays. What we want to do is add to that problem, and make a device that will make listening to music even more relaxing.

With all the advances in technology today, we decided to bring two pieces together into one functional device. Our project consists of an MP3 Player for your Home Entertainment System that can be controlled from your couch via wireless remote control. However, that isn’t the only thing that our MP3 Player will be able to do. Navigating thru songs by wireless remote is such an easy task. We plan on taking it to the next level with Voice Navigation. A microphone will be mounted on top of the remote control and will communicate with our MP3 Player using Bluetooth technology. The remote control will run our voice recognition software and analyze the voice of the
user. It will then transmit the command to the MP3 Player and navigate to the desired command.
Chapter 2 – MP3 Players of the Past

A voice recognizing MP3 player was first designed for cars, an amazing strategy to rise up the music industrial technology level. This mp3 player will allow the driver to explore his/her music library using an installed microphone inside the car and choose the song he/she wants by only saying either the name of the singer or the song’s name out loud. This is an encouragement for others to start developing devices that work wirelessly and this is where it all started for us.

Another "You Say It, We Play It" portable mp3 player is one of the first in the world to have an "On Demand" function using voice recognition. A person can download the song, directly speak it out, and within one second the song will be played.
Chapter 3 – Design Decisions

After researching for the perfect MP3 player, we ran into multiple mp3 player designs, we decided to create something that has not been done before, or at least are not popular marketwise. An mp3 player that will receive voice commands through voice recognition software installed to it was a perfect decision for our group, we were confused on whether it should be portable or stationary, and we had mixed opinions and many ideas.

Throughout the time of our research, our group finally came to an important decision. It was to update an already built and tested MP3 player by adding voice recognition software to it to enable wireless controlling of the MP3 player. It was a decision to create a stationary mp3 player that will receive a voice command through the voice recognition software installed via Bluetooth/infrared and play the song it is asked to play. Since this decision was made, we were left only with one more job, which is to purchase the equipment and parts and start working on building the Lazy Man's MP3 player.

Since we decided to transmit the voice signal through the voice recognition software, but didn’t decide how we would do that. One of our group members came up with an idea of a wireless microphone that has Bluetooth installed to it to transfer the voice signal to the stationary MP3 player, we decided to take his idea into action and start searching for wireless microphones, we ran into a good amount of microphones so we decided to add that to our design as a part of the mp3 player.
We discussed how to use Bluetooth and where we would find a kit that is compatible with our system. Our project advisor brought a Microsoft employee Mr. Dave Rohn to our discussion table and that he welcomed the idea of building a wireless voice recognition MP3 player and that Mr. Dave Rohn will donate a Bluetooth kit to our group project. Therefore we are left with the actual MP3 player to build.

Since we haven’t exactly decided which way we will go on building the MP3 player, our group members found an already built and tested MP3 player online for purchase. Our main focus was the voice recognition part on the MP3 player since MP3 players are popular as it is and it would be considered a duplicate project of millions of projects in the world, we wanted something special added to our project other than audio. We decided to purchase the built MP3 player to save us time on building an actual MP3 player from scratch then actually taking voice recognition into consideration since it will take up most of the time to get the MP3 player up and running. Therefore completing the missing parts of our project and we finally decided that we are ready to go.
Chapter 4 - Problems

At the beginning of the semester we ran into problems on deciding which way to go would be the best for us as a group, what components to purchase, and how much money are we allowed. Since our project will probably cost more than any other project at CSU, we decided to speak with our project instructor Mrs. Olivera Notaros to discuss money issues with her. She gave us the solution and we figured that our decisions would be based more on our budget rather than exceeding it. We planned our project and hoped for a donation, Mr. Dave Rohn as mentioned before donated a $3000 dollar Bluetooth kit to our group project as support, and it was the perfect donation at the perfect time.

As we all know, every project has to have its ups and downs. Our goal was to get our Bluetooth kit working with our MP3 player, but we ran into a problem. Our Bluetooth kit does not function with Windows XP, the system we are operating. It only works on Windows 2000, which is rarely found on computers these days. We decided instead of actually installing Windows 2000 on a computer, we would try to find a driver for our Bluetooth kit to configure correctly with Windows XP. We are still searching for that and it is set as a priority goal for next semester.

Another problem was time. If we were to build an MP3 player from scratch, test it, run it, and maybe correct any errors, it would've wasted our time without getting to the main goal. We purchased a built and tested MP3 player online as a solution to our time problem.
Chapter 5 – Components

5.1 - Bluetooth

Our Bluetooth kit will be the transmitter/receiver for our voice command sent by the user, transmitted via Bluetooth that is installed on the wireless microphone, and received by the kit installed inside the MP3 player. It is a new technology that will be a great marketing project if succession is to happen.

5.2 – Voice Recognition Software

The Voice Recognition software we plan to develop and implement into the mp3 Player will be aimed mainly for Hands-Free use. While we wish to detail the software for the mp3 Player specifically, we do not want to limit the use of the software and see possible uses for it in Cell Phones, Cars, Computers, and other electronic devices.

The main goal we wish to accomplish with the Voice Recognition software is to be able to convert a common person’s voice into a digital signal that will accomplish one of many mp3 Player commands.

The mp3 Player commands we wish to implement in the software are mainly the basic play, pause, stop, next, previous, rewind, and fast-forward. We are also looking into developing a search protocol to go with the voice recognition software in order to simplify finding artists, albums, songs, and etc.
The end product of the Voice Recognition Software will allow a user to for example state, “Search Artist U2,” and the software will reply through the speakers of the mp3 Player by listing the songs or albums by U2. If no artist by that name is found the software will reply accordingly and the software will reply with close matches.

When we first thought of including this voice recognition capability into the mp3 player we did not know Microsoft would be coming out with their similar Microsoft Sync. Since seeing commercials and researching the Sync, we have decided to model our software towards what they have accomplished with the Sync. While it will be a challenge to include all the features of the Sync into our voice recognition software, we feel this is a great learning opportunity for us to match ourselves against a successful product from a successful company.

Other features we will work on for the voice recognition software is the ability to understand voice commands from different people. The world is filled with people differing from each other and everyone has a different sound when they speak. We want to figure out how to allow the software to know the correct mp3 Player commands to complete whether told by someone with or without an accent.

5.3 – MP3 Player

The mp3 Player we will be building in January will be comprised of the PJRC High Capacity mp3 Player Circuit Board. The player will be standalone and will connect through an IDE interface to a hard drive containing mp3 files. The board will provide
audio output by a 24 bit DAC using line level outputs and an amplified headphone output. This will support mp3 bitrates of up to 256 kbps and 320 kbps which is very high for mp3 players. The player will have six pushbuttons which will control the main mp3 Player commands. The hard drive for the mp3 Player will need to be formatted as FAT32 which is for Large Disks. In order to put music onto the hard drive we can use Windows explorer, and just drag and drop files like we would any other hard drive. The board will be powered by four AA batteries.
Chapter 6 – Marketing

The main goal of this project is to create hands-free software, capable of working with any electronic device. Imagine a world where you can say “Lights On,” “TV On,” “Watch ESPN,” or “Find U2” or even “Call Home.” This convenience will be big in the near future. The world is filling with new information, music, movies, and people. Voice recognition software with proper search protocols could change the way everybody does things. This software could be used with any electronic device if designed properly.

Using the software in cell phones, we could have the software search for a phone number for a friend and dial the number with you just saying “Call Bob.” Using it with Televisions we can easily tell the TV what show or station we want to watch. The market to voice recognition technology is booming. Ford Motor Company has their new cars coming standard with Microsoft Sync, a voice recognition technology, in an effort to boost sales of those cars. The main sticking point in their ads is “only available with Ford.” Google currently has a team investigating search by voice.

The main goals of our project are right in line with what is going on in Today’s Market. Search by voice will surely be the next best thing to come out of the voice recognition market. With this project, I see big things coming.
Chapter 7 – Budget

As a senior design group, we were initially given $150 per semester to spend on materials. We needed to seek out as much help as we could get in order to maximize our minimal funds. It was very difficult to find donations. Companies did not take us or our project seriously it seemed. The parts that we needed for our potential design seemed way out of our budget. After a lot of discussion and searching, things finally started falling into place. Our budget for $150 per semester was raised to $200 a semester. Gerod, our project advisor, got in touch with his friend, Dave Rohn from Microsoft, who helped lead us onto the right path. He donated a $3000 Casira Bluetooth Development Kit that we could work with to figure out how we could extract our voice signal and input it into our voice recognition program. We did however run into more slumps with money. Prior to meeting with Dave Rohn, we purchased two pieces of an MP3 player that we were going to build from scratch. A digital to analog converter chip and a microprocessor were purchased. With no circuit board to place those two chips onto, we were shown a company that would make us a custom board for $50. However, we still didn’t have every part we needed for the MP3 player itself. So as a group, we decided to forego the building an MP3 player from scratch and purchase a MP3 player kit instead. This kit costs $150. Our two chips that we already had purchased were $45 total. We decided that the time that it would take to solder, receive, and plan for the parts and board would cost us more than the $150 board that
we purchased assembled and ready to go. Budgeting deals with your money and time.

The saying goes, “Your time is worth more than...” Well for us, our $150 MP3 kit.
Chapter 8 – Future Plans

Over the course of the first semester, we have determined exactly what we want to accomplish with the mp3 Player and Voice Recognition software. The following chapter will talk about our goals and schedule for next semester.

The first thing we need to accomplish next semester is getting the mp3 player up and running. We will put the mp3 player together and run tests to assure that it is working. We will test that the hard drive will accept mp3 files onto it and that the player will be able to play each of these files. We will need to test the sound quality that the mp3 player will distribute. Also we are looking into software that will allow us to interface with the mp3 player from a computer.

The Voice Recognition Software will be the next biggest task for next semester. We will first be testing Microsoft’s Voice Recognition software on a computer and use that software to convert voice commands into computer commands. Next we will start developing our own software to convert voice commands into computer commands. This will have to be tested thoroughly to be sure there are no logical errors in our reasoning. We will also want to determine solutions for slow response time, voice clarity, and noise issues.

Concurrently with the Voice Recognition Software tasks, the Bluetooth connections will need to be figured out. We aim to use a Bluetooth connection to transfer the voice signal from microphone to the mp3 player software. We wish to determine the furthest distance the microphone can be from the mp3 player for the Bluetooth technology to accomplish the task. We will use the CSR Casira Bluetooth Development kit to connect two different Bluetooth stations to two different computers via USB. Once we are able to send messages to each other,
we will begin testing the received voice signals via the computer and converting them to
computer commands via the Voice Recognition Software.

The mp3 Player will be completed within the first two weeks of February. The due date
for the project to be on schedule is February 14, 2008. Testing of the mp3 Player will be
complete by February 28, 2008. We will begin Bluetooth and Voice Recognition Software tasks
by February 15, 2008. We aim to have the Bluetooth working by the end of March. We have no
firm date because we have yet to find a dependable driver for the Bluetooth software for
Windows XP. The Voice Recognition software task will be the most time intensive task for this
team. We expect to accomplish a fully working mp3 Player with Bluetooth capabilities and
Voice Recognition Software by the end of April 2008.

Future work beyond April 2008 could possibly include using the Bluetooth capabilities
and Voice Recognition Software to operate other electronic devices such as cell phones,
computers, etc. Hands free capabilities are going to be not only essential but beneficial in the
near future.
Appendix – Budget Figures

Items Bought

- STA013 MP3 Decoder Chip $12.00 (Nick)
- 24 Bit Digital to Analog Converter $11.63 (Nick)
- On Board IDE Interface $4.00 (Nick)
- AMTel ATmega103L Microcontroller Chip $27.90 (Mike)
- PJRC MP3 Player Kit $157.00 (Yasir)

Total $ Spent Fall '07

- $212.53

Donated Items

- CSR Bluetooth Development Kit $3000
  
    Donated by Dave Rohn of Microsoft
Reference

Project Advisor

Mr. Gerod Melton

Microsoft

Mr. Dave Rohn

Project Coordinator

Olivera Notaros

Bibliography


http://www pjrc.com

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Figure 1. MP3 Circuit Board
Figure 2. MP3 Processor

Figure 3. MP3 Interface Section
Figure 4. MP3 Decoder and Audio

Figure 5. MP3 Power Supply
Figure 6. MP3 Block Diagram

mp3 Player with Voice Recognition

Figure 7. Bluetooth to MP3 Diagram