# EasySpeech

# Project report

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## **Introduction and background**

This project will cover a small area of voice recognition using an Arduino board called atmega328p (ATMEL, 2015), a mobile phone with a voice recognition software application that will compare your command with a local database, and if it exists within the database then it will increment the counter for that specific command by one. Depending on the command given to the database an “Id” will be sent to the Arduino via Bluetooth telling the atmega328p which light that shall be lit. This is only the first step towards bigger ambitions like creating a robot in medicine that is fully automatic and capable of understanding your problems through voice recognition. The project only represents a small portion of the voice recognition area, this is because voice recognition is still in development and is a very big area of expertise. Background knowledge for this project are the scientific articles that were researched in this area (1R.A.Ramlee, 2013), (Saume, 2012) and (Zhong, et al., 2014). Further background knowledge for this project has been lectures in embedded systems and lectures in programming courses.

## **Aim and purpose**

The purpose of this project is to create a functional voice recognition application that will record your voice, return it in text, compare it to a local database with stored commands and give you the desired result.

## **Research questions**

* How can we make voice recognition a more reliable input?
* How can voice recognition be used to improve the quality of life?

## **Limitation**

One limitation of this project is time. This is because the project was only given one month of work. Second limitation to this project is the budget, this is because the time limit was so short and not enough resources were provided to make something bigger and more advanced. The last limitation for this project is the Arduino board, the one used in this project (ATMEL, 2015), is not meant to be used with voice recognition, there is an Arduino that is specified to be used with voice recognition but this was not available for this project (HMC, 2015).

## **Method**

## **Literature review**

* In (1R.A.Ramlee, 2013), a low-budget implementation of an automated home is performed. It exists of two different GUIs (one for PC/Laptop and one for Mobile phone). One interesting aspect of this project is the precautions used in case of malfunctioning hardware, for example; if the Windows GUI (PC/Laptop) does not work properly, the Android GUI (Mobile phone) can communicate directly with the microcontroller instead of going through the Windows GUI. This gives one ideas of different kinds of implementations. For example; instead of only having Bluetooth connection to the microcontroller, it is possible to activate WIFI connection when out of range for Bluetooth. The main difference of this project and the one being conducted is the usage of voice recognition, their future work was the implementation of voice recognition and therefor one might say that Easy Speech is an evolution of this project.
* The article (Zhong, et al., 2014) discuss about how voice controlled systems can help blind or disabled people when it comes to doing something simple like calling someone or even search for something on Google. The article mentions a program that runs in the background and always listens to your voice, then executes the commands given to it. This is a solution to everyday life for people that need a fast and easy way to interact with their phone, when they might not have the possibility or time to reach it. The discussion in this article (Zhong, et al., 2014) is what this project is all about, Easy Speech is a project that will make things easier in normal life, no matter if it is your phone, car or even your house. Therefor Easy Speech is an implementation of this article (Zhong, et al., 2014).
* In (Saume, 2012) there are discussions about voice recognition using android devices, and how it works. They discuss if voice recognition has come to the point that it is a reliable source of input, when it comes to input commands. They conclude that is it not developed enough for being a reliable input source, it often gets the words wrong or do not understand the words spoken. They tried the most popular applications in Android like Google word to text and they noticed a lot of problems with different letters and words. The resemblance in this project and Easy Speech is that we are both using voice to text, but Easy Speech is the next step of voice recognition were it has been implemented to hardware.

When looking for articles for this project, the databases on HKR home page

(HKR, 2015), were used and all searching was filtered with the words “voice recognition” and “Android”. About 20 000 articles were found using these filter words. The articles that were reviewed were the top 20 searched ones, these articles were then reviewed and the articles used were the one most relevant to the project. How relevant the articles were to the project was decided by what the article was about, and how similar the articles were to this project. This was determined by if voice recognition were used in some way, or android were used and also about Arduino. The articles that were discarded were either not on the top 20, or not relative to the project.

The conclusion drawn from the articles is that voice recognition is very interesting for scientist interested in sound manipulation and other aspects of sound implementations. Voice recognition is a very young technology that has not yet been mastered, because of the lack of research in the area and there have not been a need for it until now.

## **Benchmarking**

The result of this project is only a prototype that is not ready for the market. This project in voice recognition is only the start of something that could be used in real life for example: Smart houses, medicine, cars and mobile phones.

## **Results**

## **Expected results**

The expected result from this project is there will be a functional and good working program, which will work well with voice recognition. It will also be able to turn on the right light depending on the given command, and store every given command in the database.

## **Results**

In this project Extreme Programming was used, between the iterations we used story cards and task cards. The story cards were used to know how far the project had gone, and what was left to do. The task cards were also used between iterations but they were individual between the members in the project, they were tasks for the members to be complete for the next iteration. The testing done in the project was Black box - White box testing, this is done by testing while programming. Instead of doing a complete code for testing, there were test between every code done to see if it worked. In this project GitHub was used as its revision control program. This was a very good combination with the Black box – White box testing, between every successful test the project would sync with GitHub and saved (PMJ, 2015). (VELOCITY)

The problems that were encountered in this project were:

* Learning the new programs: Android studio, Arduino playground.
* Programming and implementation to the application: Database, application functions, implementing voice to text.
* The connection between the Android app and the Bluetooth unit.
* Sending commands from the Android app to the Arduino.
* Receive commands in Arduino and make the desired output.

All these problems were solved by implementing code from tutorials and complete code, Black box – White box testing and pair programming. Tutorials and complete code were searched, to be able to learn the programs and to manage the implementations of the database, application functions and voice to text. The tutorials were searched were to learn the different programs, and learn how to manage the send and receive commands from the application to the Arduino board. Using all this knowledge this project was able to achieve its goals and make a functional program, and create all the functions needed for this project to work. After a lot of research the Bluetooth connection between the Arduino and the application was achieved, using all the tutorials and code found. Sending and receiving the commands to the Arduino was a big problem in this project, this was the problem researched the most and it showed out to be the physical connection that was wrong.

## **Social and ethical aspects**

Voice recognition can be wrong if you implement it somewhere and save personal data without the authorization from the individual in question. Even if you have authorization from the user to save personal data, it needs to be done in a good and secure way. It would also be an ethical problem if this would be mass produced, it would not be good for the environment. There is also a good side to the environment, this is because you could optimize the electronics in the house so a lot of electricity would be saved. This leads to greater life length on the equipment and less environment pollution from making more electronics.

## **Discussion and conclusion**

## **6.1 Discussion**

In the start of this project all members were declared different areas to be their own, and that they should focus on in this project. These areas were: Android programming, Database, Arduino and Bluetooth. All these areas were researched and implemented in this project. This project has processed in a good rate with all the tasks, and has always been on schedule with the customers demands and wishes. Overall this project have been running smoothly over this past month and all its members have committed their all for this project to make it as good as possible.

## **6.2 Conclusion**

Conclusions drawn from this project is that you can easily improve your normal life with voice recognition, by implementing it to your house, car or phone. Making it easier to do normal days activates like turning off all lights in your house with one command, or calling your mother from your car by just telling it to. About voice recognition not being a good input is true, due to the voice recognition in this project have difficulties recognizing exactly what have been spoken, but gets it right for about 75% of the time.

## **Suggestions for further work**

Things that could be done further after this project is to develop the app more, insert more functions to make it more universal, use more advanced hardware to be able to implement it to for example the smart house concept, example (Gavazzi, 2015). The areas that were not implemented in this project were to advance to be done in time, and the project did not have enough resources to be able to create the functions needed, and get the hardware needed. The areas that should have been implemented were voice recognition, voice feedback from a robot with different feedbacks depending on the person and the command given. There were also supposed to be a functional robot, that would be able to respond to different people depending on what they said to the robot and who it was.

## **References**

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## **Appendices and enclosures**