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# CENG491 PROJECT PROPOSAL





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Turkish Sign Language Recognation Using Microsoft Kinect

# 1. Project 1.1. Description

The aim of the project is to implement an interface working through Microsoft Kinect that can recognize and understand Turkish Sign Language (TSL). We plan to divide our implementation in two main dimensions. First, by using the information we inferred from Kinect, we will be translating the meaning to text(including various languages), audio and visuals (such as videos and pictures) to provide a bidirectional communication between speech disabled people and people who doesn't know TSL, by creating a platform that they can communicate. The second dimension of our project is to design an interactive education tool for TSL.

The communication platform will be a tool that maps basic TSL phrases to Turkish Language, and then transfers it to the second party in text, audio or visual object formats, depending on the desires of the parties.

With the educational tool we are planning to implement, we are willing to increase the number of TSL speakers, which will be containing both the handicapped people who want to communicate with the handicapped people such as their relatives/friends etc.

## **1.2. Problem**

According to statistics the percentage of handicapped people in Turkey is 11%. Furthermore, 36% of the total handicapped people are unable to read or write, where the number is 13% among non-handicapped people.[1] So, in order to handicapped people to communicate, either the handicapped party has to know how to write or both parties has to know the sign language. With our project we are willing to help those people by both translating their language to natural language and spreading the triteness of TSL with our educational tool in Turkey.

## 1.3. Characteristics 1.3.1. Limitiations & Coverage

Due to the technical capabilities of Microsoft Kinect and the amount of work can be produced by 4 people in two semesters, for now we will only be covering the basic TSL phrases, which are mostly reflected by arm movements. For the rest of the language, where the finger movements are also included, an extra and more professional approach will be required. So, for our graduation project we will design a prototype for this implementation, which will mostly be handling basic arm phrases of TSL, and leave it as a generic product which can be improved by INNOVA later on.

### 1.3.2. Tools & Enviroment

The project will be developed in Java environment. We are planning to use some of the following libraries for development such as Georgia Tech Gesture Toolkit, Hidden Markov Model Toolkit, OpenNI framework, Swing.

## 2. Market Research

According to the research handled by 'Gazi Universitesi Kulak Burun Bogaz Ana Bilim Dali, Odyoloji Bilim Dali'[2], in Turkey there are no tools available to teach and recognize Turkish Sign Language. As the idea is recently developing there are no successful commercial tools available to interpret sign languages as well. But, similar ongoing researches and projects are developing by different universities for other languages, such as English, Arabic, French etc.

#### **Research in Georgia Tech College of Computing (American SL)[3]**

Research group in Georgia Tech. University has been working on recognizing American Sign Language using Microsoft Kinect. The group has successful results as good as up to 100% sentence recognition accuracy for a small set of phrases. Although the accuracy drops down with the increasing coverage of phrases, the group is still working on developing it. As a product of their research they created a tool for deaf children called CopyCat to teach them American Sign Language.

They use Hidden Markov Model technique to train their data set, and the coverage of the program is as large as the data set trained by the research group. This is the same approach we will be following in our implementation as well. The coverage of our product will be limited to the language we trained our data with, which is the basic set of phrases in Turkish Sign Language.

# **Research in Jordan University of Science and Technology (Arabic SL)**[4]

The research group in Jordan University of Science and Technology has developed a tool named Kinect Sign Language Detection in Arabic. This device can recognize not even the basic arm movements but also recognizes and interprets finger movements. Although recognizing the finger movement is a more effective and useful property for that kind of device, we will not cover that much details and our device will recognize just the basic arm movements. Another useful property of this device is to detect the movements of a person and then translate this movements into four different languages which are French, German, Arabic and English. We found that property very useful and our project is likely to include a part for translating a sign into different languages as well.

### **Research in Ecole D'ingénieurs Liée aux Nouvelles Techologies (French** SL)[5]

The research group working under Hubert Wassner at Esiae released a demo for their research, which is currently only able to understand 'hello' and 'sorry' in French Sign Language. However, the tough part, getting the system to work, is claimed to be complete. The system uses FANN(Fast Artificial Neural Network) to train their data. And as the implementation is claimed to be complete, now it's just a matter of training the system for more phrases. Once the system is enlarged its vocabulary, it can be commercially available. It's hard not to notice though, that the gestures that the system does recognize are fairly large, and it's not clear how it will handle smaller, finer gestures. And we believe the system will probably still require more modifications with the increasing number of phrases, since it will be harder to distinguish the signs with the increasing vocabulary and the performance is likely to to decrease proportionally.

# 3. Work Plan



#### 11-Nov-11 11-Dec-11 10-Jan-12 9-Feb-12 10-Mar-12 9-Apr-12 9-May-12 8-Jun-12

Figure 1. Gantt Chart

## 4. References

[1] T.C. Aile ve Sosyal Politikalar Bakanlığı Özürlü ve Yaşlı Hizmetleri Genel Müdürlüğü. (n.d.). *Türkiye Özürlüler araştırması* temel göstergeleri. Retrieved from <u>http://www.ozida.gov.tr/arastirma/oztemelgosterge.htm</u>

[2] Gazi Universitesi Kulak Burun Boğaz Ana Bilim Dalı, Odyoloji Bilim Dalı. (n.d.). *Ülkemizde İşitme engellilerin durumu*. Retrieved from <u>http://www.odyoloji.gazi.edu.tr/isitme engellilerin durumu.htm</u>

[3]Christopher Grant. (Dec 20th, 2010). Kinect hacks: American sign language recognition. Retrieved from <u>http://i.joystiq.com/2010/12/20/kinect-hacks-american-sign-language-</u> recognition/

[4]http://www.kinecthacks.com. (May 20th, 2011).*Kinect sign* language in arabic. Retrieved from <u>http://www.kinecthacks.com/kinect-</u> <u>sign-language-in-arabic/</u>

[5]Max Eddy. (May 19th, 2011).*Hacked kinect understands sign language*. Retrieved from <u>http://www.geekosystem.com/kinect-sign-language/</u>