CENG491
PROJECT PROPOSAL

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1. GROUP DESCRIPTION

1.1. Group Information

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1.2. Sponsor

INNOVA

2. PROJECT DESCRIPTION

2.1. Project Name

Turkish Sign Language Recognition Using Microsoft Kinect

2.2. Problem

Our project intends to develop software that recognize pre-defined gestures of TSL, and enable users to learn and practice TSL. The primary aim is to enable people with speech disorder to communicate with the others and make the TSL learning widespread among society.

The core of the system and technical aspect is formed by gesture recognition. There are plenty of advantages of Kinect technology and its SDK. For instance, these technologies undertake the recognition the skeletal structure of user and movements of bones without any image processing.

On the other hand, the classification of the gestures that are slightly different from each other is the main problem that we are aiming to solve. In order to achieve the desired communication ability of the software, the system should recognize the signs even if performed movements with the same textual meaning are different each time. In addition to this, the database of the pre-determined movements should be constructed by using a well-formed, specific methodology. The main problem which will be solved in our project is how this database will be constructed and how the system will classify the inputs precisely.

2.2 Solution

Our solution to above-mentioned gesture recognition problem is a learning-system. Our system will be a neural network which will approximate the inputs provided by Kinect to the system and match this approximation to one of the gestures it learned before.

How this network topology will be, which algorithms will be used for learning or how network will adjust itself will be determined only after we specify the forms that represent the inputs coming to system from Kinect.

Basically, the system will adjust itself with a pre-determined learning algorithm and the inputs taken from Kinect SDK. After that, it will classify the given inputs to be recognized by this neural network again.

2.3 Characteristics of Project

Our major aim is to develop software for speech-impaired people by converting gestures of Turkish Sign Language to text. With this product, speech-impaired people can learn TSL easily since user are able to see whether gestures are correct or not. Besides, it will be useful for communication in government offices without TSL translators.

Core system will convert Kinect inputs in an appropriate mathematical form, and then neural network will learn and match new inputs with these pre-determined ones. We will use Microsoft Kinect SDK and develop the software using C# programming language in the Visual Studio & .NET environment.

Once we build the core of the system which is defined in the solution part, we will then create an interface for communication and education modules of the program, both using this recognition system.

Communication part of the interface will basically do nothing but converting the gestures to the text. The education module will be some kind of game, it will give user a name of a movement first, then user will perform corresponding gesture, finally the program will decide whether user movement is performed correctly or not. Also, program will calculate user mistakes, and will give a point to the performance.

Obviously, our program will have some limitations like gestures based on finger movements so, the program will not cover abstract words of TSL. For the beginning the program will recognize only 10 gestures pre-defined. Yet, it will be possible to define more gestures once it is proved that the program works well enough.

The program will work on PC environment mainly. By connecting Kinect to PC, the user will be able to use our program to convert TSL to text and/or use it to learn TSL.

3. MARKET RESEARCH

There are several technologies available about sign language recognition not only by using Kinect or other visualization technologies, but also using special gloves that is used for hand-gesture tracking. Since Kinect is a new technology, software development environment for it is not well-progressed yet and the projects via Kinect are still in its infancy. During our research on the subject, we haven't encounter with any commercial product for Turkish sign language. However, we come up with several student projects about gesture recognition which are designed for other countries' sign languages such as, Arabic, French, and American etc. There are some example projects about sign language recognition. We listed some of them below.

1. CopyCat is a platform to collect gesture data for American Sign Language (ASL) recognition system. It is also a practical application that aims to help deaf children develop working memory and improve language skills by using Kinect skeleton features.[1]

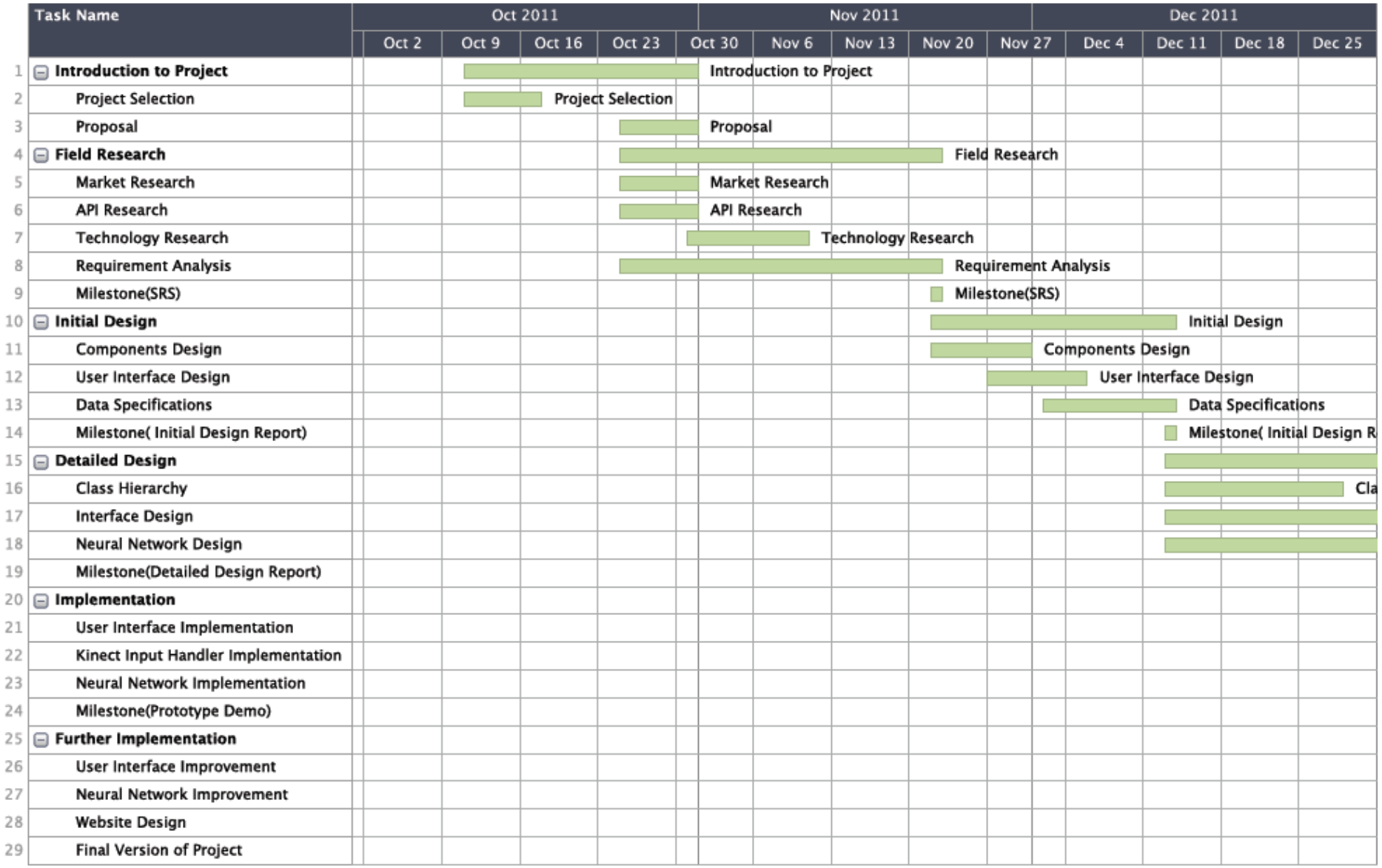
2. KinectSL recognizes hand gestures by using Kinect, then translates them to Arabic texts and demonstrates user whether the gesture correct or not.[2]

3. This project builds a neural network and uses Kinect and openNI for recognizing French Sign Language. Although project is still ongoing, and not related to an academic or commercial purpose, developers claim that "self-learning" aspects of the project will make it more and more functional without any more coding.[3]

Our project is not differ from the existent ones with respect to using technologies and methods, however it will be the first one developed in Turkish.

4. GANTT CHART

Figure-1 shows our project schedule.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Nov 2011
Dec 2011
Oct 2
Oct 9
Oct 16
Oct 23
Oct 30
Nov 6
Nov 13
Nov 20
Nov 27
Dec 4
Dec 11
Dec 18
Dec 25
1 Introduction to Project
2 Project Selection
3 Proposal
4 Field Research
5 Market Research
6 API Research
7 Technology Research
8 Requirement Analysis
9 Milestone(SRS)
10 Initial Design
11 Components Design
12 User Interface Design
13 Data Specifications
14 Milestone(Initial Design Report)
15 Detailed Design
16 Class Hierarchy
17 Interface Design
18 Neural Network Design
19 Milestone(Detailed Design Report)
20 Implementation
21 User Interface Implementation
22 Kinect Input Handler Implementation
23 Neural Network Implementation
24 Milestone(Prototype Demo)
25 Further Implementation
26 User Interface Improvement
27 Neural Network Improvement
28 Website Design
29 Final Version of Project

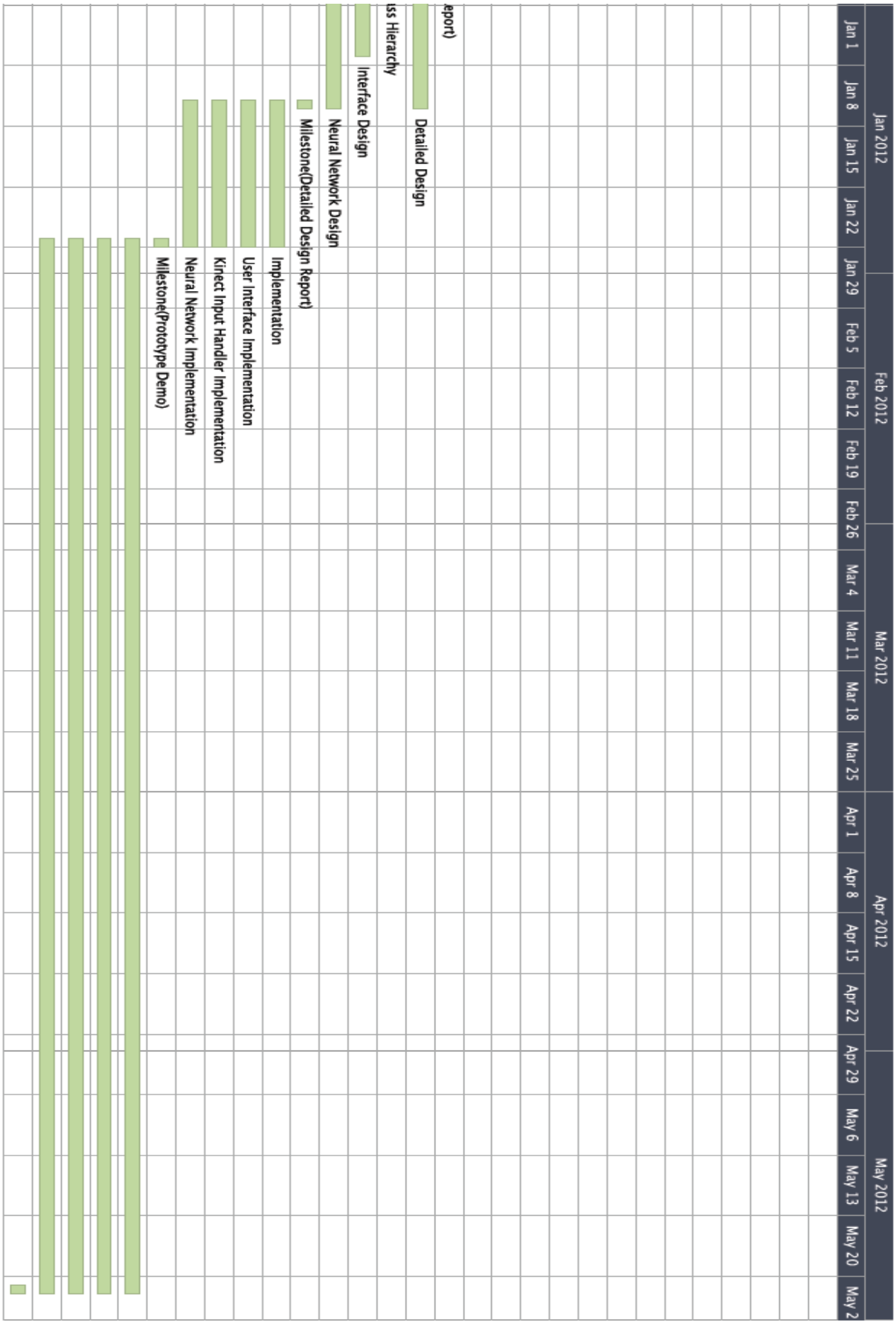

Figure -1: Gantt Chart

5. REFERENCES

1) CopyCat's Home page, http://cats.gatech.edu/content/copycat
2) The video of KinectSL, http://www.kinecthacks.com/kinect-sign-language-in-arabic/
3) The video of French sign language recognition project by using Kinect, http://techland.time.com/2011/05/19/french-hackers-create-sign-language-reader-from-kinect-camera/
4) Kinect for Windows SDK Beta documentation http://research.microsoft.com/en-us/um/redmond/projects/kinectsdk/guides.aspx