**MINISTRY OF EDUCATION AND TRAINING**

**FPT UNIVERSITY**

Capstone Project Document

**Communication by Your Hands**

|  |  |
| --- | --- |
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| **Capstone Project code** | CBYH |

-Ho Chi Minh City, **05/01/2016**-

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**Definitions, Acronyms, and Abbreviations**

|  |  |
| --- | --- |
| **Name** | **Definition** |
| CBYH | Communication by Your Hands |
| BOM | Back Office Management |

# Report No. 1 Introduction

## Project Information

* Project name: **Communication by Yours Hands**
* Project Code: **CBYH**
* Product Type: **Mobile application, BOM Website**
* Start Date: **05/01/2016**
* End Date: **<Ngày kết thúc>**

## Introduction

In communicating, sign language is the best way to communicate between people with deaf and mute. However, its required normal persons must have knowledge on sign language to communicate with the deaf and mute. Moreover, it is impossible for the deaf and mute to communicate with the blind. In this document, we introduce a solution for deaf and mute persons to communicate easily with the others without sign language knowledge on the normal person side.

We build a system, which help communication is easier between normal and deaf / mute persons. In the process of our research, we findout that MYO Gesture Control Armband is the key to solve the problem. By using MYO armband, we can read the electrical activity of person’s muscle and the motion of their arm then map the gesture with the customized data to translate sign language into text or sound with the same meaning. Beside that, we also provide an information system to manage easily the user, license packages and library packages.

This document also describes our working process in 4 months includes our perspective in the system, component designs and detailed core workflows. We all hope the system as so as our solution will help the deaf and mute persons easier to intergrate with the community.

## Current Situation

Currently, there is no official system that to support translate sign language into normal text or sound in VietNam or around the world. There is a project of Microsoft in China since 2013 named “Kinect Sign Language Translator” that use Kinect device to capture sign language movement to translate into spoken language and translate spoken language into sign language in real time. However, the project have not officially released yet.

So far, the most effective method for the deaf / mute persons to communicate is performing a combination of hands movement to describe a word or a phrase of words called “sign languge”.

There are special schools and organizations that teach deaf / mute persons (mostly children) how to use sign language to communicate in life.

Howerver, it is impossible to communicate between the deaf / mute with the blind.

## Problem Definition

Below are disadvantages of the current situation:

* Not use widly in community: In normal life, deaf / mute persons can hardly find someone who has knowledge on sign language to communicate.
* Normal turn into disabilities: It is quite hard for normal person who turn into deaf / mute accidentally to approach to sign language.
* Sign language is hard to learn: It takes time and difficult to learn sign language.

 Communicate between the deaf / mute with the blind: Sign language is useless on helping in communication between the deaf / mute with the blind.

## Proposed Solution

Our proposed solution is to build a system named “CBYH”, which use a pair of MYO armbands and an internet connected mobile device to help deaf / mute persons to communicate with the others easier by translate sign language from users into normal text or sound with the same meaning. We also design the system to be scalable so we can deploy this system on multiple platforms in future plan.

CBYH system includes a web application and a mobile application with following functions:

### **Feature functions**

* + - Web application (for staff):
      * Back Office Management: Staff can take manage on any user information, license and library database with this website.
    - Sign language training (mobile app for staff):
      * Training: Staff can add new sign language move and the meaning of it into database. Right after staff perform sign language, the application will receive raw data and the meaning of it, which is inputed by staff, then send and store them on server.
    - Sign language translator (mobile app for user):
      * Translate sign language: User can translate sign language into text or sound with the same meaning. Right after user perform sign language, the application will receive raw data from MYO armband and send to server then reveive translated data and outputs text or sound with the same meaning.

### Advantages and disadvantages

The advantages and disadvantages of the proposed solution:

* Advantages:
  + The communication between the deaf / mute with the normal persons: It is easier for deaf and mute persons to express what they want to say to normal persons. There is no need sign language on the normal to understand what the deaf and mute want to say.
  + Communicate between the deaf / mute with the blind: With the system, now the deaf and mute can communicate with the blind for the first time, which is impossible before.
  + The deaf and mute in there job: It is easier for the deaf and mute in there job especially whose job relate with presentation.
  + Mobility: To compare with “Kinect Sign language Translator” system, CBYH system’s user can translate sign language anywhere, anytime with a pair of MYO armbands and an internet connected mobile device.
* Disadvantages:
  + The delay of translation: There is delay in translation sign language into normal text or sound.
  + Lower accuracy: To compare with “Kinect Sign language Translator” system, the accuracy of sign language detection of CBYH system is quite lower.

## Functional Requirements

Function requirements of the system are listed as below:

* User component:
  + Translate sign language (online mode): User can translate sign language into text or sound with internet connection required
  + Buy license.
  + Switch: After buy license, user has three more functions to switch for personal use.
  + Translate sign language (offline mode): After buy license, user can download the meaning resource to device to translate sign language with no internet connection required.
  + Train custom hand sign: After buy license, user can create new sign move and meaning of that sign for personal use.
  + Share content: After buy license, user can create a group of device to receive translated data and stored in a list for personal use.
* Staff component:
  + Train standard sign language: Staff can train new sign language and meaning for system.
  + Manage database: Staff can take manage on database (User, license, library, sign language dictionary) with BOM website.

## Role and Responsibility

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Full Name | Role | Position | Contact |
| 1 | Kiều Trọng Khánh | Project Manager | Supervisor | [khanhkt@*f*pt.edu.vn](mailto:khanhkt@fpt.edu.vn) |
| 2 | Trương Công Thái | Developer, Tester | Leader | [thaitcse61209@fpt.edu.vn](mailto:trungdqse60994@fpt.edu.vn) |
| 3 | Nguyễn Nhất Nguyên | Developer, Tester | Member | [nguyennnse61172@fpt.edu.vn](mailto:phucnhse60749@fpt.edu.vn) |
| 4 | Phạm Hồng Quý | Developer, Tester | Member | [quyphse61130@fpt.edu.vn](mailto:tripqmse60746@fpt.edu.vn) |
| 5 | Nguyễn Duy Anh | Developer, Tester | Member | [anhndse61077@fpt.edu.vn](mailto:khanc60351@fpt.edu.vn) |

Table : Roles and Responsibilities

# Report No.2 Software Project Management Plan

## Problem Definition

### Name of this Capstone Project

-Official name: Communication by Your Hands

-Vietnamese name Phiên dịch ngôn ngữ kí hiệu

-Abbreviation: CBYH

### Problem Abstract

In daily life, communication is the one of the most basic needs and tool of humanity. There are many ways for people to communicate such as speech, body language, gesture, feeling, wrtting, texting, etc. However, with the deaf / mute persons, that basic need is hardly satisfied. The most effective current solution for them is sign language – a combination of hands movement that describes a word, or a phrase of words, which they want to express. Nevertheless, that means it requires ervery participants must have knowledge on sign language or there must be someone as a translator. In addition, the sign language cannot help deaf / mute persons communicate with the blind. Because of those, this is not a comprehensive solution and it takes lots of time and cost for training and learning sign language. In additional, there are still some temporary solution to solve the problem such as writing and texting, but these ways require a lot of time and effort. Moreover, those ways are not working in some situations with a group of people such as in a classroom or a presentation, etc.

To solve those problems, which mentioned above, we provide a system that translate sign language into normal text or sound with the same meaning so that deaf / mute persons can use sign lanaguge to communicate with the others who have no knowledge on sign language without a person as a translator. The system includes a pair of MYO armbands, an internet connected mobile device and a web service. The system will plays the translator role to translate sign language into normal text or sound with the same meaning. We also provide a web page as a sign language dictionary to support persons who want to approach to sign language. In addition, we also provide an information system to manage user information, license, library and the sign language dictionary.

### Project Overview

#### Current Situation

Below are some current behaviors of user:

* Handwriting:
* People will use something can write on as tool for communication.
* They can write out exactly what they want to say to the recipient.
* The recipient can receive and read the content immediately.
* Familiar signs:
* Speakers will describe the word which they want say through action; describe the shape, body language.
* Listeners observe the speaker's actions. They predict information that the speaker shown.
* Interpreters:
* Act as intermediary to translate the content of communication.
* Speakers express words by their language, the interpreter receive information from the speaker and then convey that information by the language of the listener.
* Degree of accuracy of translated content is quite high for both two sides.

Below are the disadvantages of current situation:

* Hand-writing :
* Users must use an intermediary for communication such as paper, pens. However, these things are not always available.
* Users spend more time to write out all their wishes and read them.
* User can meet difficulties about different languages.
* The error can be caused by user handwriting.
* Hard to use in a group of people.
* Using familiar signs :
* Maybe be misleading because the symbols are not standardized.
* It is trending towards personally identifiable user.
* It is difficult to show all wishes of communicator.
* Time consuming for understanding the content is long.
* Translator :
* Hiring a translator must be costly.
* Translator who work only in the fixed time, thus not always can meet user's demands.
* Translator must be an experienced person.
* Number of translator is limited.

Below are the problems encountered in this project:

* Disadvantages:
* Delay: There is delay in stranslation from sign language into normal text or sound with the same meaning.
* Accuracy: The accuracies of reading sign language between deifference users are not the same.
* Server crash: all the needed data to perform translating sign language is stored in the server. Therefore, if the server crash, all the devices can do any functions.
* Connection lost: if user don’t buy the license, to translate sign language, the system requires an internet connection. Therefore, if the connection is lost, the translating cannot be performed.
* Advantages:
* Mobility: Users can translate sign language into text or sound with the same meaning anywhere, anytime with the required devices.
* Lower cost of hiring translator: Cost for user to use the system is lower than hiring a personal translator.

#### The Proposed System

According to the technology researches, MYO armband is the key to solve the current situation about helping deaf / mute persons in communication. We can use the feature of MYO armband to solve the problem about translating sign language. The basic idea is to use the MYO armbands to read user’s muscle electrical activity then map with customized database to recognize the sign language.

We also build a high available web server to maintain the main system to work 24/7 to make sure that users can translate their sign language anytime, anywhere.

We assign responsibility in vertical to make sure if any member cannot continue to work in our team, there will be the least harmful to the project process

Our system include four main subsystems: a BOM website for staff, a dictionary sign language website for user, a mobile application for staff to train sign language for the system and a mobile application for user.

##### Web Site

Website is a management tool for staff to take manage on user’s info, license, library and sign language dictionary. If login by user account, the website will be a sign lanaguge dictionary for user to research.

* For staff
* Manage: Staff can take manage on user (view info, change state), license (view/ edit info), library (add new, change state), dictionary (add new, edit, change state).
* For user
* Register: User can register new account and buy license with online payment.
* Search sign language: User can search sign language moves by meaning which are supported by the system.

Beside above, the website also provide API interfaces for mobile application to receive or update data from mobile application.

##### Mobile Applicaion

* For staff
* Training: Staff can train new sign language move and the meaning of it for the system.
* For user

This is the official application, which provide to user to collect and send raw data from MYO armands then send to server and receive analyzed data to do the following funtions:

* Translate sign language (Online mode): User can translate sign language into text or sound with internet connection required.
* Buy license.

The following function only available if user have bought the license:

* Switch: user can switch between four modes (online, offline, train custom hand sign and share content).
* Translate sign language (Offline mode): User can download resource to device to translate sign language without an internet connection.
* Train custom hand sign: User can train new personal sign move and meaning of it for the system for personal use.
* Share content: User can share content of the translated data to a group of devices.

#### Boundaries of the System

* A User who want to use the funtions of this system have to equip emough device includes:
* A Pair of MYO gesture control armband.
* A mobile device with our application installed and internet connected.
* To do the job, a staff of the system must be equipped the following devices:
* Computer system with internet connection.
* A pair of MYO gesture control armband.
* A mobile device with the training application installed and internet connected.

#### Future Plans

Currently, the system only deploy on a single platform: Android. Besides that, the system just support one side of the communication: from user of the system (the deaf / mute) to the others. We design the system to make it easily to scale to be a bigger model with more functions and run on more platform:

* Run on multiple platform on client side: Android, IOS, Window phone, Window, MacOS.
* Support multiple language library: Currently just support Vietnamese.
* Support translating two sides of a communication: From sign language in to text or sound and from spoken language into sign language.

#### Development Environment

##### Hardware requirements

**For Server**

|  |  |  |
| --- | --- | --- |
| ***Windows*** | ***Minimum Requirements*** | ***Recommended*** |
| ***Internet Connection*** | *Cable, Wi-Fi (4 Mbps)* | *Cable, Wi-Fi (8 Mbps)* |
| ***Operating System*** | *Window Server 2008* | *Window Server 2008* |
| ***Computer Processor*** | *Intel® Xeon ® 1.4GHz* | *Intel® Xeon ® Quad Core (12M Cache, 2.50 GHz)* |
| ***Computer Memory*** | *1GB RAM* | *2GB or more* |

**Table 2: Hardware Requirement for Server**

**For Client**

|  |  |  |
| --- | --- | --- |
| ***Android*** | ***Minimum Requirements*** | ***Recommended*** |
| ***Internet Connection*** | *Wi-Fi (4 Mbps)* | *Wi-Fi (8 Mbps)* |
| ***Operating System*** | *Android 4.4: Kitkat* | *Android* |
| ***Computer Processor*** | *Snapdragon 400* | *Snapdragon 800* |
| ***Memory*** | *1GB RAM* | *2GB or more* |

**Table 3: Hardware Requirement for Client**

## Project organization

### Software Process Model

#### Overall Description

Scrum is an agile methodology that can be applied to nearly any project; however, the Scrum methodology is most commonly used in software development. The Scrum process is suited for projects with rapidly changing or emergent requirements. Scrum software development progresses via a series of iterations called sprints, which last from one to four weeks. In the agile Scrum world, a sprint-planning meeting is described in terms of the desired outcome (a commitment to a set of features to be developed in the next sprint) instead of a set of Entry criteria, Task definitions, Validation criteria, Exit criteria. The Scrum model suggests each sprint begins with a brief planning meeting and concludes with a review. These are the basics of Scrum project management.

#### Scrum Development Model



Figure 2: Scrum Development Model

For more information: [**https://www.scrum.org/Resources/What-is-Scaled-Scrum**](https://www.scrum.org/Resources/What-is-Scaled-Scrum)

#### Reasons for Choosing

Project is developed under scrum model. We choose this model because the scope of the project is not fixed when the requirement changes day by day. Products are created quickly. Therefore, the development team can easy to change if the wrong direction. Degree of cooperation between the members is set to high.

### Roles and responsibilities

|  |  |  |  |
| --- | --- | --- | --- |
| No | Full name | Role in Group | Responsibilities |
| 1 | Đỗ Đức Minh Quân | Scrum Master/Product Owner | * Defining user requirements * Specifying business * Control the development process * Give advices on techniques, solutions and business analysis support |
| 2 | Nguyễn Đức Lợi | Scrum Master/Product Owner | * Give advices on techniques, solutions and business analysis support |
| 3 | Nguyễn Hữu Kỳ Long | Team Leader, BA, DEV, Tester | * Managing process * Clarifying requirements * Researching solutions and techniques * Assigning task for members * Reviewing the result of task of members. * Editing documents and reports * Reviewing documents and reports * Developing the system software * Reviewing the system hardware * Coding * Creating test plan. * Testing |
| 4 | Nguyễn Đình Tân | Team Member, BA, DEV, Tester | * Clarifying requirements * Researching solutions and techniques * Designing database * Preparing documents and reports * Reviewing documents and reports * Developing the system software * Reviewing the system hardware * Coding * Testing |
| 5 | Lê Phương Bình | Team Member, BA, DEV, Tester | * Clarifying requirements * Preparing documents and reports * Reviewing documents and reports * Developing the system hardware * Reviewing the system software * Coding * Testing |
| 6 | Nguyễn Xuân Ý | Team Member, BA, DEV, Tester | * Clarifying requirements * Editing documents and reports * Reviewing documents and reports * Developing the system hardware * Developing the system software * Coding * Testing |

Table 3: Roles and Responsibilities Details

### Tools and Techniques

* + - Front-end and back-end IDE:
* QT Creator version 4
  + - Front-end technology:
* QT Linux GUI version 4
  + - Back-end library:
* OPENCV library version 2.4.9
* LIBSVM library version 3.20
* Espeak library version 1.48.04
* BCM2835 library version 1.45
  + - Managing database:
* SQLite 3
  + - Connecting to Raspberry PI B2:
* Remote Desktop Connection Program of Ubuntu 14.04
  + - Managing the project:
* SVN tortoise version 1.8.11
* Rabbit VCS
  + - Managing documents, reports, models and diagrams:
* Software Ideas Modeler version 7.70.5385.38708
* Microsoft Office 2010

## 

## Project Management Plan



### Product Backlog

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ID | Theme | User Type | Wants to... | So that... | Priority | Sprint |
| 1 | Detection | User | keep track their hand gesture | can see his/her hand in the screen | Very High | 1 |
| 2 | Device | User | the system is a portable system | move the device easily and use it more flexibly | High | 1 |
| 3 | Recognition | User | recognize the hand signs | express the same meaning to the partner can understand | Very High | 2 |
| 4 | Recognition | User | receive the recognition result via text and sound | express the translated content in a clearly way | Medium | 2 |
| 5 | Detection | User | control the system functions by hand gesture | perform and move beetween the system functions | High | 3 |
| 6 | Power | User | know remaining of battery capacity | can monitor the use of device | Medium | 3 |
| 7 | Recognition | User | increase the accuracy of the recognition result | raise the reliability of the translated content | Very High | 4 |
| 8 | Learning | User | learn the hand sign language | learn new signs or pratice his/her signs | High | 4 |
| 9 | Device | User | turn on/off the system | can turn on/off the device according to the demand | Medium | 4 |
| 10 | Device | User | the system is boxed firm, compact | the component are protected against bumps | Medium | 5 |
| 11 | Recognition | User | the system reliable operation | no error occurs when using | High | 5 |
| 12 | User manual | User | know how to install and use the system | easy to use, repair | High | 5 |

Table 4: Product Backlog Details

### Sprint Backlog

Place at folder ScrumBacklog in Github



### All Meeting Minutes

Place at folder “Meeting minute” in SVN with the following URL: https://github.com/tcthai1994/communicateByYourHands/tree/master/Meeting%20minute

## Coding Convention

*General view of C++ Programming Style put into practice in the project*

* Naming Conventions
* Variable names must be in mixed case starting with lower case.
* Named constants must be all uppercase using underscore to separate words.
* Names representing methods or functions must be verbs and written in mixed case starting with lower case.
* Plural form should be used on names representing a collection of objects
* The prefix is should be used for Boolean variables and methods
* Include Files and Include Statements
* Header files must contain an include guard
* Include statements should be sorted and grouped
* Include statements must be located at the top of a file only
* Variables
* Class variables should never be declared public
* C++ pointers and references should have their reference symbol next to the type rather than to the name
* Conditionals
* Complex conditional expressions must be avoided
* The conditional should be put on a separate line
* Executable statements in conditionals must be avoided
* Comments
* Use // for all comments, including multi-line comments
* Comments should be included relative to their position in the code
* Class and method header comments should follow the JavaDoc conventions

*References*

C++ Programming Style Guidelines, Version 4.9, January 2011, Geotechnical Software Services, Copyright © 1996 – 2011

<http://geosoft.no/development/cppstyle.html>