**MINISTRY OF EDUCATION AND TRAINING**

**FPT UNIVERSITY**

Capstone Project Document

**Communication by Your Hands**

|  |  |
| --- | --- |
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| **Ext. Supervisor** | N/A |
| **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 |
| EMG | Electromyography |
| SRS | Software Requirement Specification |

# 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”.

Process of using signlanguage:

Case 1: (All participants already knew sign language)

- Deaf / mute persons perform sign language to description the message.

- The receivers understand the sign language base on their knowledge.

- The receivers perform sign language to reply the message.

Case2: (Not all participants already knew sign language)

There must be a translator

- Deaf / mute persons perform sign language to description the message.

- The translator translate the message from sign language into spoken language.

- The receivers get the message from the translator then reply the message to the translator.

- The translator translate the reply into sign language for the deaf / mute.

## Problem Definition

Below are advantages / disadvantages of the current situation:

\*Software support behavior:

-Advantages:

* Fully support communication: “Kinect Sign Language Translator” highly support deaf / mute persons to perform communicate with normal person and vice versa with delay is nearly zero.

-Disadvantages:

* Low mobility: To use “Kinect Sign Language Translator”, user has to come to a place where is set up the system.
* Just a concept: However, “Kinect Sign Language Translator” is just at project level, hasn’t officially released yet

\*User behavior:

-Advantages:

* Familiar and ease to use for deaf / mute person: It is the most familiar and effective for the deaf / mute to communicate in deaf / mute community.

-Disadvantages:

* 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 with normal persons: 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 (for 30 days).
* 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 1: 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 the problems encountered in this project:

* Disadvantages:
* Highly risk: Because the project uses MYO armband, team must study new technology/ API to apply it.
* Not familiar topic: Main topic of this project is highly related with sign language, which is quite hard to approach for all team members
* Advantages:
* Reveive good support from MYO development forum: Because of the developing of MYO community, it is easier for team to get support from MYO forum when raise a problem.
* Receive good support from deaf / mute community of HoChiMinh city: Team got support about sign language knowledge from deaf / mute community, especially Ms. Lê THị Thu Xương – instructor of HoChiMinh City Pedagogical University.

#### 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, which called “EMG” to translate user’s sign language move into text or sound with the same meaning.

To translate sign language, user must wear two MYO armbands, and then connect them via Bluetooth v4.0 with an Android device with internet connected and install our application. While user performing the sign language, those armbands will read and send user’s raw EMG data to the Android device. Right after receive the data, the Android device will send those data to server via internet. Server will analyze raw EMG data then map with the meaning, which stored in database then return the meaning result to Android device in text. User can choose to display result as text or play sound depence on personal use.

User can also buy our license (for 30 days) to get more feature of the system. After buy our license, user can download library recource into device to translate sign language without internet connection. User can train new custom sign move for the system for personal use. Moreover, User can share in a group the meaning of translated sign language which performed by user for personal use.

##### 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 user: Staff can take manage on user as view / edit info, change user state.
* Manage library: Staff can add new or change state of library package.
* Manage dictionary: Staff can add new or change state of records in sign language dictionary.
* For user
* Register: User can register new account to use the system.
* Search sign language: User can search available sign language of the system by meaning. There will be a video to describe the word.
* Buy license: User can buy license to upgrade account to get more feature of 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.**

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 wants to use the funtions of this system have to equip enough 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** | Microsoft Window 7 | Microsoft Window 10 |
| **Computer Processor** | Intel® Xeon ® 1.4GHz | Intel® CORE i7 Quad core 2.4 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 5.1.1: Lollipop |
| **Computer Processor** | Snapdragon 400 1.7GHz Dual Core | Snapdragon 800 2.3GHz Quad Core or higher |
| **Memory** | 512MB RAM | 2GB |
| **Bluetooth** | Bluetooth 4.0 required | Bluetooth 4.0 required |

Table 3: Hardware Requirement for Client

##### Software requirements

|  |  |  |
| --- | --- | --- |
| Software | Name / Version | Description |
| Operating system | Microsoft Window 7 | Operating system and platform for development |
| Environment | Java EE 7 | Specification for developing web application |
| Modeling tool | Star UML 5.0 | Used to implement website and web service |
| IDE | Netbeans 7.4 | Programming tools |
| DBMS | MS SQL Server 2008 | Used to create & manage the database for system |
| Source control | TortoiseSVN 1.8.11 | Used for source control |
| Web browser | Chrome 47 or above | Testing browser |

Table 4: Software requirements for develop web site and web service

|  |  |  |
| --- | --- | --- |
| Software | Name / Version | Description |
| Operating system | Android 4.4 Kitkat to 5.1.1: Lollipop | Operating system and platform for development |
| Environment | Java EE 7 | Specification for developing web application |
| IDE | Android Studio 1.5.1 | Programming tools |
| DBMS | SQLite 3 | Used to create & manage the database for system |
| Source control | TortoiseSVN 1.8.11 | Used for source control |
| Testing OS | Android 5.1.1: Lollipop | Testing Client Operation System |

Table 5: Software requirements for develop client application

## Project organization

### Software Process Model

#### Overall Description

Agile development are methods allow the development team to focus on the software itself rather on design and documentation. Agile methods universally rely on an incremental approach to software specification, development, and delivery. They are best suited to application development where the system requirements usually change rapidly during the development process.

Evolutionary development model is one the models of Agile method. Evolutionary development is an iterative and incremental approach to software development. Instead of creating a comprehensive antifact, such as a SRS, that is reviewed and accepted before creating a comprehensive design model (and so on) developer instead evolve the critical development antifact over time in an iterative manner. Instead of building and then delivering the system is a single time release, developer instead deliver it incrementally onver time.

References:

- Software Engineering, 9/E -Ian Sommerville.

- <http://www.agiledata.org/essays/evolutionaryDevelopment.html>

#### Agile Development Method – Evolutionary Development Model

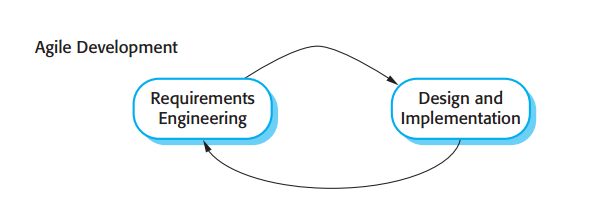


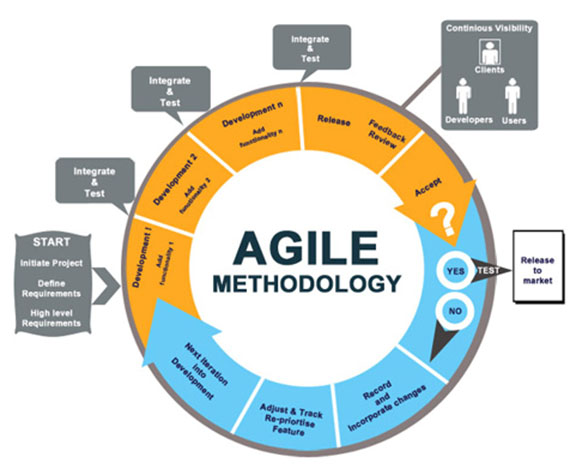
Figure 1: Agile Development Method

Figure 2: Evolutionary development Model

References:

Software Engineering, 9/E -Ian Sommerville.

<http://www.tabernae.com/process.aspx>

#### Reasons for Choosing

The project is developed under Evolutionary Development Model. We apply customized waterfall model to capable with current situation of our team. We chose this model because of the following reasons:

* The project use new technology – the MYO gesture armband, team very sure about what the device can do so the solution and reality technology may mismatch.
* The team must study MYO API and implement the project at the same time.

For those reasons, the requirements of the project can be stable, clear, fix. Moreover, they can be rapidly changed.

### Roles and responsibilities

|  |  |  |  |
| --- | --- | --- | --- |
| No | Full name | Role in Group | Responsibilities |
| 1 | Mr. Kiều Trọng Khánh | Product Owner – Technical Expert | * Specify user requirement * Specifying the business * Control the development process * Give advices on techniques, solutions and business analysis support |
| 2 | Trương Công Thái | Team Leader, BA, DEV, Tester | * Managing process * Clarifying requirements * Researching solutions and techniques * Assigning task for members * Design architecture * Support team members * Reviewing the task result of members * Creating/ Editing documents and reports * Reviewing documents and reports * Coding Web service * Creating test plan * Creating test case * Testing |
| 3 | Nguyễn Nhát Nguyên | Team Member, BA, DEV, Tester | * Clarifying requirements * Researching solutions and techniques * Design architecture * Designing database * Reviewing documents and reports * Coding Web service * Reviewing test plan * Reviewing test case * Testing |
| 4 | Phạm Hồng Quý | Team Member, BA, DEV, Tester | * Clarifying requirements * Designing Mobile application UI * Reviewing documents and reports * Coding Mobile * Reviewing test plan * Reviewing test case * Testing Coding * Testing |

|  |  |  |  |
| --- | --- | --- | --- |
| 5 | Nguyễn Duy Anh | Team Member, BA, DEV, Tester | * Clarifying requirements * Designing BOM Website UI * Reviewing documents and reports * Coding BOM Web site * Reviewing test plan * Reviewing test case * Testing Coding * Testing |

Table 6: Roles and Responsibilities Details

### Tools and Techniques

|  |  |
| --- | --- |
| Tool / Technique | Name /version |
| Front-end IDE | Android Studio 1.5.1 |
| Back-end IDE | NetBean 7.4 |
| Front-end technology | HTML5, CSS, JavaScript, JQuery, Ajax, Android |
| Back-end technology | MVC, JavaEE, Servlet, JSP |
| Managing database | SQLite 3, MS SQL Server 2008 |
| Managing the project | SVN tortoise version 1.8.11 |
| Managing documents, reports, models and diagrams | Microsoft Office 2013 |

Table 7: Tools and Techniques

## Project Management Plan

### Software development life cycle

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Phase** | **Description** | **Deliverables** | **Resource needed** | **Dependencies and Constrains** | **Risks** |
| **Define Requirement /** **Design** | -Identify and define requirements for the system in general.   * Architecture design for the system * Detail design using top-down break down * Choose Technology | -Introduction of proposed system.  -Software requirement specification.  -Project Task Plan.   * Software Design Document * Base code structure * Technology notes | 40 man- days | N/A | * Lack of member share of understand * Lack of experience. |
| **Implementation** | - Code module | - Actual software of each module | 40 man- days | Depend on Architecture and detail design | * Lack of experience. * Code dose not work. |
| **Integration and System Testing** | * Integrate modules of system * Create/ execute test case | * Actual software of the whole system * Testplan * Testcase | 20 man days | Depend on software of each module | * Modules can’t connect with others * Test case doesn’t cover all core functions |
| **Release and receive feedback / changes** | * Release the current system * Reveice feedbeck from supervisor * Analyze feedback, record changes and redefind requirement / apply changes | * Current system * Change log | 20 man days | N/A | * Too much changes |

Table 8: Software Development Life Cycle Detail

### Phase Detail

#### Defind requirement / design

|  |  |  |
| --- | --- | --- |
| **Task** | **Description** | **Author** |
| **1. Identify and define requirements.** | Define which main functions system should provide. | ThaiTC, NguyenNN, QuyPH, AnhND |
| **2. Architecture design for the system** | Design the architecture for each module and the connection between them. | ThaiTC, NguyenNN, QuyPH, AnhND |
| **3. Detail design** | Design Database | ThaiTC, NguyenNN, QuyPH, AnhND |
| **4. Choose technology** | Choose technology to implement the module | ThaiTC, NguyenNN, QuyPH, AnhND |

Table 9: Phase 1: Defind requirement / design

#### Implementation

|  |  |  |
| --- | --- | --- |
| **Task** | **Description** | **Author** |
| **1. Code modules** | Code modules base on detail design and task list | ThaiTC, NguyenNN, QuyPH, AnhND |

Table 10: Phase 2: Implementation

#### Integration and System Testing

|  |  |  |
| --- | --- | --- |
| **Task** | **Description** | **Author** |
| **1. Integrate all modules of the system** | Integrate all separate modules | ThaiTC, NguyenNN, QuyPH, AnhND |
| **2. Create test case** | Create test case base on core function with determind in phase 1 | ThaiTC, NguyenNN, QuyPH, AnhND |
| **3. Execute test case** | Execute the test case created | ThaiTC, NguyenNN, QuyPH, AnhND |

Table 11: Phase 3: Integration and System Testing

#### Release and receive feedback / changes

|  |  |  |
| --- | --- | --- |
| **Task** | **Description** | **Author** |
| **1. Release** | Release the system to supervisor | ThaiTC, NguyenNN, QuyPH, AnhND |
| **2. Get feedback / changes** | Get feedback / changes from supervisor  Loop the process if result is not satisfied | ThaiTC, NguyenNN, QuyPH, AnhND |

Table 12: Phase 4: Release and receive feedback / changes



### All Meeting Minutes

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

## Coding Convention

General view of JAVA Programming Style put into practice in the project:

* Naming Conventions:

-Variable name should be short yet meaningful. If the name is more than one word, it must be in mixed case, starting word with a lowercase.

-Constants name should be all uppercase with words separated by underscores.

-Methods name should be verbs, in mixed case with the first word lowercase, the first letter of each internal word capitalized.

-Class name should be nouns, in mixed case with the first letter of each internal word capitalized.

* Package and import staments:

-Package statement is the first non-comment line.

-Import statement is after package statement.

* Constants

-Numerical constants should not be coded directly.

* Variable Assignments:

-Advoid assigning serveral variables to the same value in a single statement.

* Comments:

-Using /\* \*/ for block comments

-Using // for line comments

* Return Statements:

-A return statement with a value should not use parentheses.

References:

**Code Conventions for the Java TMProgramming Language**

Revised April 20, 1999

<http://www.oracle.com/technetwork/java/codeconvtoc-136057.html>