**MINISTRY OF EDUCATION AND TRAINING**

**FPT UNIVERSITY**

Capstone Project Document

**Vietnamese Sign Language Recognition**

|  |  |
| --- | --- |
| **Group 05** | |
| **Group members** | Nguyễn Hữu Kỳ Long – Team leader – SE60984  Nguyễn Đình Tân – Team member – SE61115  Nguyễn Xuân Ý – Team member – SE60869  Lê Phương Bình – Team member – SE61049 |
| **Supervisor** | Mr. Đỗ Đức Minh Quân |
| **Ext. Supervisor** | N/A |
| **Capstone Project code** | VSLR |

-Ho Chi Minh City, 12/05/2015-

**Meeting Minutes**

|  |  |
| --- | --- |
| **Name** | **Definition** |
| x | Selected Person |
| VH | Very High Priority |
| H | High Priority |
| M | Medium Priority |
| A | Approved |
| Y | Yes |
| N | No |

Table 1: Definitions, Acronyms, and Abbreviations

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scrum Meeting Minutes** | | | | | | | | **Target Personas** | | | | | | | | **Status** | | | | **Approval** | | | |
| **LongNHK** | | **TanND** | | **BinhLP** | | **YNX** | | **Degree of priority** | | **Task completion** | | **LongNHK** | | **Mr. QuanDDM** | |
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|
| **Date: 12/05/2015** | | | | | | | |  | | | | | | | |  | | | |  | | | |
| *Raspberry PI 2* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Development environment for Raspberry | | | | | | | | x | | x | | x | | x | | H | | Y | | A | | A | |
| *Report 1* | | | | | | | |  | | | | | | | |  | | | | | | | |
| Orienting the way writing report 1 | | | | | | | | x | | x | | x | | x | | VH | | Y | | A | | A | |
| **Date: 16/05/2015** | | | | | | | |  | | | | | | | |  | | | |  | | | |
| *Install* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Development environment for | | | | | | | | x | | x | | x | | x | | H | | Y | | A | | A | |
| *Report 1* | | | | | | | |  | | | | | | | |  | | | | | | | |
| Reviewing report 1 | | | | | | | | x | | x | | x | | x | | H | | Y | | A | | A | |
| **Date: 19/05/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Hand Detection* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Capture images from camera | | | | | | | |  | | x | |  | | x | | H | | Y | | A | | A | |
| Save image to directory | | | | | | | |  | | x | |  | | x | | H | | Y | | A | | A | |
| Showing image to user | | | | | | | |  | | x | |  | | x | |  | |  | |  | |  | |
| Convert BGR background sample image to LAB sample image | | | | | | | | x | |  | |  | |  | |  | |  | |  | |  | |
| Define color range of LAB sample color | | | | | | | | x | |  | |  | |  | |  | |  | |  | |  | |
| Create a binary image with black background | | | | | | | | x | |  | |  | |  | |  | |  | |  | |  | |
| *Portable System* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Learning about the power supply for devices, about the types of batteries | | | | | | | |  | |  | | x | |  | | M | | Y | | A | | A | |
| Try different types of batteries | | | |  | |  | |  | |  | | x | |  | | M | | Y | | A | | A | |
| Learning about the voltage regulator circuit | | | |  | |  | |  | |  | | x | |  | |  | | Y | | A | | A | |
| **Date: 23/05/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Hand Detection* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Remove the color pixels is between color range: | | | | | | | | x | |  | |  | |  | | VH | | Y | | A | | A | |
| Finding the contours on the binary image | | | | | | | |  | | x | |  | |  | | VH | | Y | | A | | A | |
| *Portable System* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Finding suitable type voltage regulator | | | | | | | |  | |  | | x | | x | | H | | Y | | A | | A | |
| *Report 2* | | | | | | | |  | | | | | | | |  | | | | | | | |
| Writing report 2 | | | | | | | | x | | x | | x | | x | | VH | | Y | | A | | A | |
| **Date: 26/05/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Hand Detection* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Remove noises and smooth the contour | | | | | | | | x | |  | |  | |  | | VH | | Y | | A | | A | |
| Find the hand in binary image | | | | | | | | x | |  | |  | |  | | VH | | Y | | A | | A | |
| Finding the contours on the binary image | | | | | | | |  | | x | |  | |  | | VH | | Y | | A | | A | |
| Draws contours outlines | | | | | | | |  | | x | |  | |  | | VH | | Y | | A | | A | |
| *Portable System* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Devices running on the test circuit to test stability | | | |  | |  | |  | |  | | x | | x | | H | | Y | | A | | A | |
| Welding the components together | | | |  | |  | |  | |  | | x | | x | | H | | Y | | A | | A | |
| *Report 3* | | | | | | | |  | | | | | | | |  | | | | | | | |
| Orienting the way writing report 3 | | | | | | | | X | | x | | x | | x | | VH | | Y | | A | | A | |
| **Date: 30/05/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Hand Detection* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Find the hand in binary image | | | | | | | | x | |  | |  | |  | | VH | | Y | | A | | A | |
| Testing function extracting color, subtracting color | | | | | | | | x | |  | |  | |  | | VH | | Y | | A | | A | |
| Testing, change draws contours outlines | | | | | | | |  | | x | |  | |  | | VH | | Y | | A | | A | |
| *Portable System* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Testing system after welding the components together, and change | | | | | | | |  | | x | | x | |  | | H | | Y | | A | | A | |
| *Report 3* | | | | | | | |  | | | | | | | |  | | | | | | | |
| Orienting the way writing report 3 | | | | | | | | x | | x | | x | | x | | VH | | Y | | A | | A | |
| **Date: 02/06/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Hand Detection* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Capture hand sign to create database | | | | | | | | x | | x | | x | | x | | VH | | Y | | A | | A | |
| *Report 3* | | | | | | | |  | | | | | | | |  | | | | | | | |
| Writing report 3 | | | | | | | | x | | x | | x | | x | | VH | | Y | | A | | A | |
| **Date: 06/06/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Hand Detection* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Setup SQLite on laptop, raspberry | | | | | | | |  | | x | |  | |  | | H | | Y | | A | | A | |
| Design database | | | | | | | |  | | x | |  | |  | | H | | Y | | A | | A | |
| Convert the BGR image containing the hand to binary image containing features | | | | | | | | x | |  | |  | |  | | VH | | Y | | A | | A | |
| *Portable System* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Designing QT Linux GUI which of the recognition flow | | | | | | | |  | |  | | x | | x | | M | | Y | | A | | A | |
| Testing design when display in LCD | | | | | | | |  | |  | | x | | x | |  | |  | |  | |  | |
| *Report 3* | | | | | | | |  | | | | | | | |  | | | | | | | |
| Reviewing report 3 | | | | | | | | x | | x | | x | | x | | VH | | Y | | A | | A | |
| **Date: 09/06/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Hand Detection* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Produce the binary image containing the hand palm from the binary image containing contour | | | | | | | | x | |  | |  | |  | | VH | | Y | | A | | A | |
| Defining features to recognize | | | | | | | | x | |  | |  | | x | | M | | Y | | A | | A | |
| *Result via sound* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Learn some text to speech opensource | | | | | |  | |  | |  | | x | |  | | H | | Y | | A | | A | |
| Testing and compare some text to speech opensource | | | | | |  | |  | |  | | x | |  | | H | | Y | | A | | A | |
| *Report 4* | | | | | | | |  | | | | | | | |  | | | | | | | |
| Orienting the way writing report 4 | | | | | | | | x | | x | | x | | x | | VH | | Y | | A | | A | |
| **Date: 13/06/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Hand Detection* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Training SVM | | | | | | | | x | |  | |  | |  | | VH | | Y | | A | | A | |
| Recognizing the hand sign by SVM | | | | | | | | x | |  | |  | |  | | VH | | Y | | A | | A | |
| *Result via sound* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Setup espeak software for laptop,  raspberry | | | | | | | |  | |  | | x | | x | | H | | Y | | A | | A | |
| Changing pronunciation | | | | | |  | |  | | x | | x | |  | | M | | Y | | A | | A | |
| Showing the recognition result of each alphabet | | | | | |  | |  | |  | |  | | x | | M | | Y | | A | | A | |
| *Report 4* | | | | | | | |  | | | | | | | |  | | | | | | | |
| Orienting the way writing report 4 | | | | | | | | x | | x | | x | | x | | VH | | Y | | A | | A | |
| **Date: 16/06/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Hand Detection* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Recognizing the hand sign by SVM | | | | | | | | x | |  | |  | |  | | VH | | Y | | A | | A | |
| Testing, improve function recognize | | | | | | | | x | |  | |  | |  | | H | | Y | | A | | A | |
| *Show result* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Join recognition result become syllable and a complete word | | | | | | | |  | | x | | x | |  | | H | | Y | | A | | A | |
| Testing, changing pronunciation of syllable | | | | | |  | |  | |  | |  | | x | | M | | Y | | A | | A | |
| *Report 4* | | | | | | | |  | | | | | | | |  | | | | | | | |
| Orienting the way writing report 4 | | | | | | | | x | | x | | x | | x | | VH | | Y | | A | | A | |
| **Date: 20/06/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Hand Detection* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Defining operations of function | | | | | | | | x | | x | |  | |  | | H | | Y | | A | | A | |
| *Monitor the battery capacity* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Learning about the types of chip voltage comparator | | | | | | | |  | |  | | x | | x | | H | | Y | | A | | A | |
| *Report 4* | | | | | | | |  | | | | | | | |  | | | | | | | |
| Writing report 4 | | | | | | | | x | | x | | x | | x | | VH | | Y | | A | | A | |
| **Date: 30/06/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Controlling function* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Defining operations of function | | | | | | | | x | | x | |  | |  | | VH | | Y | | A | | A | |
| Defining hand sign to control the system | | | | | | | | x | | x | |  | |  | |  | |  | |  | |  | |
| *Monitor the battery capacity* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Choosing chip voltage comparator | | | | | | | |  | |  | | x | | x | | H | | Y | | A | | A | |
| *Report 5* | | | | | | | |  | | | | | | | |  | | | | | | | |
| Orienting the way writing report 5 | | | | | | | | x | | x | | x | | x | | VH | | Y | | A | | A | |
| **Date: 04/07/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Controlling function* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Recognizing the control hand sign | | | | | | | | x | | x | |  | |  | | VH | | Y | | A | | A | |
| Implementing operations of function | | | | | | | | x | | x | |  | |  | | VH | | Y | | A | | A | |
| *Monitor the battery capacity* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Learning about the types of zener and choose zener | | | | | | | |  | |  | | x | | x | | H | | Y | | A | | A | |
| **Date: 07/07/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Controlling function* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Implementing operations of function | | | | | | | | x | | x | |  | |  | | H | | Y | | A | | A | |
| *Monitor the battery capacity* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Circuit design | | | | | | | |  | |  | | x | | x | | VH | | Y | | A | | A | |
| Circuit tested by software proteus | | | | | | | |  | |  | | x | | x | | M | | Y | | A | | A | |
| **Date: 11/07/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Controlling function* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Implementing operations of function | | | | | | | | x | |  | |  | |  | | VH | | Y | | A | | A | |
| Synchronize between hand gestures and operations of function | | | | | | | | x | | x | |  | |  | | H | | Y | | A | | A | |
| Designing QT Linux GUI which of the flow of operations | | | | | | | |  | | x | |  | |  | | H | | Y | | A | | A | |
| *Monitor the battery capacity* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Constructing circuit | | | | | | | |  | |  | | x | | x | | VH | | Y | | A | | A | |
| Adjusting the device components | | | | | | | |  | |  | | x | | x | | M | | Y | | A | | A | |
| **Date: 14/07/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Controlling function* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Synchronizing between hand gestures and operations of function | | | | | | | | x | | x | |  | |  | | VH | | Y | | A | | A | |
| Testing control the system function by hand gesture | | | | | | | | x | |  | |  | |  | | M | | Y | | A | | A | |
| Testing GUI on LCD , change GU | | | | | | | |  | | x | |  | |  | | M | | Y | | A | | A | |
| *Monitor the battery capacity* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Connecting to the system | | | | | | | |  | |  | | x | | x | | H | | Y | | A | | A | |
| Run system to check stability with this circuit. | | | | | | | |  | |  | |  | |  | |  | |  | |  | |  | |
| **Date: 18/07/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Hand Detection* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Defining more features to recognize | | | | | | | | x | | x | |  | |  | | M | | Y | | A | | A | |
| *Stable Environment* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Providing two LEDs to balance light | | | | | | | |  | |  | | x | | x | | VH | | Y | | A | | A | |
| **Date: 21/07/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Improve Hand Detection* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Defining more features to recognize | | | | | | | | x | | x | |  | |  | | VH | | Y | | A | | A | |
| Extracting features | | | | | | | | x | | x | |  | |  | | VH | | Y | | A | | A | |
| Improving camera setting | | | | | | | |  | |  | | x | | x | | M | | Y | | A | | A | |
| *Stable Environment* | | | | | | | |  | | | | | | | |  | | | | | | | |
| Providing two LEDs to balance light | | | | | | | |  | |  | |  | |  | | H | | Y | | A | | A | |
| Providing background | | | | | | | | x | | x | | x | | x | | H | | Y | | A | | A | |
| **Date: 25/07/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Hand Detection* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Training SVM | | | | | | | | x | | x | |  | |  | | VH | | Y | | A | | A | |
| Improving background - hand color subtraction | | | | | | | | x | | x | |  | |  | | H | | Y | | A | | A | |
| Improving camera setting | | | |  | |  | |  | |  | | x | | x | | M | | Y | | A | | A | |
| *Stable Environment* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Demo balancing light | | | | | | | |  | |  | | x | | x | | M | | Y | | A | | A | |
| *Report 5* | | | | | | | |  | | | | | | | |  | | | | | | | |
| Orienting the way writing report 5 | | | | | | | | x | | x | | x | | x | | H | | Y | | A | | A | |
| **Date: 28/07/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Hand Detection* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Demo extracting features | | | | | | | | x | | x | |  | |  | | H | | Y | | A | | A | |
| Demo improving camera setting | | | | | | | |  | |  | | x | | x | | M | | Y | | A | | A | |
| Capturing new database | | | | | | | | x | | x | | x | | x | | H | | Y | | A | | A | |
| *ON/OFF the system* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Learning about the types of switch button | |  | |  | |  | |  | |  | | x | | x | | M | | Y | | A | | A | |
| Safely way to turn on/off Raspberry | |  | |  | |  | |  | |  | | x | | x | | M | | Y | | A | | A | |
| Choosing switch button | |  | |  | |  | |  | |  | | x | | x | | M | | Y | | A | | A | |
| *Report 5* | | | | | | | |  | | | | | | | |  | | | | | | | |
| Orienting the way writing report 5 | | | | | | | | x | | x | | x | | x | | VH | | Y | | A | | A | |
| **Date: 01/08/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Learning Function* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Defining operations of function | |  | |  | |  | | x | | x | |  | |  | | H | | Y | | A | | A | |
| Creating database | |  | |  | |  | | x | | x | |  | |  | | H | | Y | | A | | A | |
| Designing GUI | | | | | | | |  | | x | |  | | x | | M | | Y | | A | | A | |
| *ON/OFF the system* | | | | | | | |  | | | | | | | |  | | | | | | | |
| Testing system with switch button | | | | | | | |  | |  | | x | | x | | M | | Y | | A | | A | |
| Constructing circuit with switch button | | | | | | | |  | |  | | x | | x | | H | | Y | | A | | A | |
| Run system to check stability with switch button | | | | | | | |  | |  | | x | | x | | M | | Y | | A | | A | |
| **Date: 04/08/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Learning Function* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Managing database | |  | |  | |  | |  | | x | |  | |  | | M | | Y | | A | | A | |
| Designing GUI | | | | | | | |  | | x | |  | | x | | H | | Y | | A | | A | |
| Implementing the practice function of learning | | | | | | | | x | |  | |  | |  | | VH | | Y | | A | | A | |
| *ON/OFF the system* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Adjusting the device components | | |  | |  | |  | |  | |  | | x | | X | | H | | Y | | A | | A | |
| *Report 5* | | | | | | | |  | | | | | | | |  | | | | | | | |
| Writing report 5 | | | | | | | | x | | x | | x | | x | | VH | | Y | | A | | A | |
| **Date: 08/08/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Boxed* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Measuring, designing the box for system | | | | | | | | x | |  | |  | | x | | VH | | Y | | A | | A | |
| Compare, choose materials for box |  |  | |  | |  | |  | | x | | x | |  | | H | | Y | | A | | A | |
| Constructing box for system |  |  | |  | |  | | x | | x | | x | | x | | H | | Y | | A | | A | |
| **Date: 11/08/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Boxed* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Constructing box for system | | | | | | | | x | | x | | x | | x | | H | | Y | | A | | A | |
| Assembling of component |  |  | |  | |  | |  | | x | |  | | x | | M | | Y | | A | | A | |
| **Date: 15/08/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Report 6* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Writing install guide | | | | | | | | x | | x | | x | | x | | H | | Y | | A | | A | |
| Writing recognize hand sign manual | | | | | | | | x | | x | | x | | x | | H | | Y | | A | | A | |
| Writing some solutions when system has problems | | | |  | |  | | x | | x | | x | | x | | H | | Y | | A | | A | |
| **Date: 18/08/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Improve Reliably* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Perform system testing | | | | | | | | x | | x | |  | |  | | H | | Y | | A | | A | |
| Fix some recognition bug | | | | | | | |  | |  | | x | | x | | M | | Y | | A | | A | |
| Fix pronunciation of some word | | | | | | | | x | | x | | x | | x | | H | | Y | | A | | A | |
| **Date: 21/08/2015** | | | | | | | |  | | | | | | | |  | | | | | | | |
| *Improve Reliably* | | | | | | | |  | | | | | | | |  | | | |  | |  | |
| Perform system testing | |  | |  | |  | | x | | x | |  | |  | | H | | Y | | A | | A | |
| Fix some recognition bug | |  | |  | |  | | x | | x | |  | |  | | H | | Y | | A | | A | |
| Fix pronunciation of some word | | | | | | | |  | | x | |  | | x | | M | | Y | | A | | A | |

Table 2: All Meeting Minus