**MINISTRY OF EDUCATION AND TRAINING**

**FPT UNIVERSITY**

Capstone Project Document

**Vietnamese Sign Language Recognition**

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-Ho Chi Minh City, 31/05/2015-

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# Definitions, Acronyms, and Abbreviations

|  |  |
| --- | --- |
| **Name** | **Definition** |
| VSLR | Vietnamese Sign Language Recognition |
|  |  |
|  |  |
|  |  |

# Report No. 3 Software Requirement Specification

## User Requirement Specification

*The system is not only reserved for mute person but also everyone who wants to learn sign language. Therefore, we have determined the requirement from these users:*

* Recognizing his or her hand signs to text and sound: users want devices that can recognize exactly their hand signs. Then, the device must show recognition results via text on screen and emit pronunciation of this word via speaker.
* Learning the way expressing hand signs: there still is a lots of hand signs that users do not know exactly, they want a device that can help them practice these signs. The system should have images which can describe clearly the way expressing hand sign for user can follow. In addition, the system should have practice function for user practise.
* Controling the system by hand gesture: users want to perform the operations of the system through his or her hand gesture without electricity devices.
* The system is portable: Users can easily move the system. They expect the system can work at many places, and it still works during a power outage.
* System's power must be controlled: Users can know the remaining battery capacity to monitor the use of equipment. Moreover, they can charge the battery when the battery is low.
* System should be easy to control the hardware: Users can turn on/off the system safely without prejudice to the durability of the equipment.

## System Requirement Specification

### External Interface Requirement

External interface is concerned with designing interactive products to support the way people communicate and interact in their everyday and working lives. The products must be usability means easy to learn, effective to use and provide an enjoyable experience.

#### User Interface

General requirement for graphics user interface is the GUI should be simple, clear, intuitive, and reminiscent. The interface design is an iterate process includes design, sketching, prototyping, user assessment.

#### Hardware Interface

* Raspberry Pi B2 with SDRAM 1GB, Quad-core, 900 MHz ARM Cortex-A7 chip
* Camera module of Raspberry Kit.

#### Software Interface

* QT 4 Development Tools Version v4.8.2

### System Overview Use Case

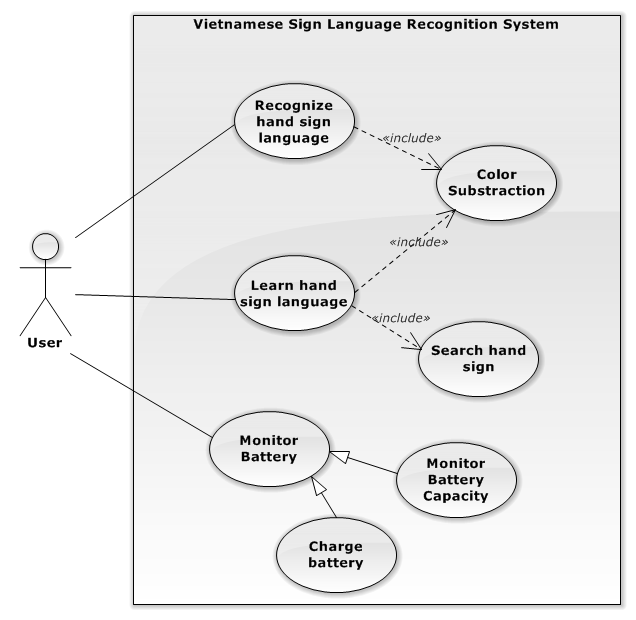


Figure 1: System Overview Use Case



### List of Use Case

#### Translate Sign Use Case

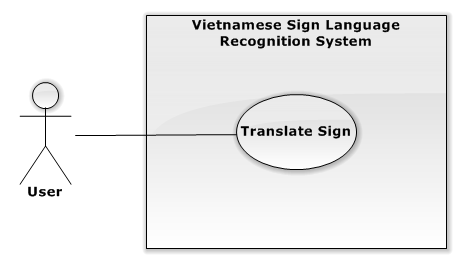
****

Figure 2: Translate sign use case diagram

**Use Case Specification**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **USE CASE -1 SPECIFICATION** | | | | | |
| **Use-case No.** | VSLR001 | **Use-case Version** | | | 1.0 |
| **Use-case Name** | Translate Sign | | | | |
| **Author** | Nguyễn Hữu Kỳ Long | | | | |
| **Date** | 31/05/2015 | | **Priority** | High | |
| **Actor**   * User   **Summary**   * The use case describes the way translating hand sign language.   **Goal**   * Recognize hand signs and translate them to content with the kind of sound and text.   **Triggers**   * User uses his or her specific “select” hand signs on the “Translate” button to select “Translate Sign” function.   **Preconditions**   * The background color and hand color must be analyzed.   **Post Conditions**   * **On Success**: The content of hand signs shows on the screen and speaker.   **Main Success Scenario**   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | User shows hand signs on the camera | - The system shows the mean of the current sign.  - The system will capture his or her sign every second. After that, it will show the current content. | | 2 | User shows “end” hand sign. | - The system will end capturing when getting the “end” sign. At the same time, the system will show the whole content which was translated.  [Alternative No.1] | | 3 | User selects “Continue” case by making specific “select” sign on the “Continue” button. | - The system moves back to step 1.  [Alternative No.2] |   **Alternative Scenario**   |  |  |  | | --- | --- | --- | | No | Actor Action | System Response | | 1 | User shows the specific “delay” hand sign on the camera. | - The system will delay at the same time. | | 2 | User selects “End” case by making specific “select” sign on the “End” button. | - The system navigates to main screen. |   **Exceptions**   |  |  |  | | --- | --- | --- | | No | Actor Action | System Response | |  |  |  |   **Relationships**   * N/A   **Business Rules**   * N/A | | | | | |

#### Learn Hand Sign

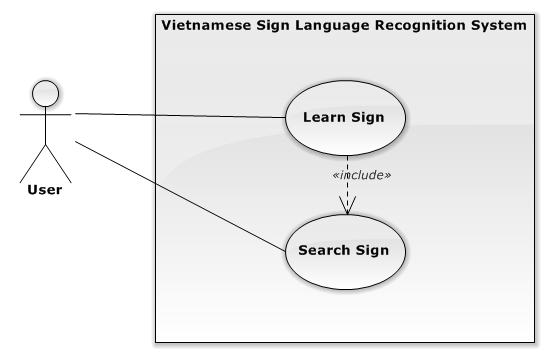


Figure 3: Learn sign use case diagram

**Use Case Specification**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **USE CASE -2 SPECIFICATION** | | | | | |
| **Use-case No.** | VSLR002 | **Use-case Version** | | | 1.0 |
| **Use-case Name** | Learn Hand Sign | | | | |
| **Author** | Nguyễn Hữu Kỳ Long | | | | |
| **Date** | 31/05/2015 | | **Priority** | Medium | |
| **Actor**   * User   **Summary**   * The use case describes the way to take a particular hand sign.   **Goal**   * It is to help user training his or her hand gesture more accurately.   **Triggers**   * User uses his or her specific “select” hand signs on the “Learn” button at the “Search Sign” screen to select “Learn Sign” function.   **Preconditions**   * The background color and hand color must be analyzed. * The word which user wants to learn musts be selected.   **Post Conditions**   * **On Success**: The system shows the mean of the hand sign which is capturing.   **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 |  | - The system shows the image explaining the way to take hand gesture. | | 2 | User puts his or her hands in the model which is drawn on the image. | - The system will capture from camera and show the meaning of the current hand gesture. | | 3 | User takes the “select” sign on the button “Finish” | - The system navigates to main screen.  [Alternative No.1] |   **Alternative Scenario**   |  |  |  | | --- | --- | --- | | No | Actor Action | System Response | | 1 | User takes the “select” sign on the button “Learn” | - The system navigates to the screen for searching others. |   **Exceptions:**   |  |  |  | | --- | --- | --- | | No | Actor Action | System Response | |  |  |  |   **Relationships**   * N/A   **Business Rules**   * N/A | | | | | |

#### Charge Battery

**Use Case Specification**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **USE CASE -3 SPECIFICATION** | | | | | |
| **Use-case No.** | VSLR003 | **Use-case Version** | | | 1.0 |
| **Use-case Name** | Charge Battery | | | | |
| **Author** | Lê Phương Bình | | | | |
| **Date** | 31/05/2015 | | **Priority** | High | |
| **Actor**   * User   **Summary**   * The use case describes users how to know to charge battery.   **Goal**   * It is to help the system has enough power to operate.   **Triggers**   * User is connected battery charger with AC power source 220v.   **Preconditions**   * Has 220v electric source.   **Post Conditions**   * **On Success**: The charge battery will be shown led on the charge battery.   **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 |  | - The system shows message “Low battery. Please connect the power charger”. | | 2 | - Users are connected the system with battery charger. | - The charge battery will be shown led on the charge battery. |   **Alternative Scenario**   |  |  |  | | --- | --- | --- | | No | Actor Action | System Response | |  |  |  |   **Exceptions:**   |  |  |  | | --- | --- | --- | | No | Actor Action | System Response | |  |  |  |   **Relationships**   * N/A   **Business Rules**   * N/A | | | | | |

#### Monitor Battery Capacity

**Use Case Specification**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **USE CASE - 5 SPECIFICATION** | | | | | |
| **Use-case No.** | VSLR004 | **Use-case Version** | | | 1.0 |
| **Use-case Name** | Monitor Battery Capacity | | | | |
| **Author** | Lê Phương Bình | | | | |
| **Date** | 31/05/2015 | | **Priority** | Medium | |
| **Actor**   * User   **Summary**   * The use case describes users how to know the remaining battery capacity to supply the system.   **Goal**   * It is to help user uses reasonable system.   **Triggers**   * User uses his or her is look at the status bar.   **Preconditions**   * The battery capacity display circuit is activated. * The battery capacity display circuit is connected with GPIO pin of Raspberry Pi.   **Post Conditions**   * **On Success**: Battery capacity display is shown in the status bar.   **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 |  | - Battery capacity display is shown in the status bar.  [Alternative No.1] |   **Alternative Scenario**   |  |  |  | | --- | --- | --- | | No | Actor Action | System Response | | 1 |  | Battery capacity display is shown by led:   * 4 Led: Full * 3 Led: 75% * 2 Led: 50% * 1 Led: 25% * No Led: empty |   **Exceptions:**   |  |  |  | | --- | --- | --- | | No | Actor Action | System Response | |  |  |  |   **Relationships**   * N/A   **Business Rules**   * N/A | | | | | |

## Software System Attribute

### Usability

The system should be designed for everyone can use easily in controlling and GUI operations.

#### Graphic User Interface

* The system musts show all instructions and operations in Vietnamese.

#### Usability

* User just needs to read the user manual which is enclosed with the system for using in the first time. The attached manual guide must be clear. User can read and do by themselves.

#### Hardware controlling

* User can control the device very easily as well as using any electronic device in the daily live.

### Reliability

* The database should be constructed on Vietnamese sign language.
* The result must be satisfiable to the user requirement with higher than 80% in accuration.

### Availability

The system runs continuously about 7 hours with 1500mAh battery and 3.5V to 5V battery. That means it is safe to user.

### Security

N/A

### Maintainability

* When any electronic equipment, which is attached with the system, is out of ordered, it is so easy to change or to fix at any electronic store.
* The system can be extended in the future.

### Portability

* The system supplies the power source in which user can use for 7 hours without charging. In addition, the system also provides a USB charger and an electronic charger.
* The device should be designed as quite small and convenient.

### Performance

* System can recognize hand sign in the range from 5 to 10 seconds.