# 3. SYSTEM REQUIREMENTS SPECIFICATIONS (SRS)

## 3.1 User Requirement Specification

The system consists of an armband and a window application.

When user wears the armband, it must record hand gestures of user in the form of EMG data. Then the EMG data must be sent to window application via Bluetooth connection. The armband has five main functions:

* Get analog signal from hand gestures
* Process analog signal: this function requires following steps:
* Pre-amplify: Because of the amplitude of signal is too minimal for rectify and amplify, so this step will make signal amplitude increased.
* Rectify: In order to keep the value of signal to be positive for microcontroller, this step will simply convert all negative value to positive value.
* Amplify: This step will again widen the amplitude of signal.
* Filter: This step is to eliminate the noises of the signal.
* Convert analog signal to digital signal: Convert analog signal to 12-bit digital signal.
* Package digital signal (called EMG data): Data will be packaged in form of services that available in Low Energy Bluetooth.
* Send EMG data from the armband to window application through Low Energy Bluetooth protocol.

The purpose of the window application is to make communication between armband and PC. When user starts the application, user can:

* **Connect with armband:** User plugins Bluetooth Adapter, and launches the application. The application must recognize the armband.
* **Perform Sync Gesture:** User performs a hand gesture that is shown on the screen, then the application must sync armband with PC. This function makes the armband ready to use with window application.
* **Test armband with hand gestures**: User performs each hand gesture shown on the screen in turn. This function makes sure that the armband work correctly.
* **Manage the armband:**

***Turn on/off presentation control*:** User can turn on or turn off Microsoft PowerPoint presentation control.

***Disconnect armband*:** User can disconnect with armband. This function helps user to refresh and reconnect armband in case of the armband doesn’t work correctly.

***View armband battery level*:** User can view the battery level of the armband.

* **Control Microsoft PowerPoint presentation with hand gestures:** User can perform some simple hand gestures to control PowerPoint presentation:

**Spread fingers:** Zoom Out of the Slide

**Make a fist:** Zoom In to the Slide

**Wave Right:** Move to next Slide

**Wave Left:** Move to previous Slide

**Double tab:** Exit Slide Show

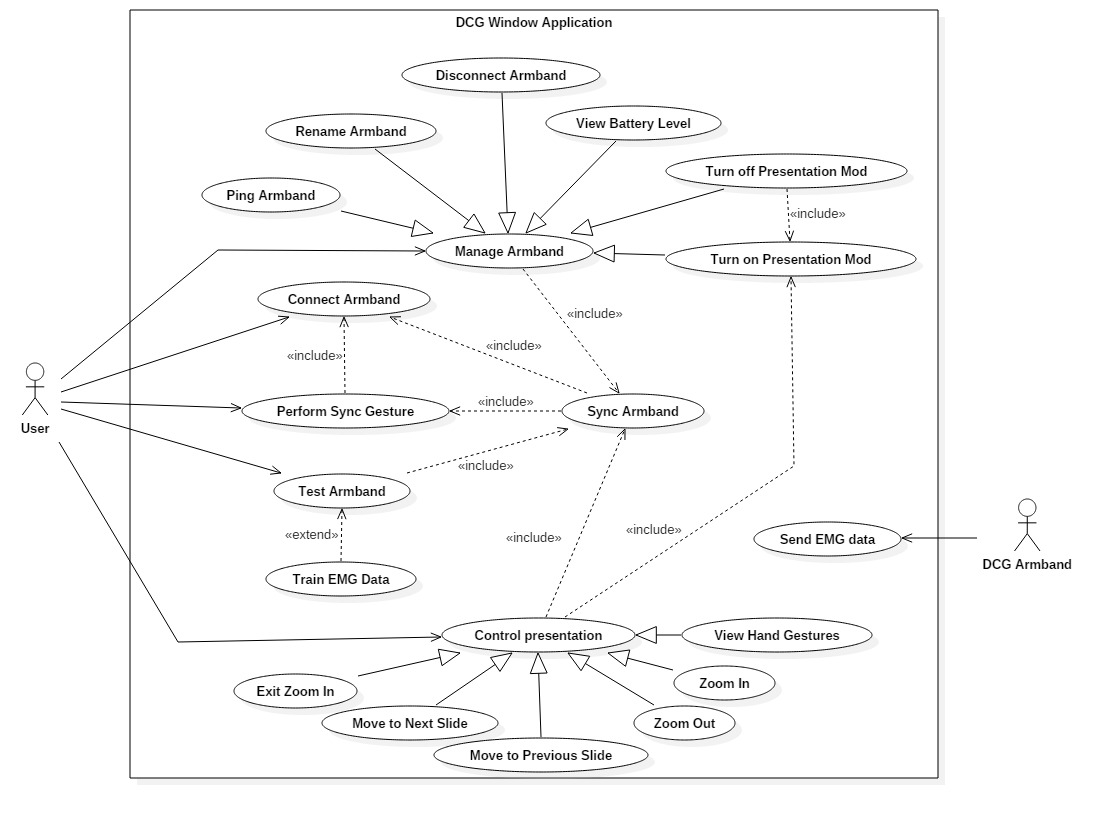
Window Application must do background tasks:

* Automatically connect armband with PC when user press connect button.
* Sync armband to PC when user perform Sync Gesture.
* Train EMG data of sent from armband, when user tests their hand gestures.
* Get and analyze EMG data from armband, then map those data with correct expected function.

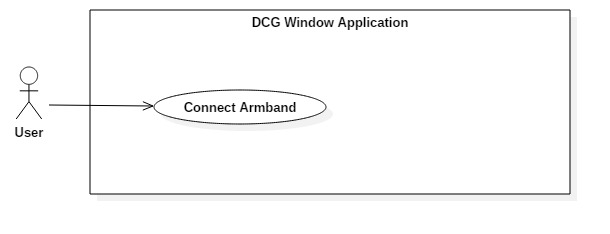
## 3.2 System Requirement Specification

### 3.2.1 Functional Requirement

#### 3.2.1.1 Software Requirement

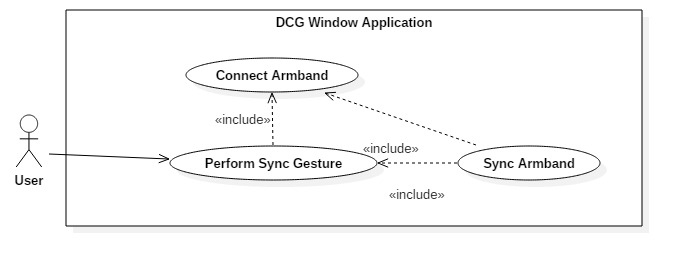


##### **Connect Armband**



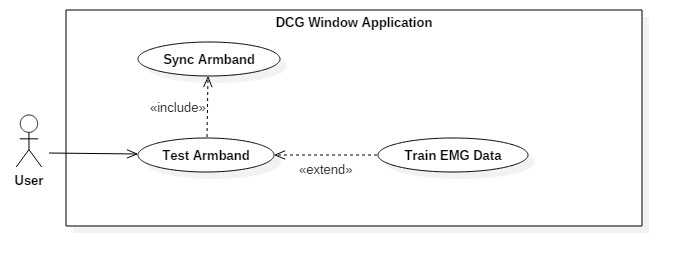
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| USE CASE - UC001 – Connect Armband | | | | |
| Use-case No. | UC001 | **Use-case Version** | | 1.0 |
| Use-case Name | Connect Armband | | | |
| Author | Đinh Bảo Trân | | | |
| Date | 2016/05/30 | **Priority** | Normal | |
| Actor:  User  Summary:   * + This use case allow user to connect armband with window application.   Goal:   * + The window application successfully connect armband via Bluetooth.   Triggers:   * + User launches the application.   Preconditions:   * + Armband is ON   + Armband is not connected to window application.   Post Conditions:   * + Armband is connected to window application   + Windows application changes connection status from *Disconnected* to *Connected* in Manager Screen   + Windows application changes “Connect” button in TATUS Tab of Manager Screen to “Disconnect”   Main Success Scenario:   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Launch the application | Application appears. The Welcome Screen is shown. | | 2 | Click on “**Continue**” button | Plugin Screen is shown. | | 3 | Plugin Bluetooth Adapter  Plugin USB Cable | 1. The first Green Checked Icon appears  2. The second Green Checked Icon appears  3. “Continue” button changes from Disable to Enable. |   Alternative Scenario:   |  |  |  | | --- | --- | --- | | No | Actor Action | System Response | | 1a | Move to **Status Tab** in **Manager Screen**  Click on “**Connect**” button | Application appears. The **Welcome Screen** is shown. |   Exceptions:  N/A  Relationship:  Sync Armband | | | | |

##### **Perform Sync Gesture**



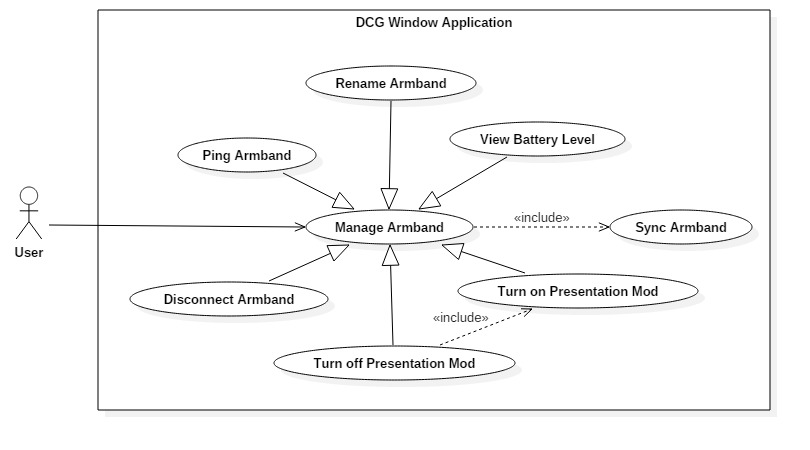
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| USE CASE - UC002 – Perform Sync Gesture | | | | |
| Use-case No. | UC002 | **Use-case Version** | | 1.0 |
| Use-case Name | Perform Sync Gesture | | | |
| Author | Đinh Bảo Trân | | | |
| Date | 2016/05/30 | **Priority** | Normal | |
| Actor:  User  Summary:   * + This use case allow user to sync armband with window application, which means application start to get data from armband.   + After sync function is finished, application can now start to communicate with armband.   Goal:   * + The window application successfully sync with armband.   Triggers:   * + User clicks “Continue” button in Plugin Screen.   Preconditions:   * + User has moved to Plugin Screen.   + Armband is ON   + Armband is connected to window application.   Post Conditions:   * + Armband is synced to window application   Main Success Scenario:   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Click “**Continue**” button in **Plugin Screen** | The Syncing Screen is shown. | | 2 | Perform Sync Gesture | 1. Sync Icon appears while syncing  2. Green Checked Icon appears when sync successfully  3. “Continue” button in changes from Disable to Enable |   Alternative Scenario:  N/A  Exceptions:  N/A  Relationship:  Test Armband, Manage Armband, Control Presentation | | | | |

##### **Test Armband**



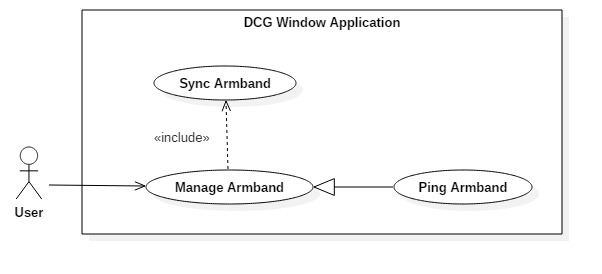
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| USE CASE - UC003 – Test Armband | | | | |
| Use-case No. | UC003 | **Use-case Version** | | 1.0 |
| Use-case Name | Test Armband | | | |
| Author | Đinh Bảo Trân | | | |
| Date | 2016/05/30 | **Priority** | Normal | |
| Actor:  User  Summary:   * + This use case allow user to test armband with 5 hand gestures.   Goal:   * + The window application successfully sync armband with application.   Triggers:   * + User clicks “Continue” button in Syncing Screen.   Preconditions:   * + User has moved to Syncing Screen.   + Armband is ON   + Armband is synced to window application.   Post Conditions:   * + Armband is ready for use.   + “Continue” button in Test Screen changes from Disable to Enable   Main Success Scenario:   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Click “**Continue**” button in **Syncing Screen** | The Test Screen is shown. | | 2 | Perform 5 hand gestures one by one | The symbol of corresponding gesture changes color from Grey to Blue. |   Alternative Scenario:  N/A  Exceptions:  N/A  Relationship:  Sync Armband | | | | |

##### **Manage Armband**



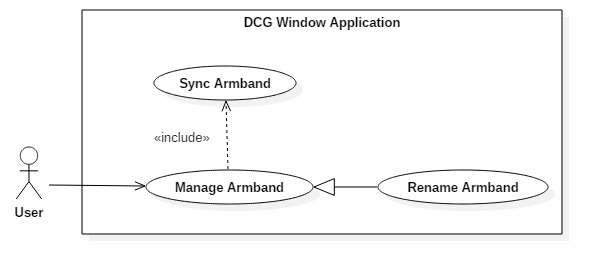
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| USE CASE - UC004 – Test Armband | | | | |
| Use-case No. | UC004 | **Use-case Version** | | 1.0 |
| Use-case Name | Manage Armband | | | |
| Author | Đinh Bảo Trân | | | |
| Date | 2016/05/30 | **Priority** | Normal | |
| Actor:  User  Summary:   * + This use case allow user to start manage armband.   Goal:   * + The window application successfully shows Manager Screen.   Triggers:   * + User clicks “Continue” button in Test Screen.   Preconditions:   * + User has moved to Test Screen.   + Armband is ON   + Armband is synced to window application.   Post Conditions:  N/A  Main Success Scenario:   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Click **“Continue”** buttonin **Test Screen** | The Ready Screen is shown. | | 2 | Click “Start” button in Ready Screen | The Manager Screen is shown |   Alternative Scenario:  N/A  Exceptions:  N/A  Relationship:  Sync Armband | | | | |

###### Ping Armband



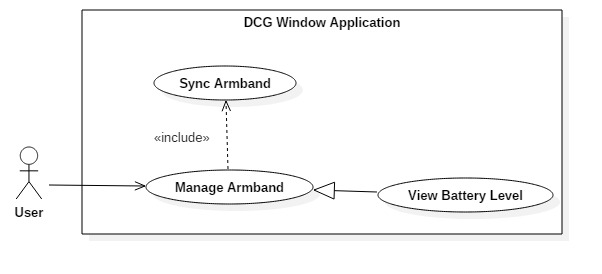
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| USE CASE - UC004.1 – Ping Armband | | | | |
| Use-case No. | UC004.1 | **Use-case Version** | | 1.0 |
| Use-case Name | Test Armband | | | |
| Author | Đinh Bảo Trân | | | |
| Date | 2016/05/30 | **Priority** | Normal | |
| Actor:  User  Summary:   * + This use case allow user to make armband vibrate.   Goal:   * + The window application successfully send signal to vibrate armband.   Triggers:   * + User clicks on “STATUS” tab.   Preconditions:   * + User has moved to Manager Screen.   + Armband is ON   + Armband is synced to window application.   Post Conditions:  N/A  Main Success Scenario:   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Click on “**STATUS**” tab | The STATUS Tab is shown. | | 2 | Click “Ping” button |  |   Alternative Scenario:  N/A  Exceptions:  N/A  Relationship:  Sync Armband | | | | |

###### Rename Armband



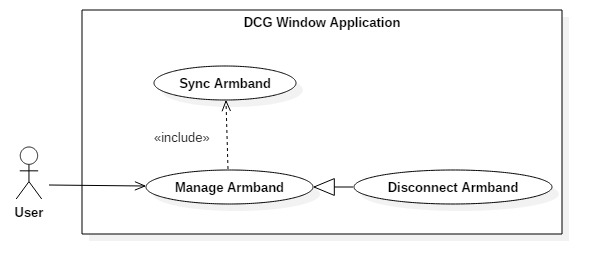
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| USE CASE - UC004.2 – Rename Armband | | | | |
| Use-case No. | UC004.2 | **Use-case Version** | | 1.0 |
| Use-case Name | Rename Armband | | | |
| Author | Đinh Bảo Trân | | | |
| Date | 2016/05/30 | **Priority** | Normal | |
| Actor:  User  Summary:   * + This use case allow user to rename armband on application.   Goal:   * + The window application successfully rename armband.   Triggers:   * + User clicks on “DETAIL” tab.   Preconditions:   * + User has moved to Manager Screen.   + Armband is ON   + Armband is synced to window application.   Post Conditions:  N/A  Main Success Scenario:   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Click on “**DETAIL**” tab | The DETAIL Tab is shown. | | 2 | Enter new name in text field  Click “Rename” button | Change the name of armband. |   Alternative Scenario:  N/A  Exceptions:  N/A  Relationship:  Sync Armband | | | | |

###### View Battery Level



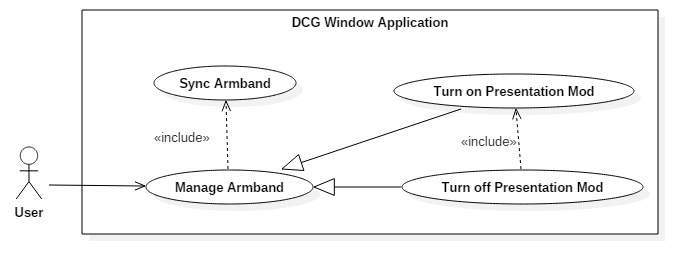
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| USE CASE - UC004.3 – View Battery Level | | | | |
| Use-case No. | UC004.3 | **Use-case Version** | | 1.0 |
| Use-case Name | View Battery Level | | | |
| Author | Đinh Bảo Trân | | | |
| Date | 2016/05/30 | **Priority** | Normal | |
| Actor:  User  Summary:   * + This use case allow user to view armband battery level.   Goal:   * + The window application successfully gets battery level from armband.   Triggers:  Preconditions:   * + User has moved to Manager Screen.   + Armband is ON   + Armband is synced to window application.   Post Conditions:  N/A  Main Success Scenario:   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Look at the top-left side of the Manager Screen | Battery Icon changes its level according to battery level of armband. |   Alternative Scenario:  N/A  Exceptions:  N/A  Relationship:  Sync Armband | | | | |

###### Disconnect Armband



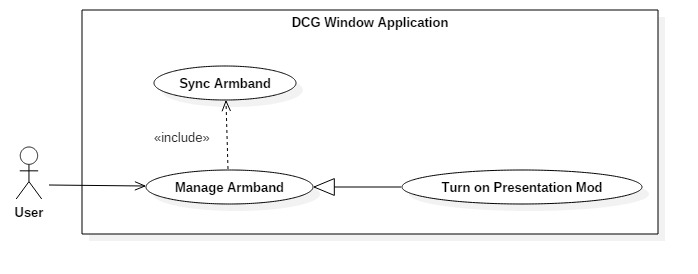
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| USE CASE - UC004.4 – Disconnect Armband | | | | |
| Use-case No. | UC004.4 | **Use-case Version** | | 1.0 |
| Use-case Name | Disconnect Armband | | | |
| Author | Đinh Bảo Trân | | | |
| Date | 2016/05/30 | **Priority** | Normal | |
| Actor:  User  Summary:   * + This use case allow user to disconnect with armband.   Goal:   * + The window application successfully disconnect with armband.   Triggers:   * + User clicks “STATUS” tab.   Preconditions:   * + User has moved to Manager Screen.   + Armband is ON   + Armband is synced to window application.   Post Conditions:   * + If user is controlling presentation, application will execute function “Turn off Presentation Mod” automatically.   Main Success Scenario:   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Click “**STATUS**” tab | The STATUS Tab is shown | | 2 | Click on “Disconnect” button | 1. Change Connection Status from *Connected* to *Disconnected*  2. Change Checked Icon color from Green to Grey |   Alternative Scenario:  N/A  Exceptions:  N/A  Relationship:  Sync Armband | | | | |

###### Turn off Presentation Mod



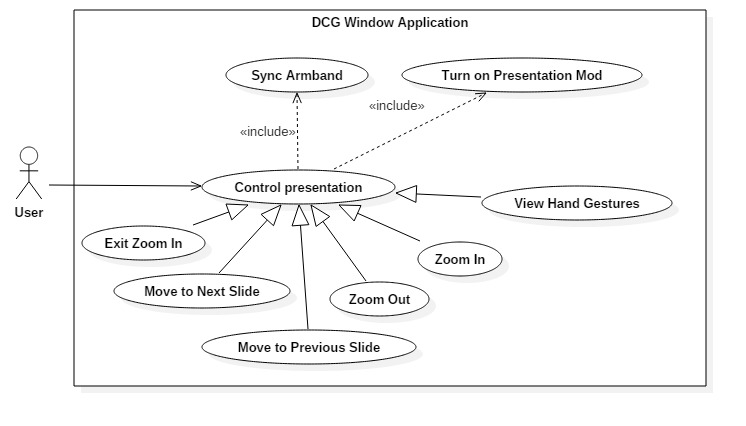
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| USE CASE - UC004.5 – Turn off Presentation Mod | | | | |
| Use-case No. | UC004.5 | **Use-case Version** | | 1.0 |
| Use-case Name | Turn off Presentation Mod | | | |
| Author | Đinh Bảo Trân | | | |
| Date | 2016/05/30 | **Priority** | Normal | |
| Actor:  User  Summary:   * + This use case allow user to turn off presentation mod.   Goal:   * + The window application successfully turns off presentation control.   Triggers:   * + Click “DETAIL” tab.   Preconditions:   * + User has moved to Manager Screen.   + Armband is ON   + Armband is synced to window application.   + Presentation Mod is ON   Post Conditions:  N/A  Main Success Scenario:   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Click “**DETAIL**” tab | The DETAIL Tab is shown | | 2 | Click on “Deactivate” button | 1. The Presentation Screen disappears  2. Change “Deactivate” button to “Activate” |   Alternative Scenario:  N/A  Exceptions:  N/A  Relationship:  Sync Armband, Turn on Presentation Mod | | | | |

###### Turn on Presentation Mod



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| USE CASE - UC004.6 – Turn on Presentation Mod | | | | |
| Use-case No. | UC004.6 | **Use-case Version** | | 1.0 |
| Use-case Name | Turn on Presentation Mod | | | |
| Author | Đinh Bảo Trân | | | |
| Date | 2016/05/30 | **Priority** | Normal | |
| Actor:  User  Summary:   * + This use case allow user to turn on presentation control mod.   Goal:   * + The window application successfully turns on presentation control.   Triggers:   * + User clicks “DETAIL” tab.   Preconditions:   * + User has moved to Manager Screen.   + Armband is ON   + Armband is synced to window application.   + Microsoft PowerPoint is opened.   Post Conditions:  N/A  Main Success Scenario:   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Click “**DETAIL**” tab | The DETAIL Tab is shown | | 2 | Click on “Activate” button | 1. The Presentation Screen is shown  2. Change “Activate” button to “Deactivate” |   Alternative Scenario:  N/A  Exceptions:   |  |  |  | | --- | --- | --- | | No | Actor Action | System Response | | 2 | MicrosoftPowerPoint is not opened | Show message *“Please Run PowerPoint Firstly”* under “**Activate**” button |   Relationship:  Sync Armband | | | | |

##### **Control Presentation**



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| USE CASE - UC005 – Control Presentation | | | | |
| Use-case No. | UC005 | **Use-case Version** | | 1.0 |
| Use-case Name | Control Presentation | | | |
| Author | Đinh Bảo Trân | | | |
| Date | 2016/05/30 | **Priority** | Normal | |
| Actor:  User  Summary:   * + This use case allow user to control PowerPoint presentation by hand gestures.   Goal:   * + The window application successfully gets data from armband, analyses data, and maps each gesture’s data with correct function.   Triggers:  Preconditions:   * + User has turned on presentation mod   + Armband is ON   + Armband is synced to window application.   + Presentation Screen has been shown   Post Conditions:  N/A  Main Success Scenario:   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Perform hand gestures to control PowerPoint presentation | 1. Presentation Screen shows the image of the gesture that map with user’s gesture.  2. PowerPoint presentation will “Move to Next Slide”, “Move to Previous Slide”, “Zoom In”, “Zoom Out”, and “Exit Zoom In” according user gestures |   Alternative Scenario:  N/A  Exceptions:  N/A  Relationship:  Sync Armband, Turn on Presentation Mod | | | | |

#### 3.2.1.2 Hardware Requirements

### 3.2.2 Non-functional Requirement

## 3.3 Conceptual Diagram

