



Software Development Final Project
Wearable using Movesense Hardware
Functional Specification

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1. Introduction

This Functional Specification Document is a part of the final-year Software Development Project at South East Technological University.

This document will illustrate the project vision, functional and non-functional requirements, Use case diagram, and detailed Use case scenario.

The purpose of this Functional Specification document is to set instructions for the project application, such as what is the cooperation between the Movesense sensor and the project application, and how the application works on the different functional modules.

2. Vision

2.1. The project description

The project name is “Wearable using Movesense Hardware”, the project purpose is to develop a mobile application that uses the Movesense sensor as hardware technical support and can achieve the goal of measuring and tracking the application user’s physical health and movement indicators data, managing the application user’s rehabilitation training plans, supplying remote diagnosis function between the application user and medical care experts.

2.2. Target users

This project application has two main target user categories.

2.2.1. The Patient

The patient needs rehabilitation training and measuring health indicators. The patient age range is without limitation, people of any age can be the target user, however, there exists a higher proportion of senior people who need to do rehabilitation training to recover physical body function, and the sporter and fitness personnel have possibly gotten injured during the competition and training progression.

2.2.2. The Medical Institution’s Expert

Medical institutions such as hospitals, and clinics have relevant physical rehabilitation training experts, the rehabilitation training application can be used by experts for remote diagnosis of patients’ physical rehabilitation status purposes.

The medical care expert can use the rehabilitation training application one-to-one to monitor a patient’s health indicators and the progression of the rehabilitation training.

3. Functional and non-functional requirements

3.1. The project application's core functions

3.1.1. Create personal health and rehabilitation profile

The project application is a rehabilitation training application, this application allows the user to create a personal profile with personal information, such as name, age, gender, illness history and rehabilitation plan.

3.1.2. Health and rehabilitation training data tracking and managing

The user can track measurement health indicators and movement data, with readable charts (line chart & bar chart), and manage the rehabilitation training progression.

3.1.3. Remote diagnosis with medical care experts

The rehabilitation training application offers a remote diagnosis option that allows the medical care experts to review the patient's health status and the rehabilitation training's complete progression.

3.2. Basic functions

3.2.1. Register account

The application user needs to register a private account with basic information such as name, email address, password and select an image from the device gallery.

3.2.2. Login

If the application user successfully signs in to the application, then the user's private profile information can be visited and the other application functions become available.

3.2.3. User personal details

As a registered user need to fill in a user details sheet, which includes the user's Age, Gender, Illness-history, and Rehabilitation plan.

3.2.4. Rehabilitation scheme

The Rehabilitation scheme part involves different training body parts, the user can based on their unique body condition select relevant rehabilitation scheme.

3.3. Usability

The rehabilitation training application needs to follow Krug's First Law of Usability — “Don't make me think” as possible to make the application with a clear and simple Graphical user interface, which easily follows instructions and allows users without thinking too much about the operations of register, connect Movesense sensor, review profile, tracking rehabilitation training progression and remote diagnosis with medical care experts.

All the above application functions need to have a specific button option in the application that is easy to find and operate as well.

For example, the registration process only needs three steps to finish, fill in the phone number or email address as the account name, then set a password to create a new personal account.

3.4. Reliability

The project rehabilitation training application should be executed smoothly and with a fastly reflect speed, and the connection between the Movesense sensor and the application should be stable without disconnecting frequently and loss of measurement data issues, as a result, the stable Andriod version can be a good choice for the project application development.

3.5. Performance

The project application should offer a good user experience for the application users, the application reflects the speed and smooth degree between application interface pages are the key features of application performance.

In addition, the clear user interface design can reduce user finding target function time and also is a necessary feature for improving application performance.

3.6. Supportability

The project application can allow effective sustainment development including maintenance, iteration, and other extended functions.

4. Use Case Diagram

This part is to describe a basic project application structure relationship between the application users and the rehabilitation training system.

For this rehabilitation training application, the target user needs to be categorized in detail.

For example, the rehabilitation patient is focused on senior people.

As a result, rehabilitation training needs to have detailed schemes, for example, balance training for a patient who loses control of their arms and legs.

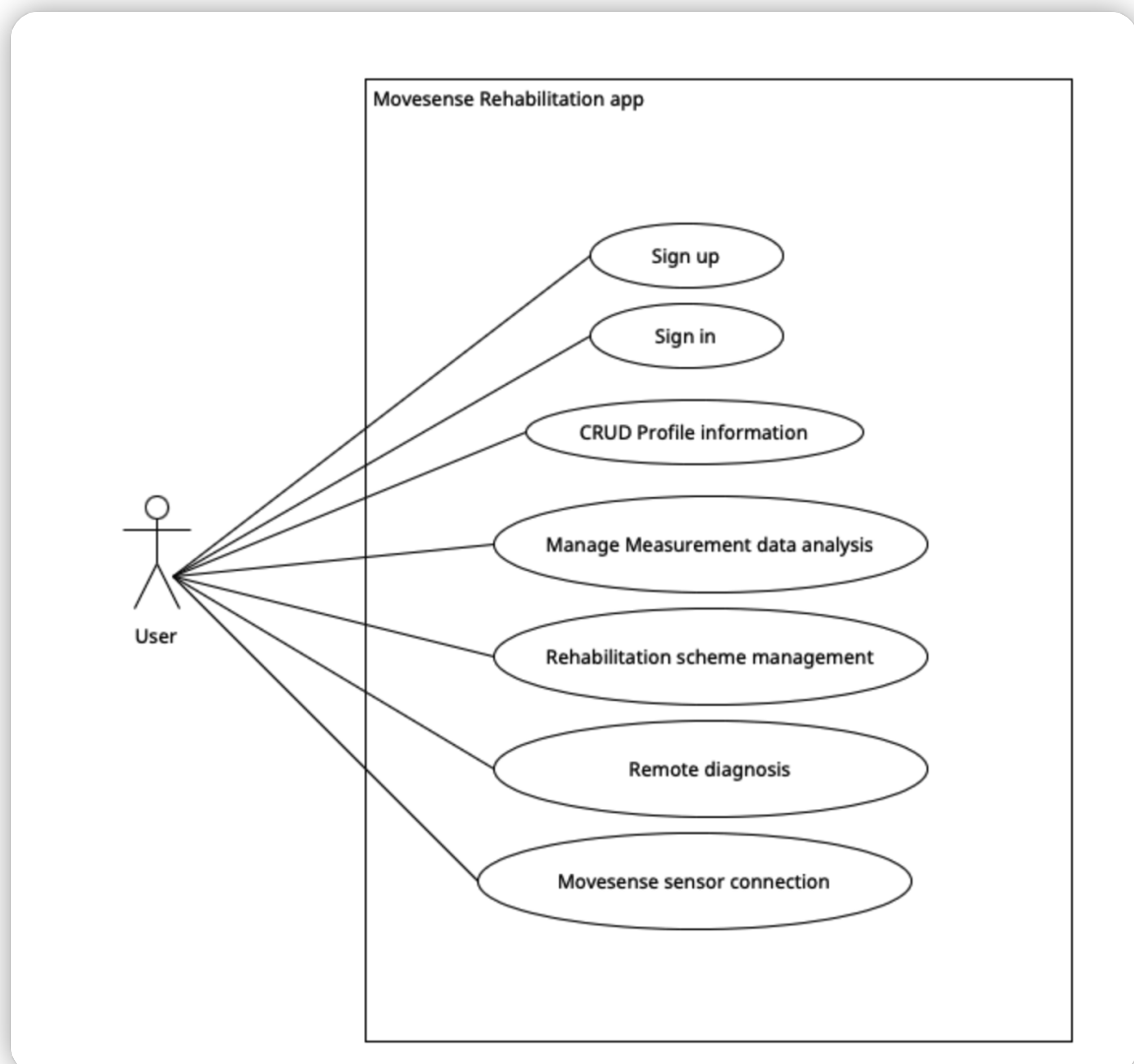


Figure 1. Use case diagram

5. Detailed Use Case Scenario

The full detail of the Use Case will be illustrated in the below Use Case Scenario

Detailed Use Case: Sign up

Primary Actors: Unregister User

Brief Description:

Register a new account for unregistered users and record the information that the user filled out the forms.

Main Success Scenario:

1. Unregister the user clicks the application Signup button to enter the interface page.
2. The user fills in the account name, email address and password into the form.
3. After inputting the account name, email address, and password, the user clicks the Signup button.
4. The application system creates a new account for the user
5. The application interface jumps to a new page, with the START REHABILITATION, USER DETAILS, REHABILITATION SCHEMES, and remote diagnosis functions.

Alternatives:

After the user clicks the Signup button, the application system needs to check whether the form is fully filled or not.

Detailed Use Case: SignIn

Primary Actors: Registered User

Brief Description:

Registered Users fill in the account email address and password in textboxes, in order to log into the application.

Main Success Scenario:

1. Registered user input the email address and password then click Sign in button.
2. The application compare the user input information with the firebase database information.
3. If the user input information matched the firebase database data.
4. Application Signin page redirect to the application main page.
5. If the user input information not matched the firebase database data, the application pop up a notice that can't sign in.

Alternatives:

If the account user's email address does not match the database data, the system will notify the user to try again.

Detailed Use Case: CRUD Profile

Primary Actors: Logged-in User

Brief Description:

The Logged-in User wants to Create, Read, Update, and Delete (CRUD) the profile's personal information.

Main Success Scenario:

1. The logged-in user chooses the USER DETAILS function in the main menu interface.
2. The application system redirects the menu interface to the profile interface and displays the relevant personal information.
3. The user selects one of the personal details, then does CRUD operations, and finally submits the modified data.
4. The application system accepted the new modified data and update data in the database. Then, the profile interface with new updated personal information.

Alternatives:

If the update data progression fails, the user's personal information will not be changed and still keep the original data.

Detailed Use Case: Manage Rehabilitation Scheme Selection

Primary Actors: Logged-in User

Brief Description:

The Logged-in User wants to select a Rehabilitation body Site for rehabilitation training.

Main Success Scenario:

1. The user selects Manage Rehabilitation Scheme Selection option in the main menu interface.

2. The application system redirects the menu interface to the Rehabilitation Site Selection interface and shows the body sites selection details.
3. The user chooses one of the body sites.
4. The application system displays body site rehabilitation scheme instructions.
5. The user follow the instruction then start rehabilitation training.

Alternatives:

If the user selects the wrong training body site, the system allows the user to go back to the previous interface.

Detailed Use Case: Connect Movesense sensor

Primary Actors: The logged-in user

Brief Description:

The User finished the body site selection and wants to start rehabilitation training.

Main Success Scenario:

The user selects one of the Rehabilitation scheme in the rehabilitation instructions page, and click the Movesene Functions icon to connect the Movesense sensor.

The application system require the user to open the Bluetooth and GPS.

The user open the Bluetooth and GPS functions, and click the Movesense Functions icon .

The application system check the connect conditions, if matched then Movesense sensor can connect to the mobile device.

Alternatives:

If the user waiting for sensor connect over 10 seconds, then may try go back previous page and click the 'START REHABILITATION' button again or refresh the current page.

Detailed Use Case: Select Linear Acceleration

Primary Actors: The logged-in user

Brief Description:

The User finished sensor connection and wants to start rehabilitation training linear acceleration measurement.

Main Success Scenario:

1. After mobile device connected with the sensor, in the new page of Sensor List, user click Linear Acceleration.
2. The application system redirect current page to Linear Acceleration measurement page.
3. The user click the subscribe the button.
4. The application draw a real time line chart in the current page.
5. The user follow the rehabilitation instructions to move the movesen sensor.
6. The Linear Acceleration line chart with a real time change trend.

Alternatives:

After click button may needs to wait few seconds until application have a reaction.

Detailed Use Case: Measurement data analysis

Primary Actors: The logged-in user

Brief Description:

The User started the Linear Acceleration and wants to have a analysis about the Linear Acceleration line chart with another way to view the sensor movement trend.

Main Success Scenario:

1. The user click the data analysis button.
2. The application redirect the current Linear Acceleration page to the Mean Value diagram page

3. The user keep continue to complete the rehabilitation training.
4. The application draw mean value analysis diagram as bar chart and with the time records.

Alternatives:

The time counting position at the bottom of the Mean Value analysis page, which is not easy to notice and click.

Detailed Use Case: Summary Measurement data analysis

Primary Actors: The logged-in user

Brief Description:

The User started the Linear Acceleration measurement data analysis and wants to have an overall analysis summary of the Linear Acceleration.

Main Success Scenario:

1. The user click the data SUMMARY button.
2. The application redirect the current Mean Value analysis page to the Summary mean Value diagram page.
3. The user save the overall Linear Acceleration analysis line chart as a screenshot with clicking the 'SAVE AND STOP' button.
4. The application save the overall summary line chart as a screenshot.
5. The application redirect the current page to the sensor functions list page.
6. The application upload the screenshot into the firebase firestore web server.
7. The web server received the new screenshot and update the web server screenshot collection.

Alternatives:

The 'SAVE AND STOP' button position at the bottom of the Summary Mean Value page, which is not easy to notice and click.

Detailed Use Case: UserProfile

Primary Actors: The logged-in user

Brief Description:

The logged-in User finished the overall Summary Mean Value analysis and wants to have a view user profile

Main Success Scenario:

1. The user click the UserProfile.
2. The application redirect the current sensor functions list to the UserProfile page.
3. The application download the screenshots from the firebase firestore screenshots collection to the application user profile page.
4. The application display the screenshot to the user.
5. The user scrolling up and down page to view the screenshots.

Alternatives:

When first time to view the UserProfile may need to wait few seconds, the application reaction may lower because the download speed not fast.

Detailed Use Case: Remote diagnosis

Primary Actors: The logged-in user

Brief Description:

The logged-in User wants to have a remote diagnosis with a medical care expert.

Main Success Scenario:

1. The user click the "add" icon which located in the right corner.
2. The application display the user list to the user.
3. The user click one of doctor head image.

4. The application redirect the current page to a conversation page.
5. The user send message to the doctor.
6. The application upload the message the firebase web server in the conversion collection.
7. The firebase web server send the message to the doctor.
8. The doctor application receive the message from the firebase web server.
9. The application display the message to the doctor.

Alternatives:

If the message sent fails, the system chat box should notify send again.