Software Development Final Project

Wearable using Movesense Hardware

Final Project Report

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Introduction

This document is a project report document based on the Research Report document and Functional Specification with more specific application design and software application development details.

Wearable using Movesense Hardware as a Rehabilitation mobile application, the primary function is to help users formulate personal physical rehabilitation schemes and manage relevant training at home.

Based on the previous three iterations of the project application and relevant documents.
This document will illustrate the final application interfaces and functions in real screenshots as below.

1. Application Flow Chart

The Flow Chart below describes the application operation progression and the relationship between the application's different functions.
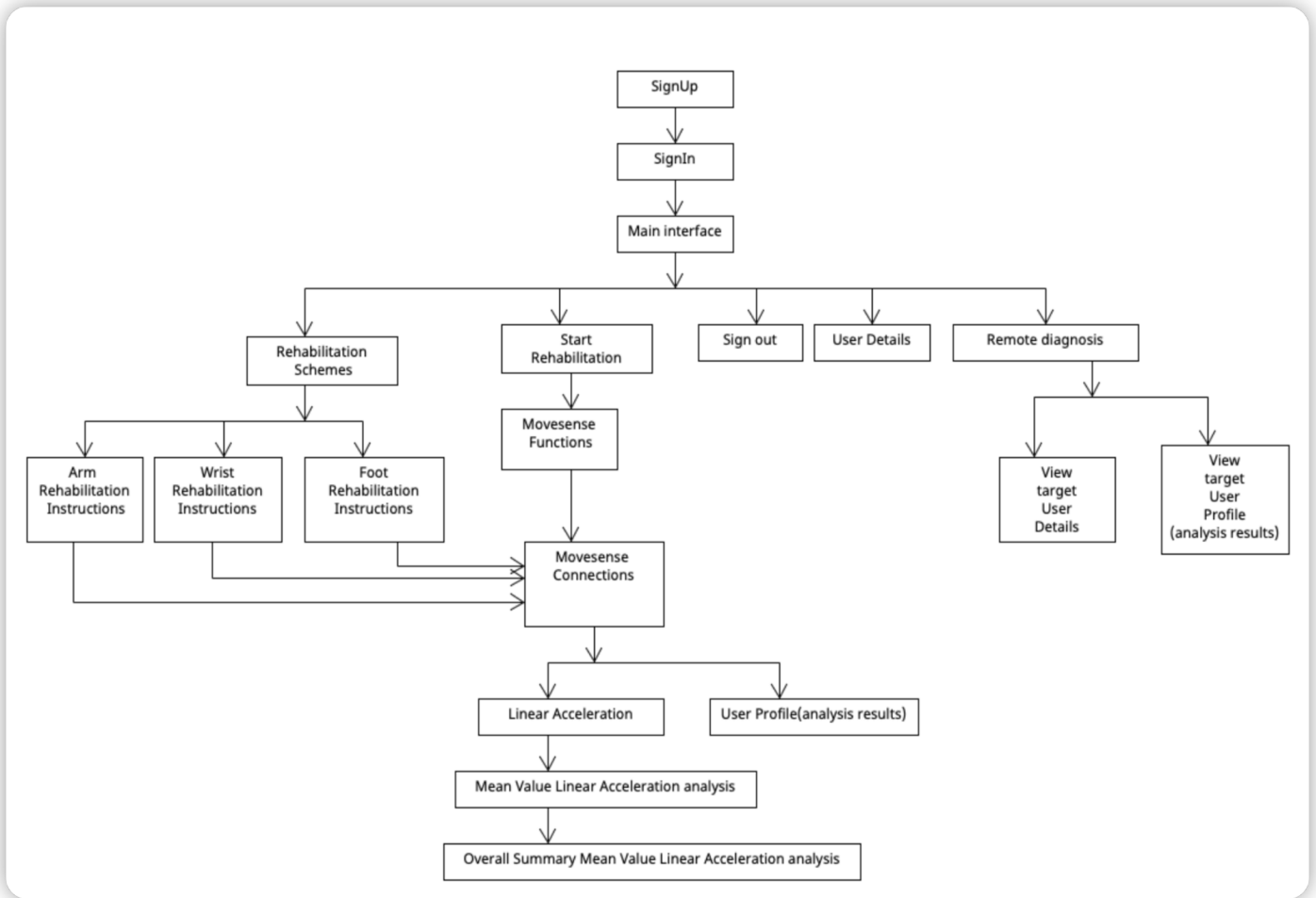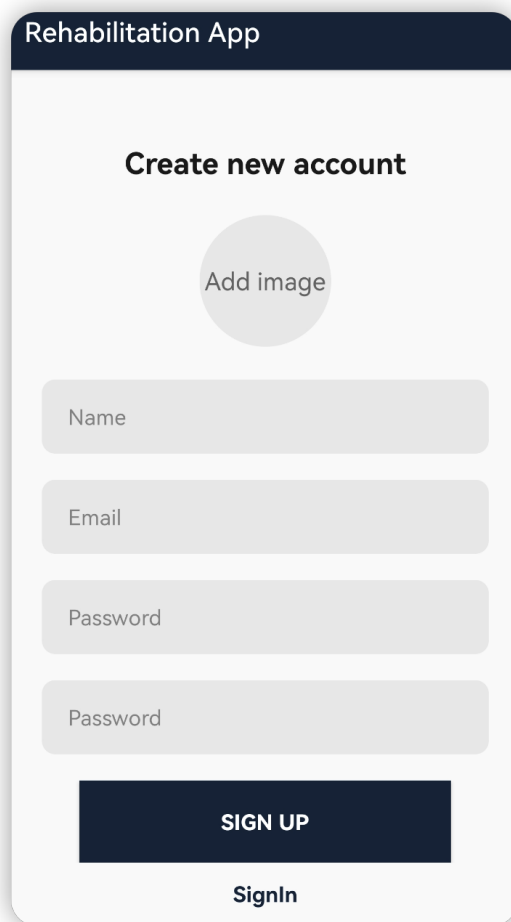
Figure 1. Application Flow Chart Example

2. Application screenshots

The project application with different functional interfaces that designs and shows in the below draft design screenshots.
The project application will be based on the below draft design to develop and improve.
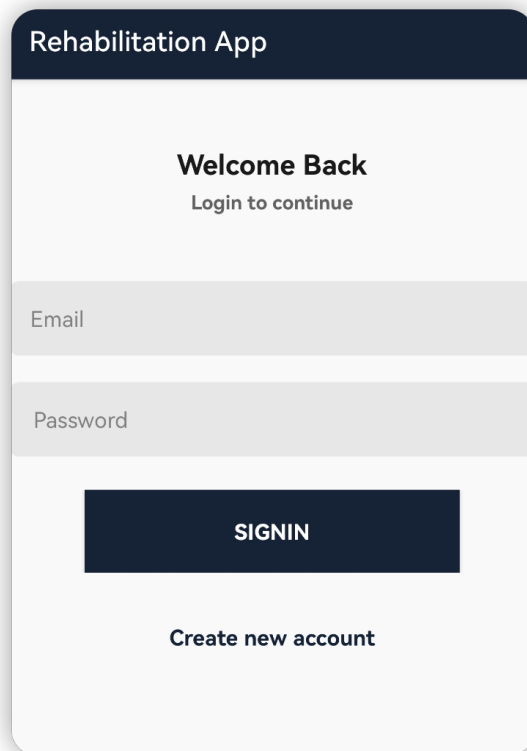
2.1. New Account Sign Up & Sign In

Figure 1. New Account SignUp

The application user needs to create a new account before using the application.
In the create new account interface, the user fills in the relevant required information, such as email address, password, name, and so on, then

presses the SignUp button, and the account data is transferred to the database. A new account is created.

After the user has a personal account, then the user can log into the application and use the application by inputting the account name and password.

Figure 2. New Account SignIn
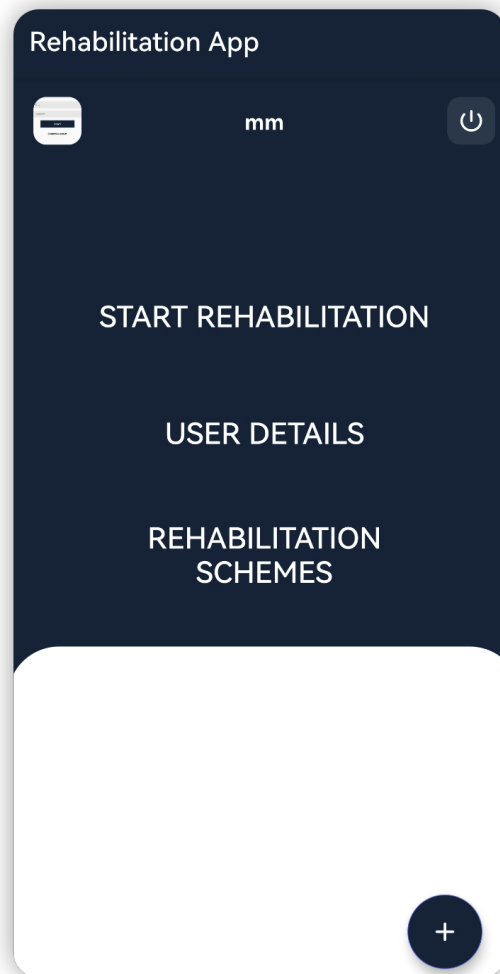
2.2. Menu interface

Figure 3. Rehabilitation app menu interface screen

The menu interface screen shows the project application involves various functions, such as Start Rehabilitation, User Details, Rehabilitation Schemes, Remote Diagnosis, SignOut.
When click one of above function, then the current page will redirect the new page with more functions.

2.3. User Details

Figure 4. The user profile screen

The user can enter the 'User Details' interface to review the user's personal information details, such as Age, Gender, Illness History, Rehabilitation Plan. in the meantime, if the user wants to Save and Update button.

2.4.   Physical Rehabilitation training Schemes selection

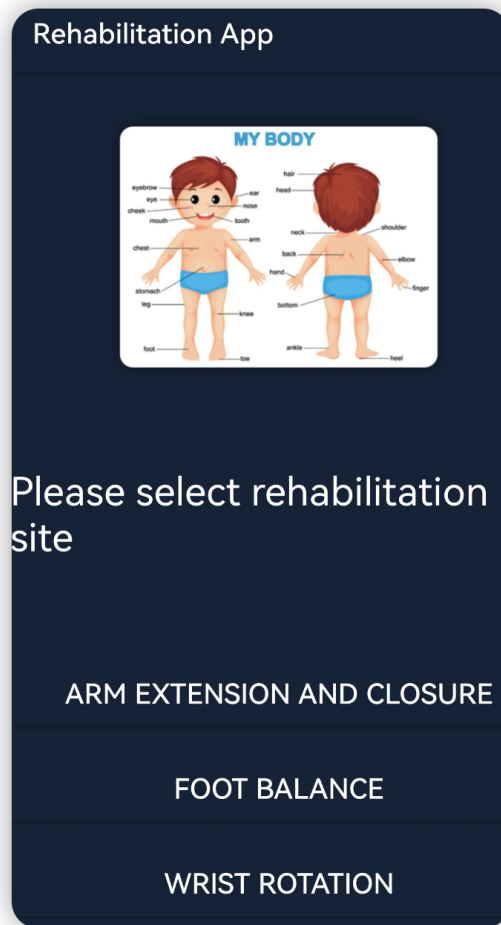Figure 5. Rehabilitation training site selection screen

In this screen, the application user can based on their individual body injury status select rehabilitation sites for the following training.

2.5.   Rehabilitation Scheme instructions
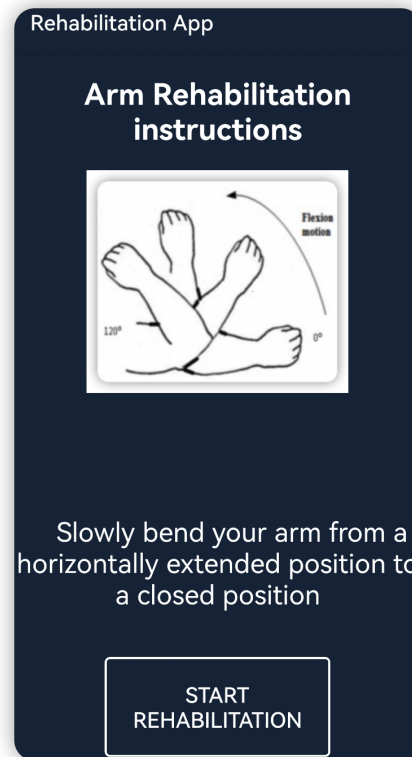
Figure 6. Arm Rehabilitation Scheme Instructions.
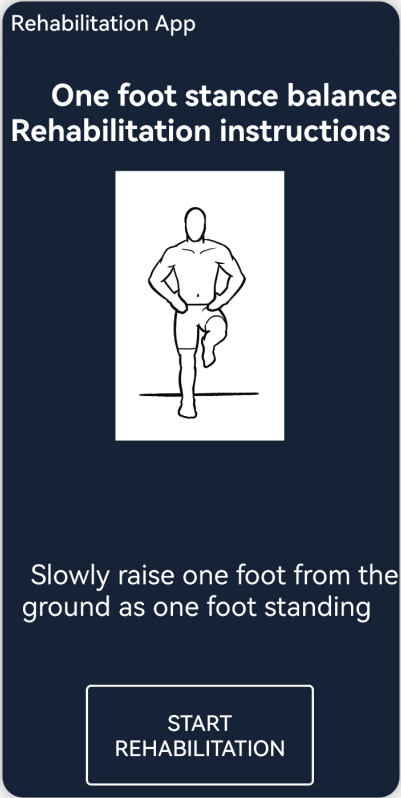
Figure 7. Foot Rehabilitation Scheme Instructions.
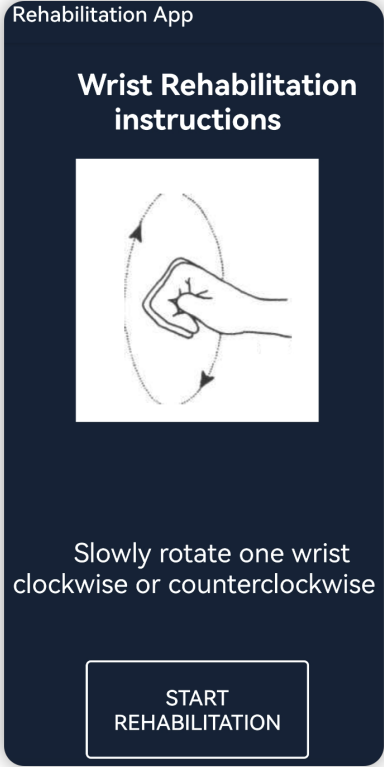
Figure 8. Wrist Rehabilitation Scheme Instructions.

There are three different body sites can be selected to do the rehabilitation training, each of them have individual training instructions. The user can follow the instructions to start Training.

2.6. Linear Acceleration line chart
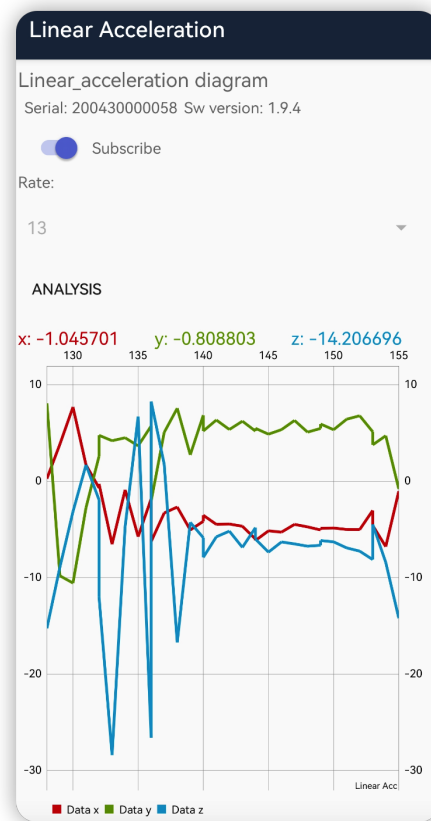
Figure 9. Movesense sensor measurement data analysis screen.
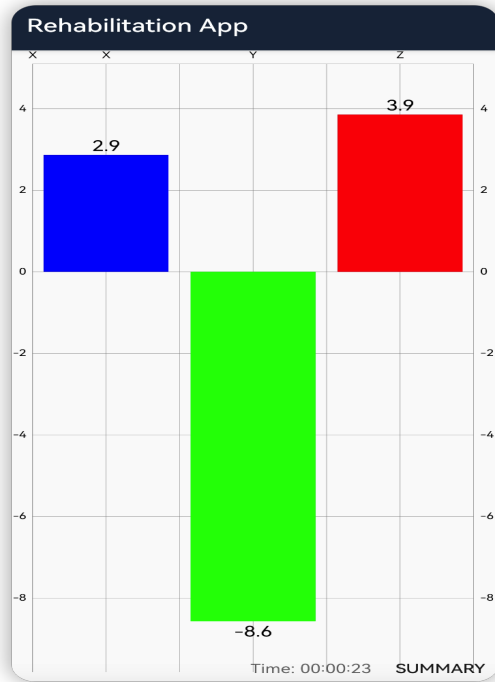
Figure 10. Movesense sensor measurement data Mean Value analysis bar Chart.
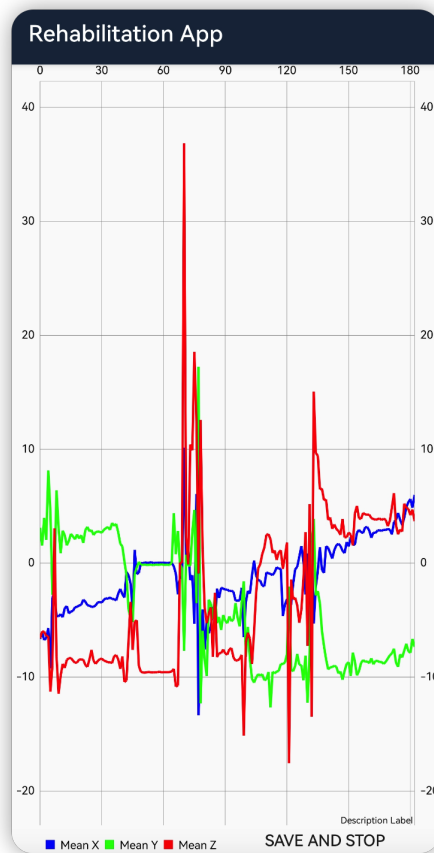
Figure 11. Movesense sensor measurement data overall Mean Value Summary line Chart.

The Movesense sensor has in-built measurement elements, for example, movement sensor: acceleration, gyroscope, and magnetometer.

The user can track their movement data with friendly readable charts and summaries.

2.7. Remote diagnosis
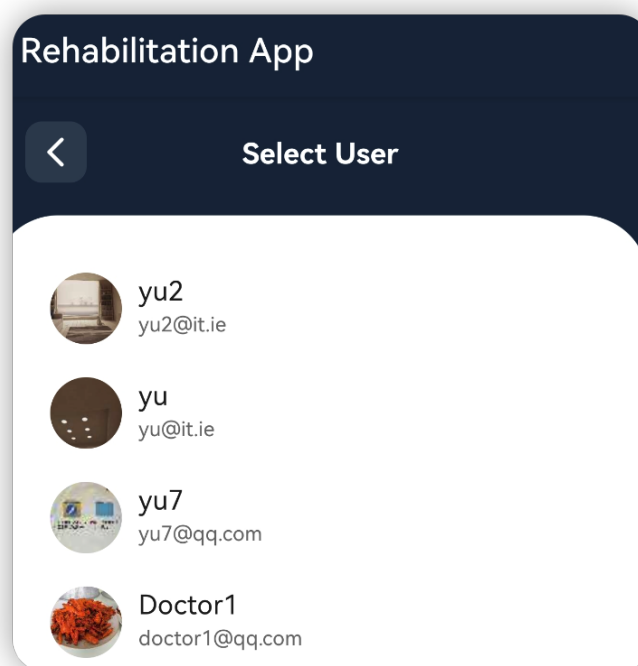
Figure 12. Remote diagnosis user selection screen.
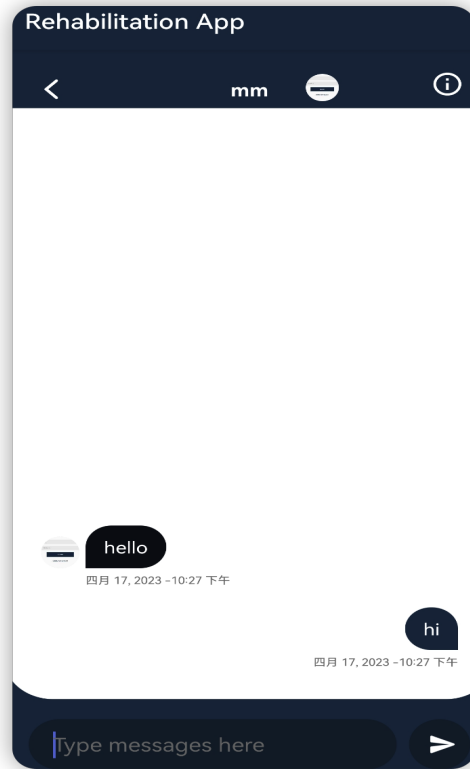
Figure 13. Remote diagnosis user message conversation screen.

The user can have a remote diagnosis service with medical care experts. the user's personal rehabilitation status and movement data analysis data can be shared with rehabilitation medical care experts for diagnosis usage.

2.8.   User Personal Details

Figure 14. User personal details screen.

The user details contain the Age, Gender, illness History and the Rehabilitation Plan.

Figure 15. User personal rehabilitation summary line chart screen.

The user personal rehabilitation summary line chart screen, with the trend of mean value linear acceleration data analysis.

3. Movesense sensor raw data transfer screenshot

```
BleManager: Received data: WB_DATAMSG_CLIENT_ON_NOTIFY, type: 1, direct msg, msgLen: 41, reqId: 0, size: 47
MdsOperationHandler: SDSInternalCallback with call type: 2 header: {"Content-Type": "application/json", "Uri": "MDS/EventListener/34", "Content-Length": 180, "Reason":
LinearAccelerationTestActivity: onSuccess(): {"Body": {"Timestamp": 5429430, "ArrayAcc": [{"x": 0.17946811020374298, "y": -0.074180148541927338, "z": -9.851602554321289
BluetoothGatt: onNotify() - Device=0C:8C:**:**:**:F9 handle=25
BleManager: Received data: WB_DATAMSG_CLIENT_ON_NOTIFY, type: 1, direct msg, msgLen: 41, reqId: 0, size: 47
MdsOperationHandler: SDSInternalCallback with call type: 2 header: {"Content-Type": "application/json", "Uri": "MDS/EventListener/34", "Content-Length": 180, "Reason":
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BluetoothGatt: onNotify() - Device=0C:8C:**:**:**:F9 handle=25
BleManager: Received data: WB_DATAMSG_CLIENT_ON_NOTIFY, type: 1, direct msg, msgLen: 41, reqId: 0, size: 47
MdsOperationHandler: SDSInternalCallback with call type: 2 header: {"Content-Type": "application/json", "Uri": "MDS/EventListener/34", "Content-Length": 179, "Reason":
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BluetoothGatt: onNotify() - Device=0C:8C:**:**:**:F9 handle=25
BleManager: Received data: WB_DATAMSG_CLIENT_ON_NOTIFY, type: 1, direct msg, msgLen: 41, reqId: 0, size: 47
```
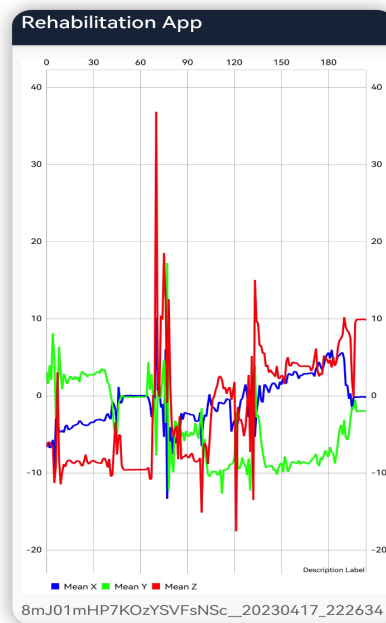
Figure 16. Movesense sensor raw data transfer screenshot.

As above Movesense sensor raw data is transferred to the application screenshot, which shows the Movesense sensor movement track that is represented as X, Y, Z three dimensions (3D) direction data.
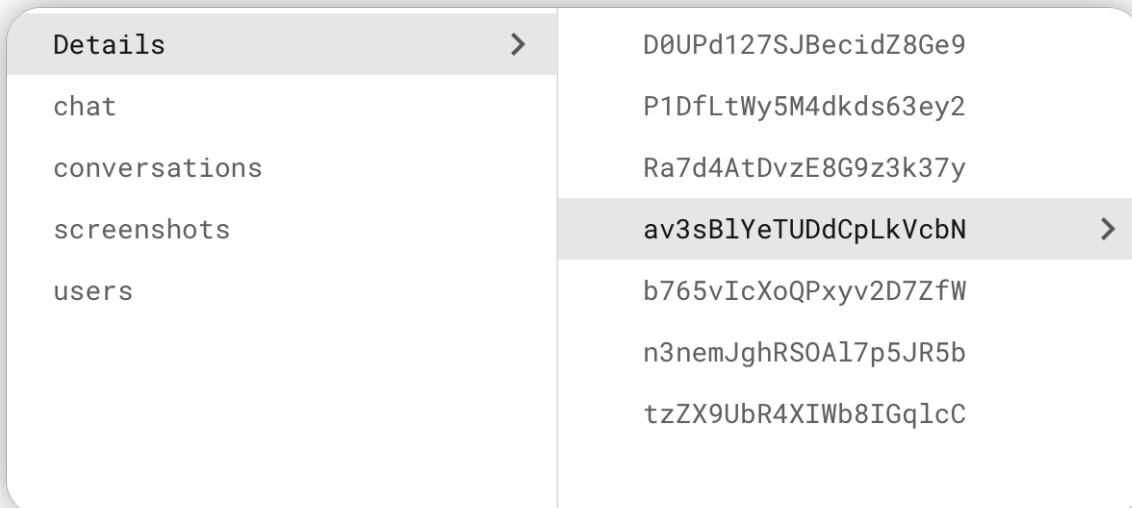
4. Firebase firestore of the application data structure

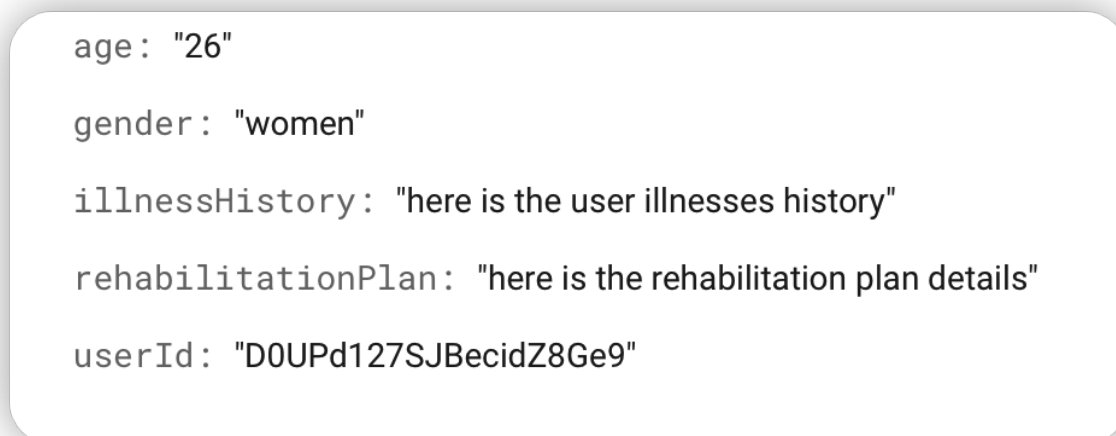Figure 17. Firebase Firesotre application variable data collections screenshot.

Figure 18. Firebase Firesotre application user details screenshot.

message: "uuuuuu"

receiverId: "D0UPd127SJBecidZ8Ge9"

senderId: "b765vIcXoQPxyv2D7ZfW"

Figure 19. Firebase Firesotre application user mesasge screenshot.

createDate: "20230417_222634"

description: "8mJ01mHP7KOzYSVFsNSc__20230417_222634"

fileName: "MeanValueSummary_20230417_222633.png"

image: "iVBORw0KGgoAAAANSUhEUgAABUAAAAmSCAIAAACeMrl8AAAA
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8eRmNgt4A6Ct3MYYqFar/Q+t136xWBx+anj70DBweqXzY/uni

Figure 20. Firebase Firesotre application rehabilitation analysis summary screenshot.

5. Conclusion

This project is based on "Movesense" as wearable hardware to develop a rehabilitation training application to transform the unformed monitoring data from the wearable Movesense sensor into a visualizable interface for helping senior patient rehabilitation training and data sharing with the medical care expert as a remote diagnosis.

Based on the project application requirements, research results, and application iterations, the development technologies decide to use Android Studio as the Movesense sensor programming environment Firebase as the database and cooperate with Java as the programming language, because the Movesense sensor official development kit and Movesense-mobile-API uses Java as the programming language.

I declare that all material in this submission, Final Project Report, is entirely my own work except where duly acknowledged. I have cited the sources of all quotations, paraphrases, summaries of information, tables, diagrams, or other material, including software and other electronic media in which intellectual property rights may reside. I have provided a complete bibliography of all works and sources used in the preparation of this submission I understand that failure to comply with the Institute's regulations governing plagiarism constitutes a serious offence.

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