Architectural Design Specification
CSE 4316: Senior Design I
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Team APT
Automated Personal Trainer

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Revision History

Revision	Date	Author(s)	Description
0.1	11/20/2017	KJ	Document creation
0.2	12/04/2017	KJM, IS, CN, KJ	Complete draft

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1 Introduction

The Automated Personal Trainer application is based off of a client-server architecture design:

- The client will open the mobile application to start
- Client will feed information into the server through the Kinect
- The Kinect will record angle data and send to application
- Server processes and analyze raw data
- Result recorded in database and sent back to client
- Client will be able to see results on mobile device

2 System Overview

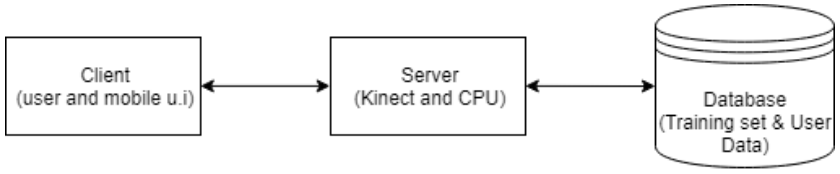

Figure 1: Architectural Layer Diagram

3 Subsystem Definitions & Data Flow

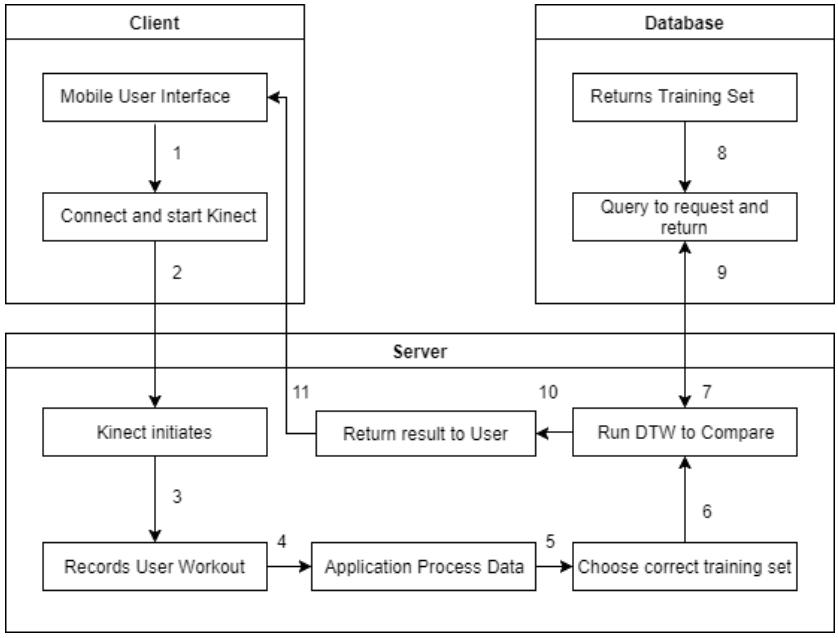

Figure 2: Data Flow Diagram

4 Client Subsystems

The client layer will include 2 subsystems in its functionality.

- Subsystem 1 (Mobile User Interface) will be in charge of the user interface for on the mobile application.
- Subsystem 2 (Connect and start Kinect) will be sending a signal to start the Kinect.

4.1 Mobile User Interface

This subsystem will be the user interface for the client on their mobile device. The client will be able to interact with the U.I to enter in data and view their workout history and progress.

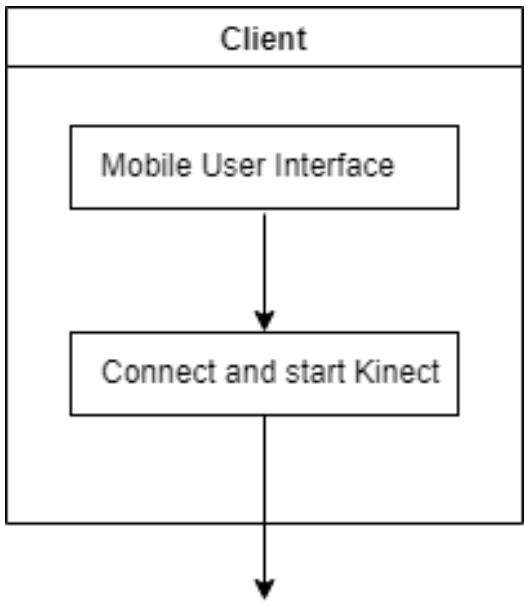

Figure 3: Client Subsystem Description

4.1.1 Assumptions

Assuming the user is able to download and intuitively interact with the mobile U.I.

4.1.2 Responsibilities

This subsystem is responsible for the following functionality:

- Sign in and sign up for an account to save personal data.
- Enter in personal information.
- Select workout and view progress.
- View history and accuracy of workouts.

Table 2: Subsystems Interfaces

ID	Description	Inputs	Outputs
1	Sign In	Email Password	Access Deny
2	Sign Up	Email Password Gender	Verification
3	Personal Info	Name Age Height Weight DOB	Accept
4	Workout History	Choose Entry	Show history of selection
5	Select workout	Choose workout	Begin recording

4.1.3 Subsystems Interfaces

4.2 Connect and Initiate Kinect

This subsystem will be a part of the mobile user interface, the client will select a workout then it will send a signal to start the Kinect video recording stream.

4.2.1 Assumptions

Assumes the user has the product set up and ready to go in order for the application to connect and begin recording.
Assumes user has access to Wi-Fi.

4.2.2 Responsibilities

Responsible for connecting to the Kinect and begin the recording process.

5 Server Subsystems

The server layer will include 6 subsystems in its functionality.

- Subsystem 1 (Kinect Initiates)
- Subsystem 2 (Record User Workouts)
- Subsystem 3 (Application Processes Data)
- Subsystem 4 (Choose Correct Training Set)
- Subsystem 5 (Run DTW to Compare)
- Subsystem 6 (Return result to User)

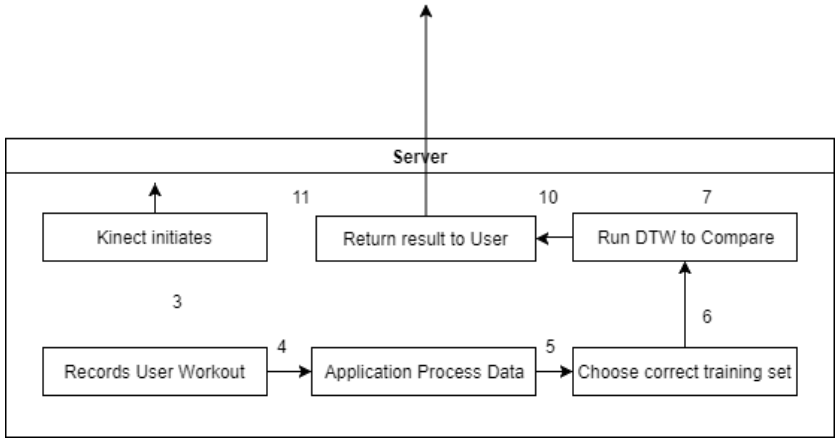

Figure 4: Client Subsystem Description Diagram

5.1 Kinect Initiates

The Kinect will start and begin the recording process.

5.1.1 Assumptions

Assumes the user has initiated the Kinect to start recording.

5.1.2 Responsibilities

Responsible for recording user workout.

- Initiate the Kinect camera.
- Start recording the user's workout.

5.2 Record User Workouts

This subsystem will begin to record the user's workout and specific angle for each workout.

5.2.1 Assumptions

Assumes the user has selected a valid workout and has successfully set up the Kinect.

5.2.2 Responsibilities

Responsible recording the user's workout and sending the angle data to the server for processing.

5.3 Application Processes Data

This subsystem will take the raw data recorded from the Kinect and normalize it for the DTW algorithm.

5.3.1 Assumptions

Assumes user has recorded a workout successfully.

5.3.2 Responsibilities

Responsible for taking the raw angle data and normalizing it in order to run through the DTW algorithm and compare it to a training set.

5.4 Choose Correct Training Set

This subsystem will take the user's selection of preset workout to determine which training set to compare to.

5.4.1 Assumptions

Assumes the user has selected a valid workout.

5.4.2 Responsibilities

Responsible for choosing the correct training set to input into the DTW algorithm.

5.5 Run DTW To Compare

This subsystem will compare the data that was normalized in the previous step to the already normalized training set data.

5.5.1 Assumptions

Assumes the data set was correctly normalized and training set was correctly chosen.

5.5.2 Responsibilities

Responsible for the DTW algorithm which takes in a training set and a user

5.6 Return Result to User

This subsystem will take the DTW results from the previous step and send them back to the user.

5.6.1 Assumptions

Assumes the DTW calculated correctly and the results are accurate.

5.6.2 Responsibilities

Responsible for returning the correct results of the DTW algorithm to the user.

6 Database Subsystems

The database layer will include 2 subsystems in its functionality.

- Subsystem 1 (Returns Training Set) will be in charge of returning the training set to the server.
- Subsystem 2 (Query Request and Return) will take in the query for the requested data set and return the result from subsystem 1.

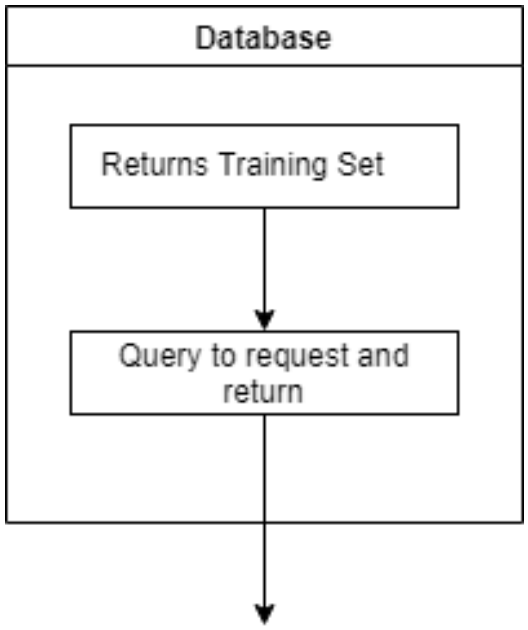

Figure 5: Database Subsystem Description Diagram

6.1 Return Training Set

This subsystem will return the training set based on the workout chosen.

6.1.1 Assumptions

Assumes the training set is within the database.

6.1.2 Responsibilities

Responsible for returning the selected training set from the database.

6.2 Query Request and Return

This subsystem will take in the query from the server requesting for a specific training set.

6.2.1 Assumptions

Assumes the server query is correct and there is a training set that exists for that query.

6.2.2 Responsibilities

Responsible for querying the user's selected working and returning the training set for the DTW algorithm to compare.