Skillcourt Backend

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Senior Project

## Legal Notices

Missing

## Abstract

There is a lot involved with the training of soccer players. The current system for training is primitive usually involving an instructor and a physical field for playing. The primary objective is to produce a new, modern, and system for training soccer players. The system will be a program with features that will assist players for learning the skills required on their own.

Implementing this system is revolutionary to the way avid players train in the sport. With the functionality and portability that SkillCourt offers, the user can create a personalized regimen for improving skills; thus, SkillCourt offers an overall improvement to both the soccer training and playing experience for players.

(Specific to the document?)

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## **Introduction**

Soccer has become a world-wide sporting phenomena with events like the World Cup massing viewers of over 900 million and over 200 teams participating in the games that lead up to it. On a much smaller level, soccer is not surprisingly a favorite past-time for countless people of all ages. Due to its popularity as a sport, there is a large demand for guidance and coaching for becoming better.

### Problem Definition

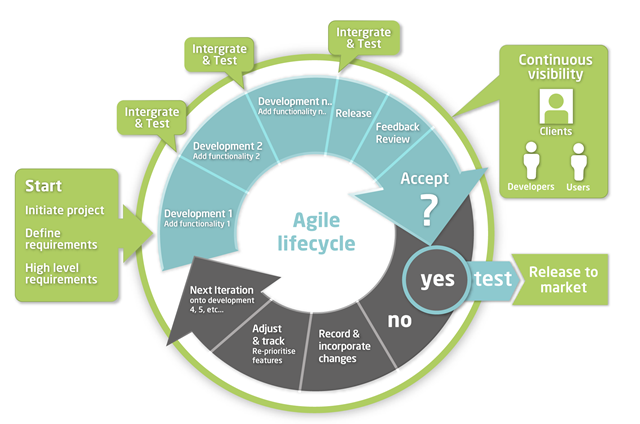
As it stands, training for soccer can be a very cumbersome feat for the average person to endeavor unaided. Without proper guidance, progression dwindles and a person may not feel obliged to continue. With so few places to turn outside of professional help, a new method is needed to fill the void.

SkillCourt is both a new method and an aid to soccer coaching. Offering the routines for honing the cognitive skills one needs for soccer, SkillCourt can be an all-in-one self-trainer for anyone. While SkillCourt alone can be a great method for training, coaches can also join and receive information vital to furthering their players’ progression.

### Design Methodology

Agile development methodology was used to begin the process of creating and adding functionality to all parts of the system. Agile is an iterative and incremental development process which allows developing functionalities and testing it along the way. Following this process was key to delivering a quality product that conforms to all standards.

Since the process is iterative, it allows small and concise changes to be made leading to the overall progression of the project as a whole. Below is the methodology diagram used for the completion of the product:

***Figure 1*** *Agile Methodology*

### For SkillCourt, we used Mingle, a ThoughtWorks agile/scrum service, to track and document the project’s progress and requirements. Mingle allowed for us to break the development process into smaller, digestible, and easy to integrate pieces.

### Terminology

#### 1.3.1 Definitions

* **Pad Simulator**: A virtual device which will take the place of physical SkillCourt pads for testing showcasing purposes. This device offers all of the features a SkillCourt Arena will offer.
* **SkillCourt**: A system which uses SkillCourt Pads and a player interface for training soccer.
* **SkillCourt Arena**: A 20’x20’ room with SkillCourt Pads on the walls used for SkillCourt routines.
* **SkillCourt Pad**: A physical device with a flat surface that can measure and transmit when and how much pressure it received.
* **Player**:
* **Coach**:

### 1.4. Overview of Document

In chapter 1, the main problem is introduced, along with the design methodology used and definitions relating to the project. In chapter 2, the system is introduced in terms of the system’s architecture, with the subsystem decomposition, hardware and software mapping, persistent data management and privacy/security aspects explained. Chapter 3 delves into the behavior of each subsystem described and the static and dynamic models used are explained. Chapter 4 is a glossary of domain-specific terms. In the appendix, miscellaneous material such as use case diagrams, use cases being implemented, and documented class interfaces can be found. Lastly, a diary of meetings are references can be found at the end of the document.

## **System Design**

## This chapter gives insight into the system’s architectural patterns used. SkillCourt was divided into subsystems, each one with specific functionality that adds richness to the sports training process. In this chapter, an overview of the system’s design is introduced. Then, the decomposition of the system into subsystems is explained. Moreover, hardware and software mapping and persistent data management aspects of the project are discussed. Finally, the security and privacy issues of the system are explained.

## The Mobile Application shall allow:

## players to create a new player account

## players to log in with their account credentials

## players to log in as a guest player

## players to view their account information

## players to change their account information

## players to view their statistics

## players to connect to SkillCourt Pads

## players to select default routines

## players to play default routines

## players to select custom routines

## players to play custom routines

## players to select coach routines

## players to play coach routines

## players to view game score and info

## players to disconnect from pads

## players to log out

## The Website shall allow:

## coaches to create a new coach account

## coaches to log in with their account credentials

## coaches to log off

## coaches to view player roster

## coaches to view their players’ info

## coaches to view their players’ statistics

## coaches to view their custom routines

## coaches to create custom routines

## players to log in with their account credentials

## players to log off

## players to create a new player account

## players to view their account info

## players to view their account statistics

## players to edit their account info

## players to create custom routines

## players to view their custom routines

## users to view a public player’s statistics

## users to view a public player’s account info

## The Simulator shall allow:

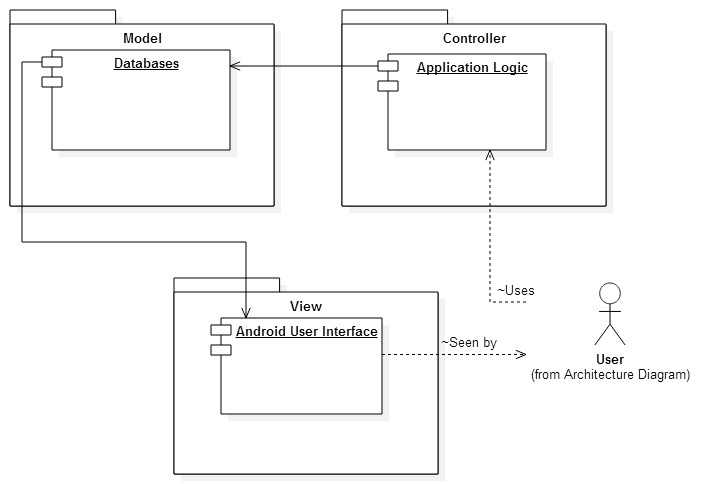
## the app to begin a routine

## the app to receive routine statistics

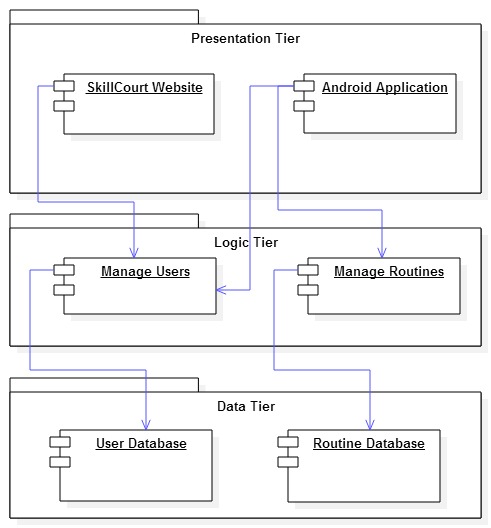
## the app to connect to pads

## the player to arrange pads as desired

### Overview

This version of SkillCourt is the first release, so all functionalities resemble work done in Version 1. SkillCourt was implemented using the Model-View-Controller architecture. ****   
**Figure 2** MVC Architecture

Also used by the system is a 3-tier architecture which is used to obtain data from the database. The following diagram demonstrates this architecture:



**Figure 3** 3-tier Architecture

### Subsystem Decomposition

SkillCourt is broken down into 3 systems: The App, the Website, and the Simulator. Each system can further be broken down into subsystems. The following diagrams represent the subsystems for each of the 3 systems.

The SkillCourt app is a mobile application which offers interaction between the player and the simulator as well as the database. As the core UX for the player, the app offers a subsystem for the following:

**Account Management**

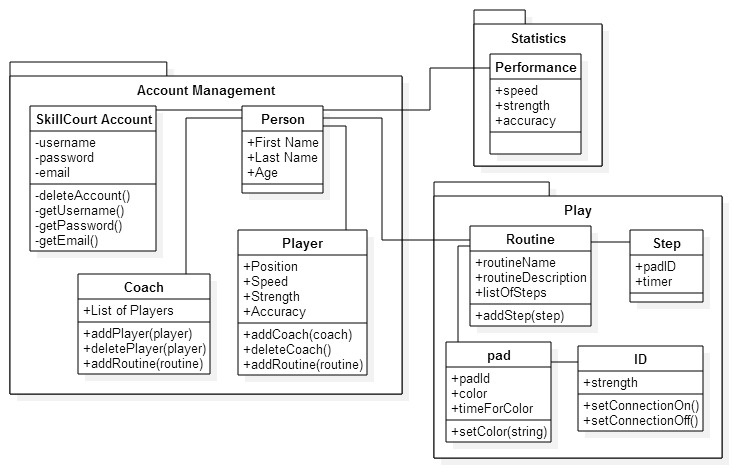
This subsystem gives the player control of all account information associated with the player’s account. This includes personal information, such as first and last name; account information, like username, password, email address; coach information, like coach’s username; and player information, ranging from position played to average statistics.

**Statistics**

As a player, statistics are a way of gauging the level of performance achieved. The statistics subsystem gives access to a range of player’s statistical information throughout the player’s lifetime with SkillCourt.

**Play**

The final subsystem of the app, play gives the player access to the game. It allows the player to send routine information to the simulator and allows the app to receive information about the played routine from the simulator

** Figure 4** App Subsystem Decomposition Diagram

The next system is the Website system. This systems is further divided into 3 subsystems. These include Account Management, Player Statistics, and User Routines.

**Account Management**

While this subsystem is similar to the App’s account management subsystem, it differs in that a different set of users has access. Coaches only have access to the website, so this subsystem considers coaches as well as players.

**Player Statistics**

As a player, statistics are a way of gauging the level of performance achieved. The statistics subsystem gives access to a range of player’s statistical information throughout the player’s lifetime with SkillCourt.

**User Routines**

As a SkillCourt coach or player, customized variations of the default routines can be created for use by players on the App. This subsystem allows for the creation of new custom user routines which will set the variables for them to the user’s choosing.

The final system for SkillCourt is the simulator. The simulator is a system which emulates the SkillCourt Arena. It is broken down as follows:

**SkillCourt Room**

The SkillCourt room represents the 20’ by 20’ arena which has SkillCourt pads on the walls. This room is represented by a 5x5 square representing the floor and 4 3x5 “walls” surrounding it. Each square on the floor and the walls are a pad.

**Statistics**

As a player, statistics are a way of gauging the level of performance achieved. The statistics subsystem is a generator of the player’s statistics from information obtained while the player interacts with the simulator. Data gathered includes force, time between strikes, number of shots attempted, number of correct targets hit, etc.

**Routine**

The routine subsystem parses information related to a routine sent by the app. The routine information parsed includes the routine type, how long it will be played, the level of difficulty, etc.

### Hardware and Software Mapping

The main components of SkillCourt are the android mobile app, the PHP website, the simulator, and the MySQL database. Both the app and the website are connected to the database and do so using PHP scripts located on the server. All models in each component are mapped to tables in the MySQL environment set up on the same machine. The browser communicated with the server using HTTP.

### Persistent Data Management

#### Coach Information Storage

The system stores the information from the coach when he/she registers to make an account. This information includes the coach’s username, email, password, and some personal information such as first name, last name, and age

#### Player Information Storage

The system stores the information from the player when he/she registers to make an account. This information includes the player’s username, email, password, and some personal information such as first name, last name, and age. Additionally, the system will store the position of the player in the field.

#### Routine Storage

When a player creates a custom routine, the system will store this new routine. It will save to the database the routine name given by the player as he/she creates it, a unique ID created by the system and a string that will be converted to the series of steps in the routine. Additionally, the system will automatically have stored several routines for the player to choose from.

#### Performance Statistics Storage

The performance of the player while using the pads will be stored by the system. Statistics from the performance will include strength, speed, accuracy, etc.

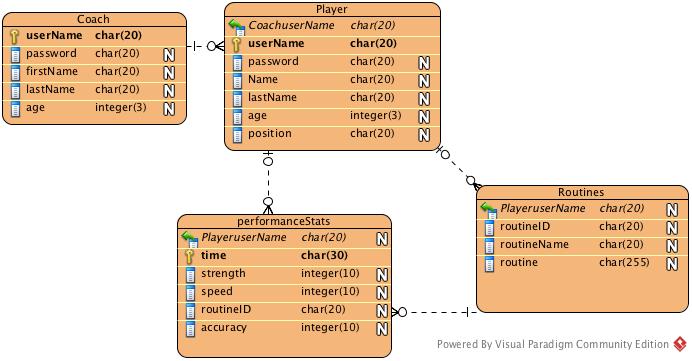


Figure 5: Database table

### Security and Privacy

#### Credential Authentication

The SkillCourt-Backend system will be accessed by players and coaches who have previously registered their credentials by making an account. In the mobile device, only players will be allowed to log in. As they enter the application, the system will provide them with a form to sing in using their previously created username and password. The system will then verify their credentials and verify that they have previously registered as “Players.” Once logged in, players will be restricted to access only their information and statistics. They will not have access to other player’s information.

In the case of coaches, they will not be allowed to sign in through the mobile device application. As they try to log in with their credentials, the system will check that they are not registered as “Player”, but as “Coach” and will return a message stating they cannot log in through the mobile device application. Additionally, users will be allowed to continue on the application as “guest,” but they will have no access to information.

In the webpage, both players and coaches will be allowed to log in by submitting their username and password. In both cases the system will verify that they have registered as players or coaches and will give each the appropriate access to information. Once logged in, players will only be allowed to access their information, while coaches will be allowed to access the information of all players they are connected to. No guests will be allowed on the webpage. In both, the webpage and the mobile application, users will no registered credentials will not be allowed to access any information

#### Data Encryption

Currently, no data is being encrypted. All sensitive data is being stored in plain text in the database.

## **Detailed Design**

### Overview

### Static Model

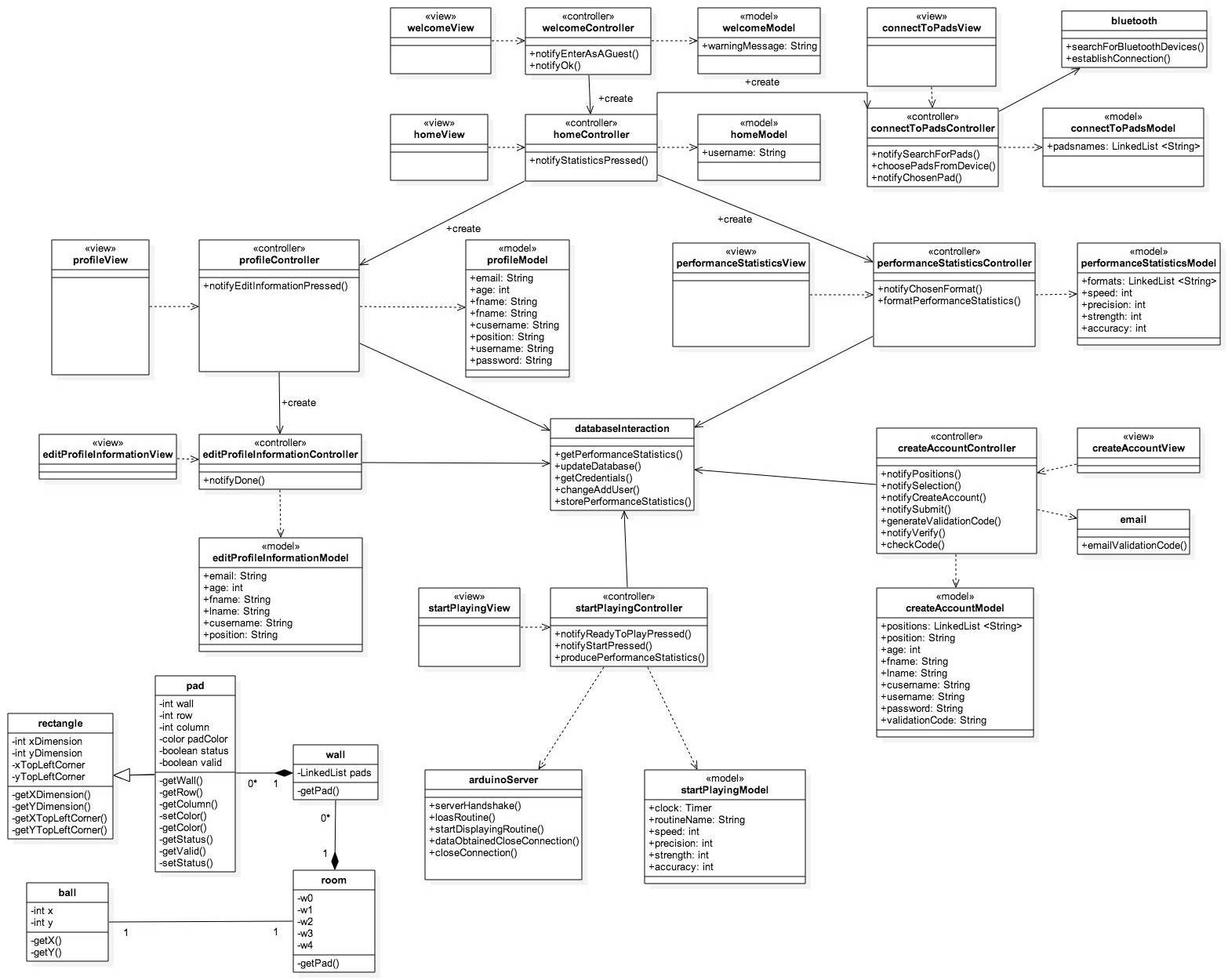
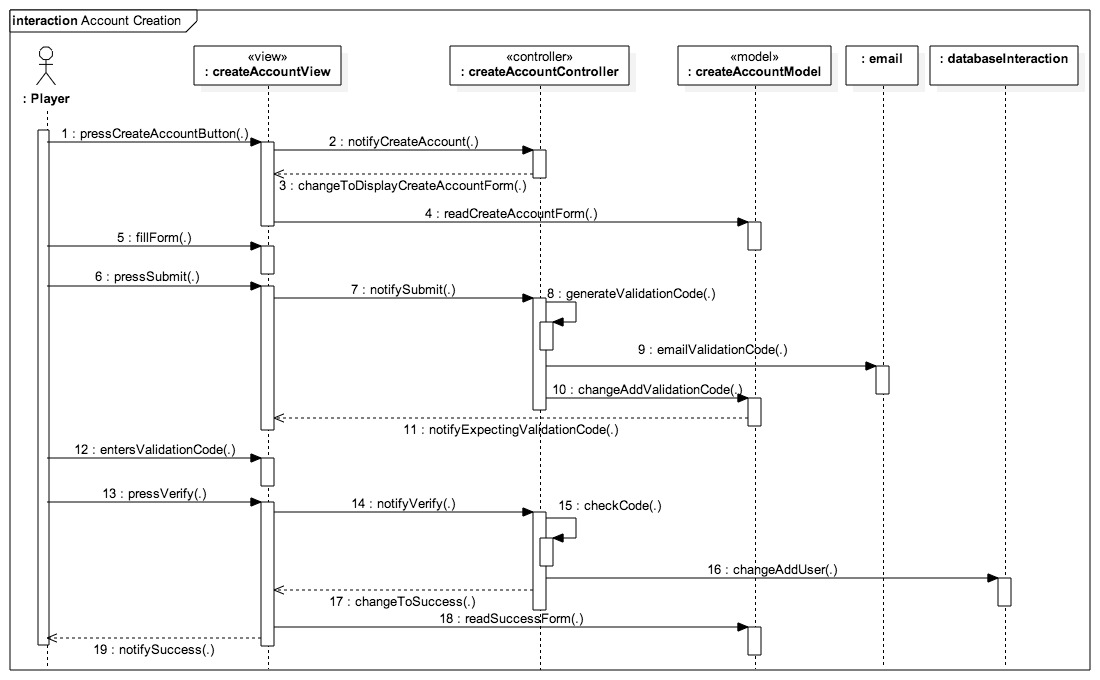
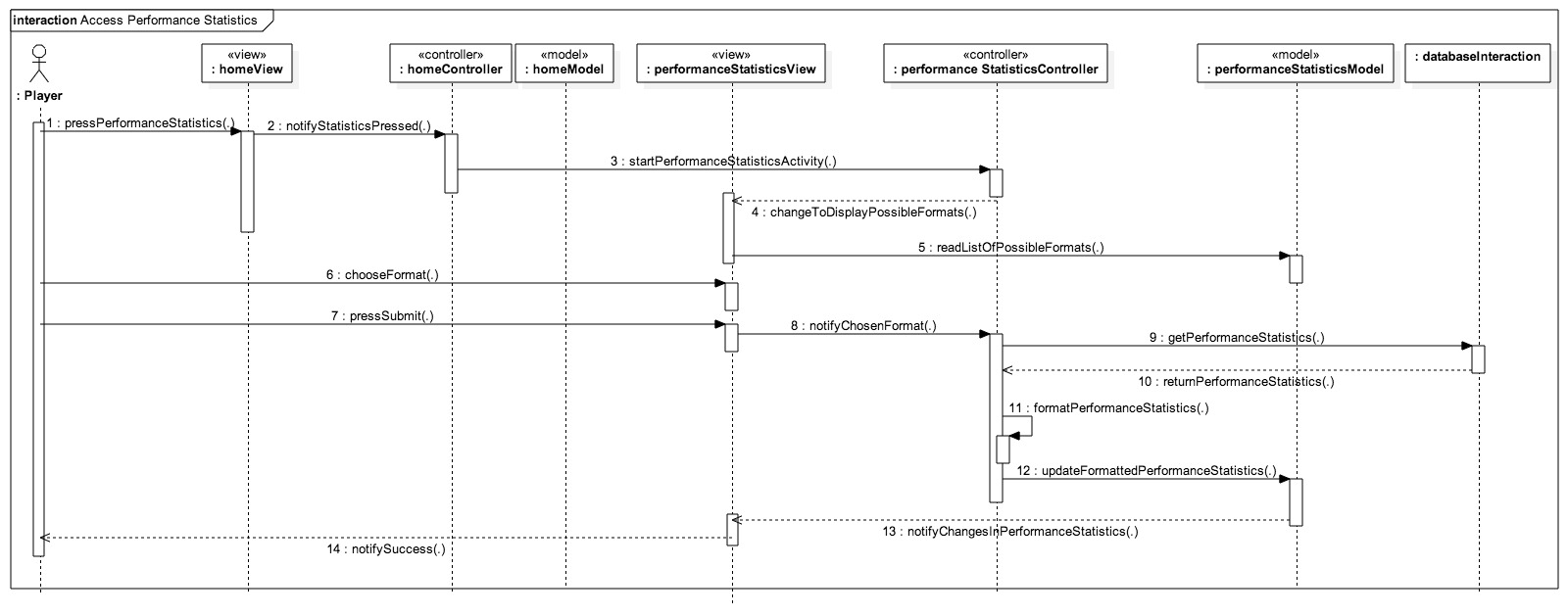
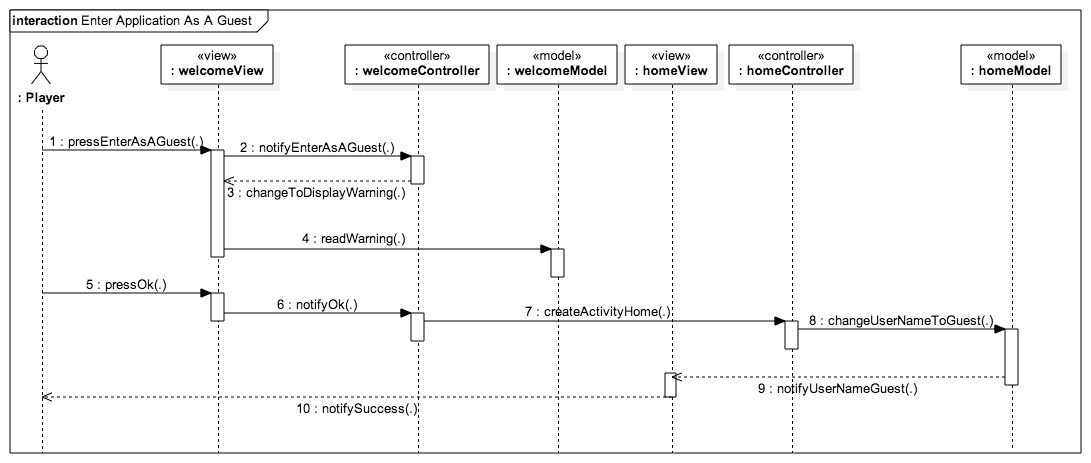


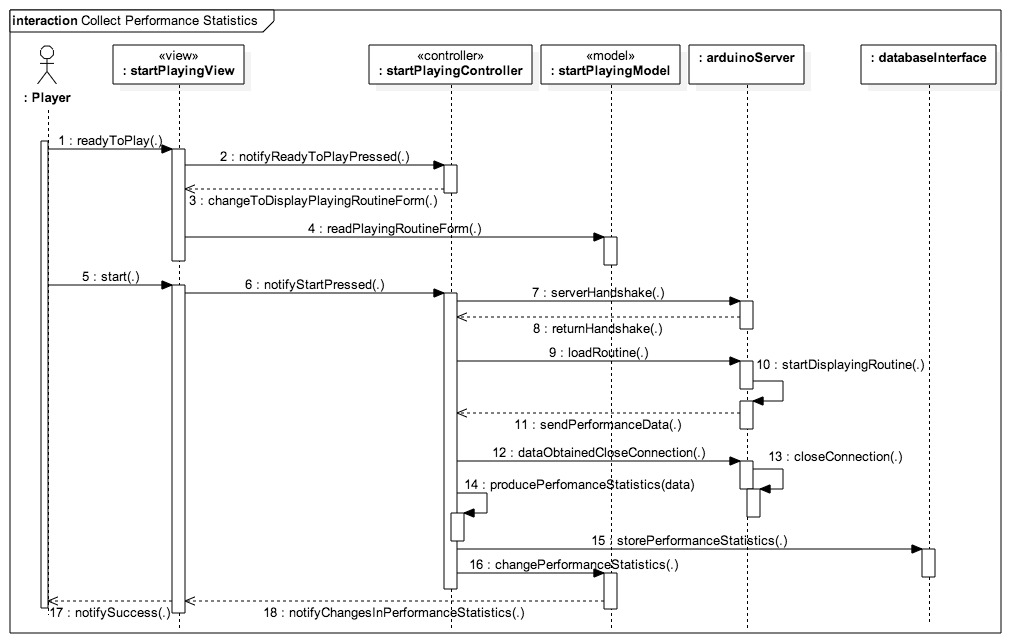
Figure 5 Class Diagram

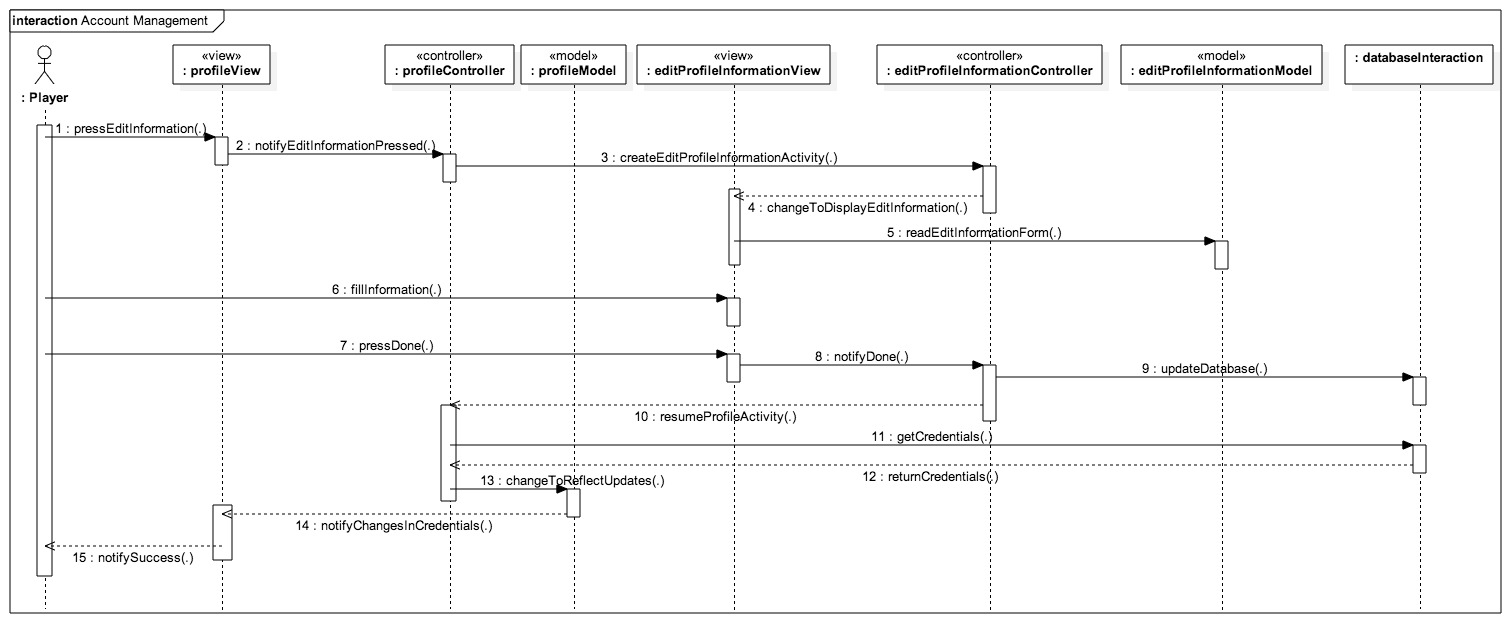
### Dynamic Model

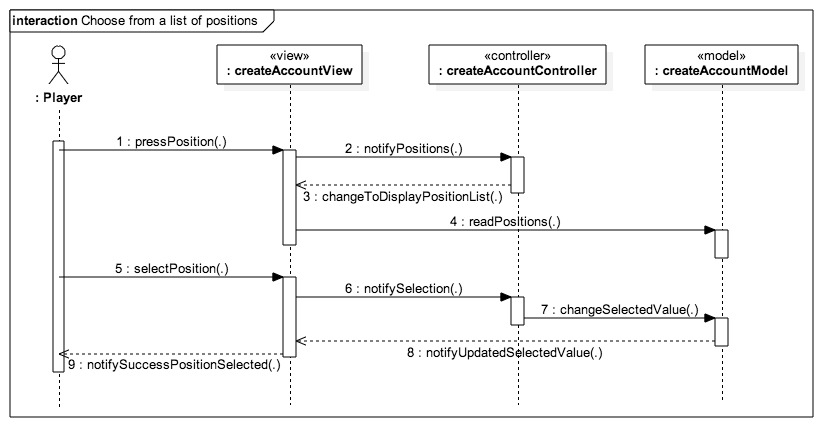
Figure 6 Account Creation Sequence Diagram

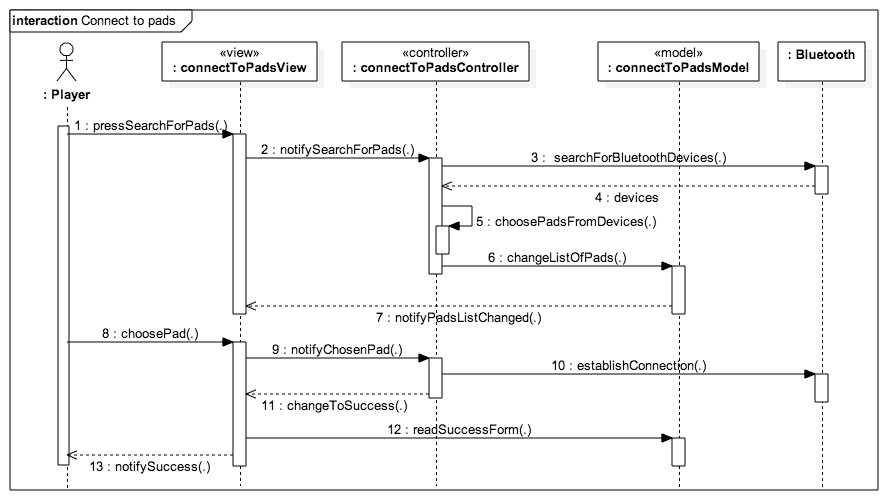
****  
Figure 7 Access Player Statistics Sequence Diagram

  
Figure 8 Enter Application as A Guest Sequence Diagram

  
Figure 9 Collect Performance Statistics Sequence Diagram

   
Figure 10 Account Management Sequence Diagram

  
Figure 11 Choose from a list of positions

  
Figure 12 Connect to Pads

### Code Specification

## Glossary

## Appendix

### Appendix A – Use case diagram

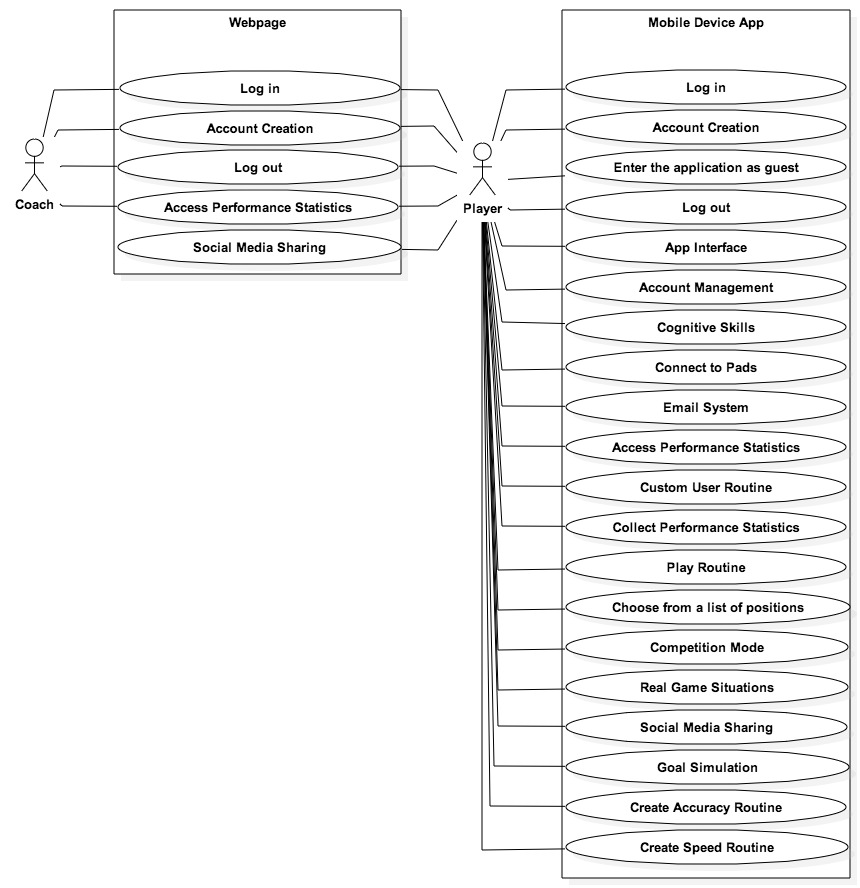


Figure Use Case Diagram

### Appendix B – Implemented Use Cases

### Appendix C – Detailed Class interfaces

### Appendix D - Diary of Meetings and tasks

1. **Meeting 1:**

Monday 1/19/15

@8:57pm

Meeting on Mingle starts

In attendance: Andy Martinez, Matthew Santiago

@9:08pm

Arranging possible meeting times for Requirements Elicitation:

* Tuesday 1/20 9:00 pm
* Wednesday 1/21 before 2:00 pm
* Wednesday 1/21 after 7:30 pm

@9:23pm

Chose for Andy Martinez to be Scrum Master for the first sprint

@9:28pm

Sent message to @Product Owner for their preferred meeting time:

* Awaiting reply…
* **1/20 @10:43am** Reply Received, Meeting Tuesday 1/20 at 9:00 pm confirmed

@9:33pm

Meeting Dismissed

1. **Meeting 2:**

Tuesday 1/20/15

@9:00 pm

Conference Call Started

In attendance: Matthew Santiago, Andy Martinez, Jaime Borras, Gummi

@9:02 pm

Introductions

@9:12 pm

Stories:

1. Skill development (accuracy, speed, intensity)
   1. User chooses skill to train from Android App
   2. Measure pressure, time
   3. 3 colors red blue green
   4. Change to red when underperforming
   5. Ball should take 5 seconds to hit the pad, turn red if user takes too long
2. Tracking and analysis
   1. accuracy, speed, intensity, reaction time
3. Single Player/2 Player
   1. Social Media Connection
4. Mapping a game
   1. Pad light up, hit pad with ball in proper time, another pad lights up, hit with ball in proper time, continue until you make goal (certain number of successful iterations)
   2. Beginner, Intermediate, and advanced levels
5. Simulator (simulate a pad)
   1. Android application?
6. (Backend look at particular game (real game) and simulate a player or play within that game)

@9:32 pm

Set meeting with Gummi on 1/21 at 11:00 am in GL 693

@9:38 pm

Meeting Dismissed

1. **Meeting 3:**

Thursday 1/22/15

@9:00

Conference Call start

In attendance: Andy Martinez, Matthew Santiago, Jaime Borras

@9:07

Review stories

Predetermined Routines:

* Separate Goal Simulation into its own story

Performance Statistics:

* Add statistics about specific game

Competition Mode:

* Separation of social media into a new story is good
* Have different routines for single and multiplayer

Custom User Routine:

Pads Simulator:

Real Game Simulation:

Social Media Sharing:

Website:

* (Differentiate between coach and player?)
* Webpage access

@9:46

Meeting Dismissed

1. **Meeting 4:**

Tuesday 1/27/15

@ 6:30 pm

Meeting starts

In attendance: Jaime Borras, Andy Martinez, Matthew Santiago

**Github upload schedule:**

Matthew upload from 10:00pm - 10:59pm

Andy upload from 11:00pm - 11:59pm

**Weekly in-person meeting:**

Thursday between 2:00pm - 6:00pm to prepare for weekly meetings with project owners

**Coding standards**

Comment Convention:

/\*\*

\* Comment goes here

\* and here

\*/

fun()

{

random code

}

**Indentation:**

1 tab per pair of curly braces

**Variable names:**

private \_variableName

public variableName

**Reports:**

**Matthew:** Feasibility report & Initial System Design

**Andy:**  Project Plan & Initial Object Design

**Read up on:**

Android BlueTooth library

Java Databases

1. **Meeting 5:**

Tuesday 1/30/15

@ 4:00 pm

Conference Call starts

In attendance: Jaime Borras, Andy Martinez, Matthew Santiago, Gummy

Complete?

## References