myAPFT

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Contents

Abstract

myAPFT will revolutionize the way soldiers in the United States Army prepare for and take part in the Army Physical Fitness Test by providing not only a quick, elegant, easy-to-use calculator for determining APFT scores, but also act as a social and competitive platform tailored to a soldier's needs.

myAPFT will turn off duty fitness into an enjoyable and rewarding experience by adding gamification and competitive features that will motivate users to strive for improved physical fitness. This type of motivational experience can been seen on such applications and devices as FitBit and myFitnessPal, both of which create and log user goals and provide in-app achievements that increase the user experience.

myAPFT will be written in Swift and developed in Apple's Xcode IDE. Following from Apple's human interface guidelines [2], the application will include an easy to navigate tab bar and include framework such as Google's Map API and open source iOS graph frameworks for tracking user data. In total, myAPFT will be adaptable for the users who's only desire is a score calculator to the users who want the immersive social and competitive platform that myAPFT also offers.

1 Introduction

myAPFT has two main purposes: to act as an easy-to-use Army Physical Fitness Test calculator and history database in order expedite the calculation process and remove the need to calculate scores by hand using large data tables, and secondly, to become a social fitness platform that motivates soldiers to stay active and healthy during long gaps in duty weekend, which occur once a month for Reserve and National Guard members.

1.1 Army Physical Fitness Test

The Army Physical Fitness Test (APFT) is a standardized fitness and performance test in which all soldiers in the United States Army, to include Active Duty, Reserve, and National Guard, must meet a standard fitness goal that is associated with their gender and age.

The APFT scores soldiers in three separate physical events whose total sum must meet a minimum score of 180. Each of these events has a maximum obtainable score of 100 points. Maxing out each of these categories will results in a perfect overall score of 300 points. The three events that every soldier must take part in, in order, include:

- 2-minutes of push-up
- 2-minutes of sit-up

- 2-mile run

Soldiers must also meet a minimum of 60 points in each of these events. For example, the soldier cannot obtain a maximum score of 100 in both the push-up and sit-up events, and receive 0 in the 2-mile run.

1.2 Current Problems

The APFT is a performance test that is taken twice a year per soldier. While active duty soldiers have a regular regimen of early morning physical fitness that keep them in shape in these six month gaps, those in the Reserve and National Guard do not. Of course, many soldiers maintain fitness regimens at their home gyms or through other means, but many in this population have other duties that keep them form thinking about this such as another full-time job, family, and children. There are also those that just lack the proper motivation to keep a regular fitness regimen. Without setting proper fitness goals and developing a regular fitness regimen, soldiers can lose a lot of muscle mass and strength within these size month gaps.

The current method for scoring the APFT is done on paper, by scouring long tables of scores based on the number of reps performed in each event. During the events, some soldiers act as graders, counting the number of repetitions in each of the events and recording the score. In then end, ether they add it up by hand or use their calculator app on their phone. These scores end up on a paper scorecard in a filing cabinet, inaccessible to the soldier, making it difficult to see increases or decreases in physical performance.

1.3 How myAPFT Fixes These Problems

At first glance, myAPFT will be an easy to use calculator for the Army Physical Fitness Test that will free up user time that is normally spent running up and down long tables to find their scores.

Not only will myAPFT speed up the calculation of user scores dramatically, it will also keep a history of user scores that will turn into data to be used in goal settings and graphs to display the user's improvement or decline in physical strength over their course of use with the application.

In order to keep users motivated in between the six month gaps between fitness tests, myAPFT will act as a personalized and social platform for setting and achieving goals, rewarding users for reaching their goals and creating a competitive platform for users to share their achievements with others

2 Project Description

2.1 Use Cases

2.1.1 Use Case 1: Bare Bones

myAPFT's front facing functionality is the easy to use score calculator. A user in this case simply wants nothing more than to be able to calculate their score quickly and efficiently without any other distractions. This user will download the application and expect no additional data usage to come from the app, the ability to use the app in and out of cell service areas, and want to use the service without their location being used and without taking up large portions of their internal storage.

The user in this use case will begin by simply downloading the myAPFT from Apple's App Store. Upon opening the application, the user will be prompted with a welcoming screen that will ask for the minimal amount of information necessary to begin calculating the user's test score. This information includes the user's age and gender. They will also be asked if they would like to provide a profile picture from their phone's photo storage but they are allowed to skip over this step. Following the initial welcome screen, the user will be taken to the first screen in the application, the ScoreCardViewController. This simple interface clearly marks where the user can enter the number of reps performed in both the push-up and sit-up sections of the test as well as their run time. After all fields have been successfully filled, the user score will automatically be calculated and displayed on the same screen for them.

Immediately after calculating their score, the user has two options: save the score card to their history or delete the score card. Both of these operations can be performed by a simple swiping gesture. The user simply swipes the score card to the left of their screen to delete the score forever, or the user can swipe the card to the right of their screen to save it to their history, which can be view by accessing the second tab on the screens tab bar.

2.1.2 Use Case 2: Personal Motivation

The user in this use case is someone who may not have physical fitness in their list of strong suits, but that's okay! They want an experience that will allow them to improve on their own without other users shining over them and want to motivation to help them achieve their goals.

This user downloads the application from the App Store and happily personalizes their experience by adding a profile picture and a name to the application when prompted on the welcome screen. They won't have to worry about their score cards being shared until they're

ready because the local sharing option will be turned off automatically on the settings page.

This user then notices the "Goals" icon at the bottom of the screen in the tab bar and clicks on it. They are taken to a screen that presents graphs, though empty due to a lack of data from the user, that track the scores from the user's history of push-ups, sit-ups, and run times. Scrolling down on the same screen, the user will see a place to set goals, which include a section for settings goals to meet specific high scores in each of the three tested areas. This user is an avid runner, but could really use some help achieving higher scores in the push-up and sit-up sections. They do this by entering in their desired score in prompting text fields on the screen as well as settings how often they are free during the week. These free times will be used by myAPFT to schedule short and effective workouts that the user can perform in their own home.

The user has exactly a month until their next fitness test, but isn't worried because they plan to use myAPFT to achieve a high score this time around. With a wealth of free time, the user scheduled workouts everyday with myAPFT. Each day at 3:00 p.m., the user alternates between a push-up or sit-up centered workout by being prompted on their phone with a notification from the app. Upon answer the notification, they will see a detailed view of the workout, along with a timer that the user can start when they are ready.

Today's workout includes a 5-minute session of guided push-up workouts, including wide-hand placement, mid-hand placement, and close-hand placement which helps the user workout a wide range of muscles that are all used when performing this exercise on the test. The following day that will have a similar workout scheduled, this time involving sit-ups.

Come time for the fitness test, the user is ready to hit their goals! By keeping up with their fitness regimen, the user adds ten push-ups and ten sit-ups to their total test score. After entering and calculating their score in the app, they save the score to their history and are notified that they reached their goals! They are then awarded an achievement which they can find in the application and share with their friends.

2.1.3 Use Case 3: Competitive Spirit

This user is constantly seeking out competition in every way they can. They always strive for the top of the leaderboards and if there isn't one, they'll make one.

During their Army Physical Fitness Test, this user doesn't even break a sweat. To ensure they have the top score in their unit, they go around and check out everyone's score card, comparing scores back and forth. If only there was an easier way for them to make sure that he was doing better than everyone else!

One day they stumble across myAPFT on the App Store and decide to download it. When setting up their account, they decide to let the auto sharing feature be turned on automat-

ically. They enter their latest test scores into the app and let it be shared to the users around them. When they go to the map view to see other score cards around them, they see that they are no longer hold the highest test score! The user immediately starts setting and tracking goals in order to raise their score, until they finally start beating their new found competition.

2.2 Features

The following section will outline, in detail, each of the features that may be found throughout myAPFT. These features will be discussed according to the ViewController that they appear in. In iOS development, a ViewController is the corresponding Graphical User Interface in which the user is currently viewing on their device (iPhone, iPad, iPod).

myAPFT will be a "tabbed" application, meaning the central navigation unit for the application is a tabbed bar at the bottom of the user's screen in which they can click a corresponding tab to switch to a different view. This allows users to navigate to any view from any other view.

2.2.1 ScoreCardView

The ScoreCardView will be the front facing view for the application. In this view the user will see an empty "score card" with text fields for the number of repetition they performed in the push-up and sit-up portions of the APFT, as well as a text field where they may enter their run time. Upon entering numeric values in each of the three fields, myAPFT will calculate the total score and present the total score to the user on the screen.

After receiving their calculated score, the user may then either discard the score, or save it to their history. To discard their score, the user simply swipes left on their score card until it disappears off screen. Similarly, if the user wishes to save their score, they can swipe the score card to the right of their screen.

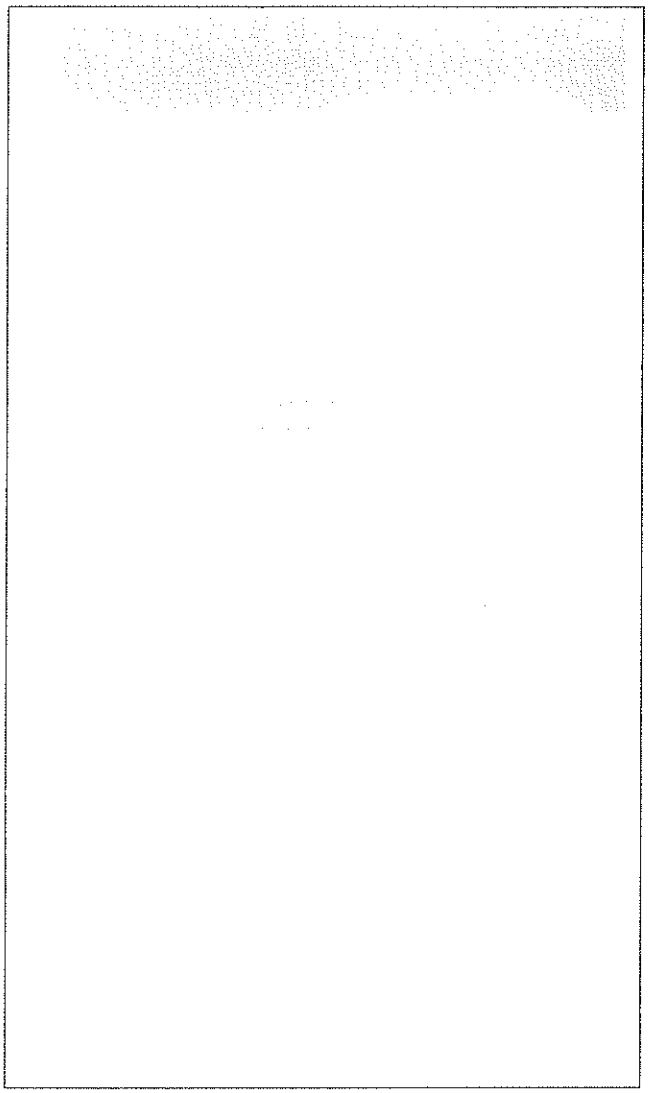

Figure 1: ScoreCardView Mockup

2.2.2 HistoryView

The HistoryView is the second screen of the application. In this view, the user will be able to scroll through all the score cards they have saved during their time using the application. This view has a couple unique features that have not yet been discussed:

Core Data: This section of the application uses a feature of iOS Development entitled Core Data. "Core Data is a framework that you use to manage the model layer objects in your application. It provides generalized and automated solutions to common tasks associated with object life cycle and object graph management, including persistence." [4] In short, Core Data allows the programmer to store data on the user's device, rather than to a database.

This allows the user to access information without needing to rely on network connectivity.

UITableView: This screen includes what is know as a UITableView. This is a scroll-able collection of data in which all the programmer has to do is define how one row or "cell" in the table is supposed to act, and allow them to have an array of data be display as cells in a scrolling view. In this way, the user's score cards are stored in an array as special cells that the table view then loads and displays to the user.

The user also has two options while scrolling through the history table. They may also use swipe gestures to perform actions. This can be seen in the figure below where the use has swiped left on a cell and is prompted with a previously hidden delete button. Clicking the button removes this score from the table as well as from the user's Core Data. Similarly, the user may swipe right and be prompted with a Share button. This will allow the user to share their score card to the local map.

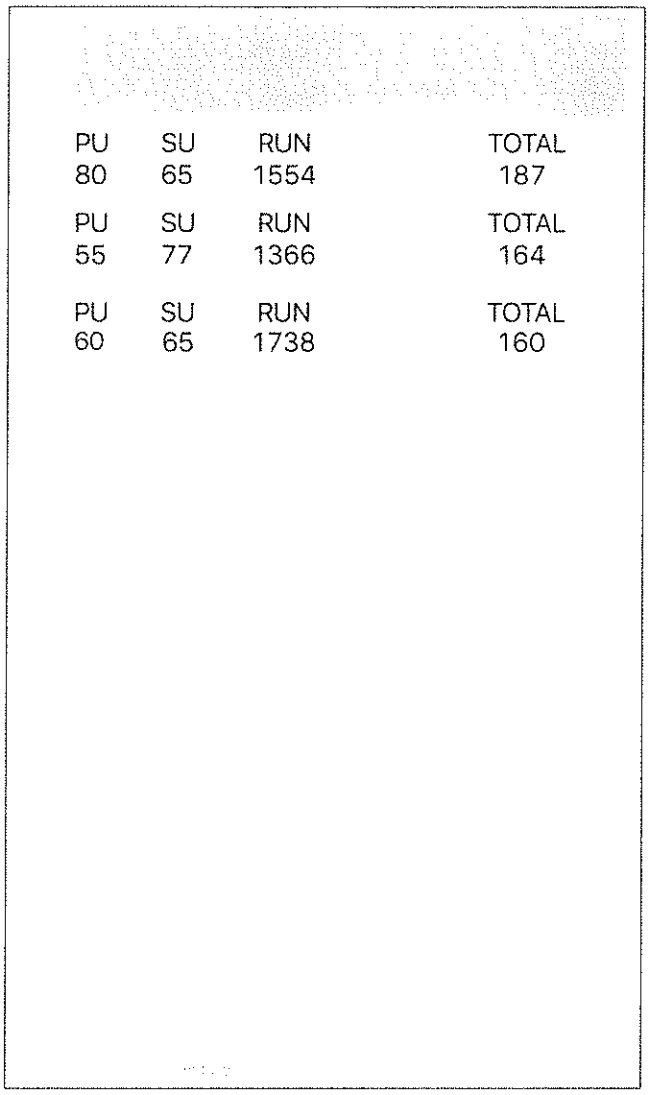

Figure 2: HistoryView Mockup

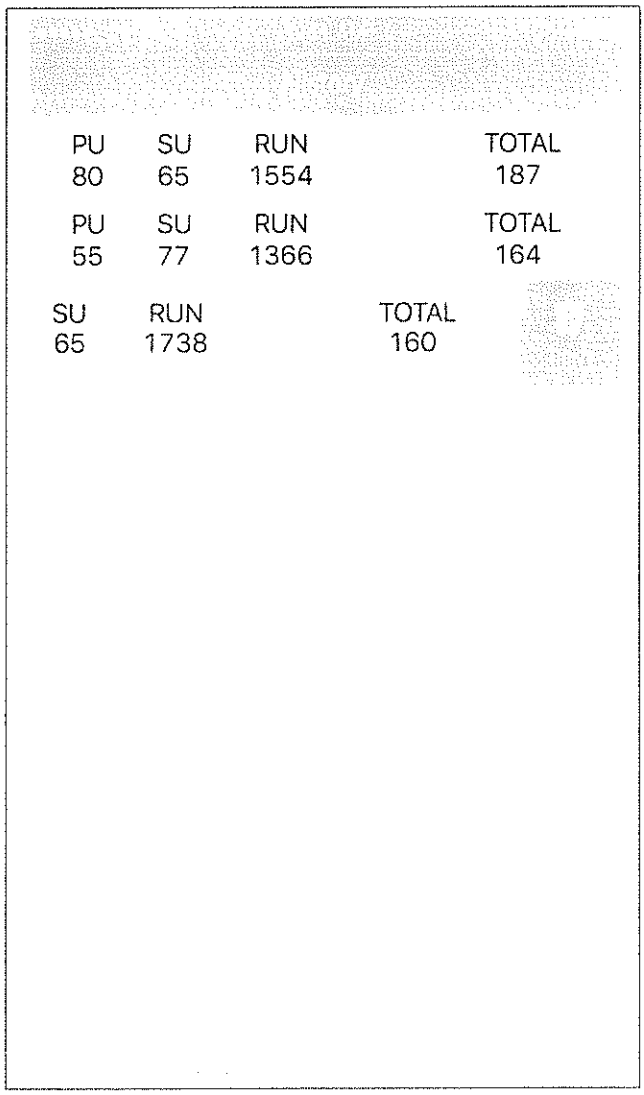

Figure 3: HistoryView Delete Mockup

2.2.3 MapView

The MapView is the GUI in which multiple third-party libraries come together to add competition to myAPFT. When the user enters the MapView, they will be shown a satellite view map of their current location, with a blue dot in the middle signaling their exact location. This map will be provided by the integration of the Google Maps SDK. This easy-to-integrate library will allow the the programmer to find the users location by enabling the phone's location services and returning a single data type which includes a latitude and a longitude.

Plotting Points: Using the Google Maps SDK, the programmer is able to plot points on

the map by creating and dropping "pins" onto the map, which are effectively just latitude-longitude pairs. These pairs will be stored on a backend server, Parse. "Parse is the perfect cloud to power your app on any platform," is the one-liner that can be found on their website. [1] Parse allows for easy querying and store of information from mobile applications. In myAPFT, Parse is used to store geolocations and user's score card data. In the MapView, the backend is queried for all geolocations within a specific radius. Each geolocaiton matching the criteria is stored in an array and then mapped as pins on the MapView's map.

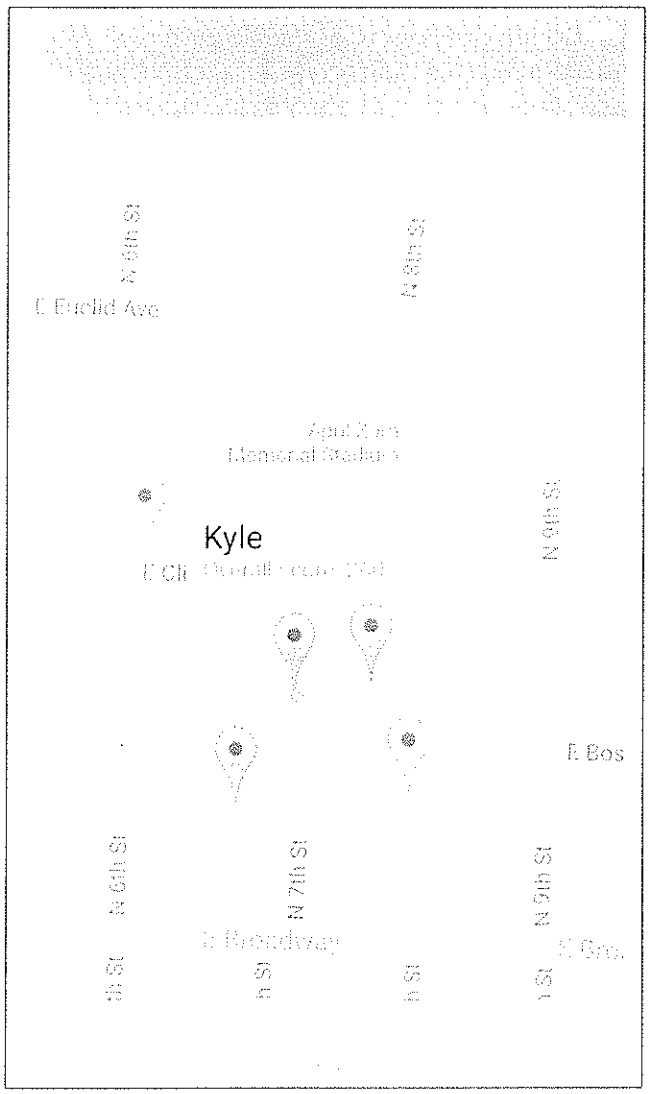

Figure 4: MapView Mockup

2.2.4 GoalView

The GoalView brings together many different concepts that keep users engaged with continuous use of myAPFT.

Data Tracking myAPFT provides users with the technology to set fitness goals and the ability to track those goals with data graphs which grow with the use of the application. By storing the user's data from their fitness test calculations and leveraging open source iOS graphing libraries such as BEMSimpleLineGraph [6], or PNChart [10], the user will be able to see their fitness progress mapped against their goals they set.

Gamification "Gamification has been defined as a process of enhancing services with (motivational) affordances in order to invoke gameful experiences and further behavioral outcomes." [9] By including an achievement system in myAPFT, users will stay engaged during the six month gaps that occur between Army Physical Fitness Tests. Acievements will be earned in a multitude of ways, encouraging users to use all aspects of the application and to use the application regularly. Some of the achievements that may be found will categorized as such:

- Lifetime Achievements – Users will be rewarded for the time spent using the application.
- Goal Based Achievements – Users will be rewarded by settings and reaching goals
- Use Based Achievements – Users will be rewarded for using all aspects of the application, from calculating their score to sharing their score with other users.

2.2.5 SettingsView

The SettingsView of myAPFT will be a minimalistic view that will allow users to customize the application without crowding them with unnecessary options. The options will be laid out as follows:

- Edit Profile - This option will allow the user to upload or change their profile picture from the photos on their device as well as change their name, gender, and age.
- Auto Sharing - The auto sharing option will be a simple on/off switch. When the option is on, each score that the user calculates on the ScoreCardView will be automatically shared to the MapView. Turning it off will force the user to manually share their scores to the map.
- Delete Account - This option will allow the user to completely delete their account should they want to. Upon pressing the delete button they will be prompted to confirm

their decision. Upon deleting, the application will erase all data that has been stored in the user's Core Data.

2.3 Stakeholders

The set of stakeholders will include the following groups:

Soldiers: Any soldier in the U.S. Army that would like to calculate and save their fitness test scores to their iPhone while publishing and storing minimal information to backend servers.

Pre-basics: Pre-basics are those individuals who have signed up for the Army but are waiting to be sent into training. These individuals will be able to see whether or not they meet Army fitness standards as well as find and track areas in which they may improve.

2.4 Ethics

Issue: Information Security: A user who offers any personal information to an application must entrust their information's security in the software and in the developer.

Resolve: All personal user information will be stored on that specific user's device, where it will never be sent to or touch an external server.

Issue: Sharing Privacy: Users who wish to use the location based sharing features should not have to publish personal information.

Resolve: In myAPFT, users have the option to share their scores to a local feed. This option is turned off by default. Minimally the user will only have to share their scores, should they choose to share anything. Users may also include their first name and profile picture, though not required to use the feature.

2.5 Design and Architecture

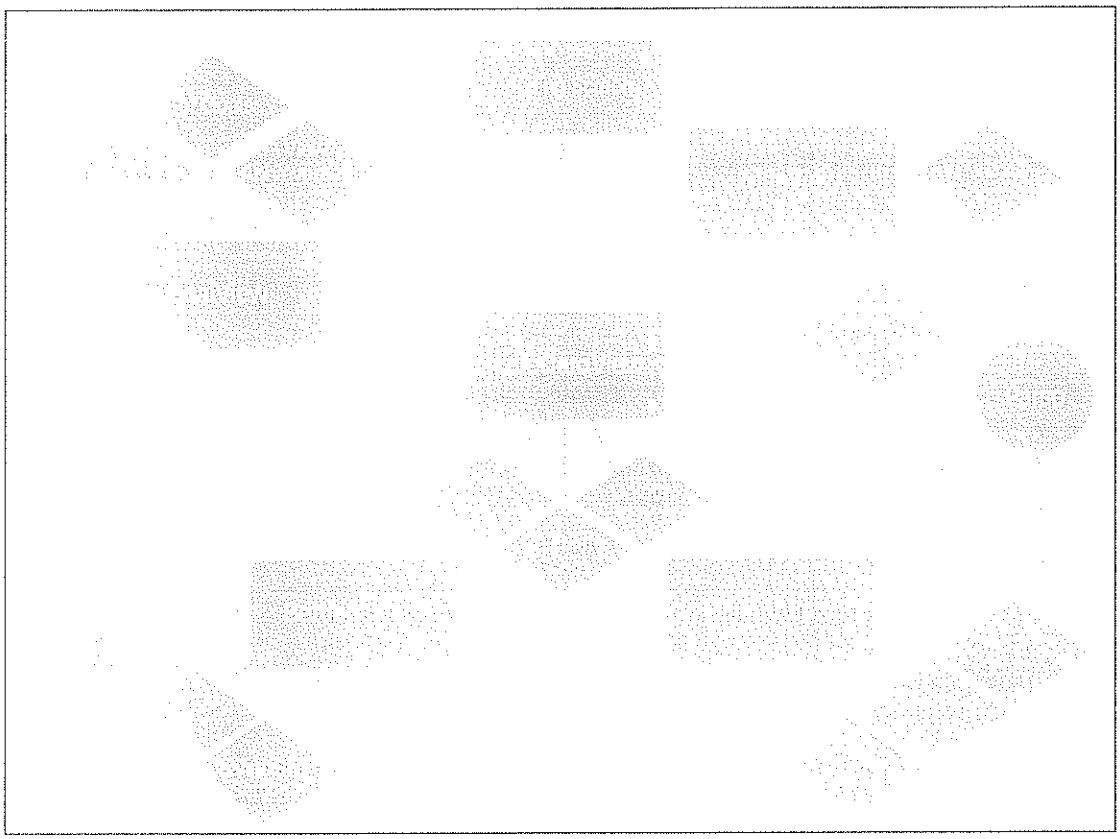

Figure 5: Projected System Design

3 Foundations

The following sections outlines the core foundations that will make up myAPFT, including best practices and research in the area of mobile application development and user experience.

User Experience Apple clearly defines that basis for what makes a good app for their App Store. They outline these into three categories: "deference, clarity, and depth". [2]

Following along with the Apple design standards, myAPFT's navigation was built upon key user research. Many apps on the App Store, even many popular ones such as Spotify, use the "hamburger" style menu navigation in their apps. (So dubbed because of the three layered button in the upper left hand corner that roughly resembles a hamburger). Many user interface (UI) designers beg developers to end their use of this style of navigation because it hides the navigation options that are available to the user. Essentially, what is out of sight is out of mind, meaning users spend less time in the application because they constantly have

to go find where else they can visit in the app. Many designers pave the way for a better navigation system, the tab bar. In a test done on app usage in the mobile application *zeebox*, the tab bar drove a 55 percent average weekly frequency of use, and an 8.7 percent higher average daily frequency. [11] It may seem obvious that displaying the available options to the user on every screen of your app would drive usability up, though some developers do not like using the already limited screen space for navigation bars. But tests do not lie and big companies often follow user trends, so the App Stores most popular apps such as Facebook and Twitter have taken to the tab bar navigation style. myAPFT follows suite, allowing users to access any page of the app from any other page, which reduces the amount of searching and swiping the user must perform.

Gamification Through Achievements The APFT is only performed twice a year, so there must be that encourages users to user myAPFT in between those six month gaps. By allowing the user to collect achievements in the app, the user will be engaged more than just twice a year.

"Achievements are a great way to track what a player has done in your game and to give the player more incentive to keep playing your game. An achievement represents a quantitative goal that the player can accomplish in your game." [3]

While many users will be able to obtain a few achievements through basic usage, such as calculating their score, they must engage themselves with the app in order to collect them all. Achievements will be earned through extensive use of the app, from customizing the user profile, to setting and reaching goals, to sharing scores on the local map. Being able to view both obtained achievements and locked achievements will encourage users to maintain their time spent using myAPFT.

4 Implementation Plan and Time Line

The following sections will detail the tools and libraries used within myAPFT the allow for effective and efficient development for the programmer and interactive components for the user.

4.1 Implementation Framework

Xcode IDE The Xcode Integrated Development Environment (v7.0) is an all-in-one tool that allows developers to work on the full suite of Apple's operating systems with ease. Xcode includes built-in testing support, connection to the Apple Developer program to sign your apps with your digital developer signature, and the ability to test your applications directly on your iDevice.

Xcode also includes an intuitive Interface Builder, which allows the developer to "prototype in minutes, then graphically connect your interface to the source within the Xcode editor, laying out windows, buttons, and sliders to create a functioning Mac, iPhone, or iPad user interface." [5]

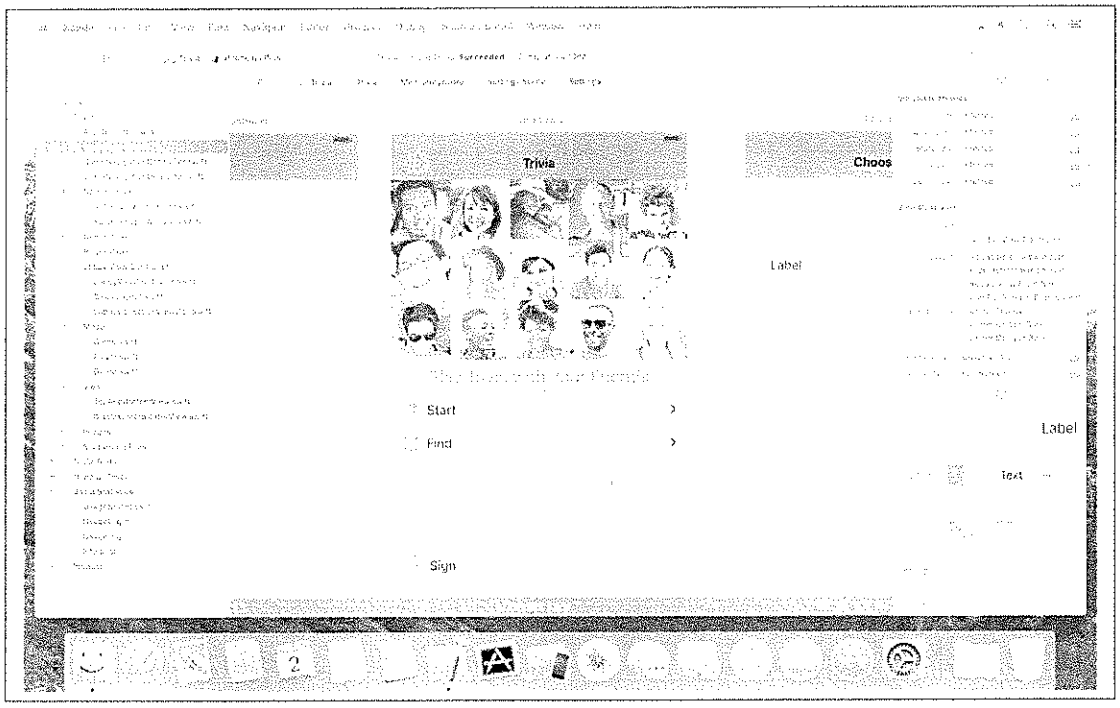

Figure 6: Xcode Interface Builder

Sketch 3 Sketch 3 is a software package designed specifically for designing interfaces within your Apple applications. Sketch 3 allows a developer to "easily create complex shapes with our state-of-the-art vector boolean operations and take advantage of our extensive layer styles. Sketchs fully vector-based workflow makes it easy to create beautiful, high-quality artwork from start to finish." [7]

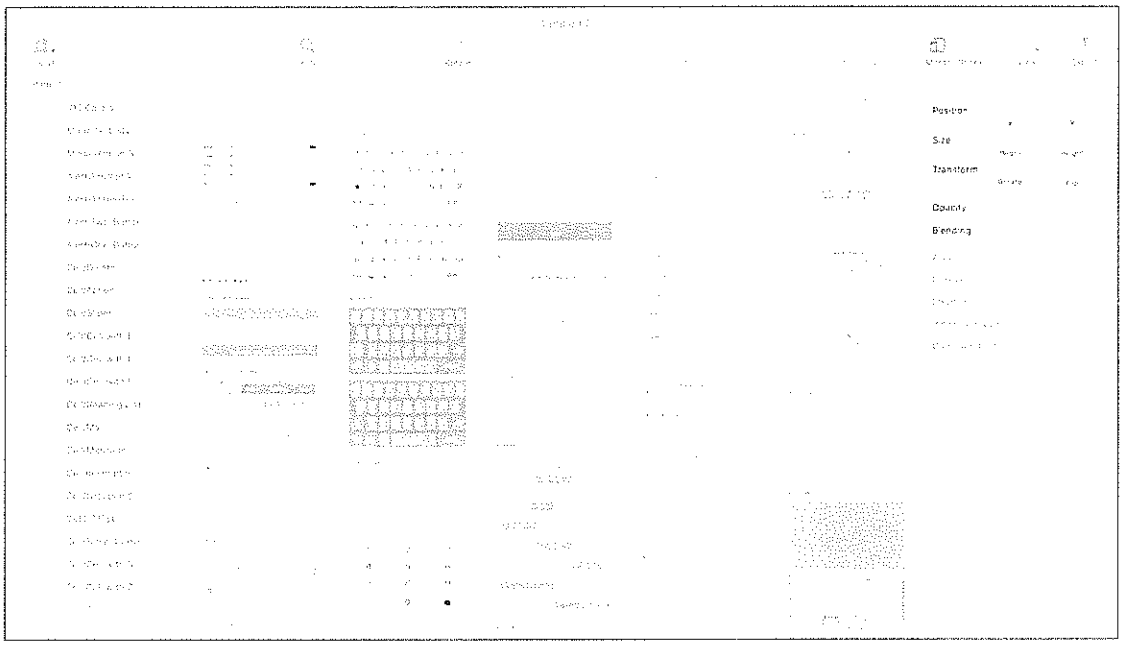

Figure 7: Sketch 3 iOS Design Template

4.2 Libraries

Parse "Parse is the perfect cloud to power your app on any platform." [1] Parse allows anyone to have access to a free backend database for their projects. Included in Parse's free database plan are unlimited data analytics tracking the usage of your application, ability to add push notifications, and a 30 request per second limit on all database queries. While the scalability of this free service is very limiting, the free data plan will allow myAPFT store and query user scores with minimal effort.

Google Maps Using the Google Maps SDK allows the programmer to "automatically handle access to the Google Maps servers, map display, and response to user gestures such as clicks and drags." [8] Using Google Maps SDK in myAPFT will allow users the programmer to easily collect the user's latitude and longitude in order to share their scores as well as pass this information to Parse in order to find local scores.

Graph Libraries The use of open-source graphing libraries will leverage existing libraries in order to track user data for each of the APFT's physical activities as well as track how close the user's scores are to the goal they have set for themselves within myAPFT.

4.3 Time Line

Checkpoint 1

- Complete ScoreCardView, HistoryView, and SettingsView Graphical User Interfaces

Checkpoint 2

- Complete functionality for ScoreCardView, HistoryView, and SettingsView
- Label as v1.0 and uploaded to Apple's App Store

Checkpoint 3

- Google Map integration
- Parse integration for storing score cards by geolocation
- Local sharing tab/view added to application

Checkpoint 4

- Open source graph API added to application
- Ability to track data and plot graphs through user history
- Add Goals tab/view to app

Checkpoint 5

- Achievement system/gamification added
- Ability to set fitness goals
- Ability to schedule workouts

Checkpoint 6

- App available on Apple's App Store
- Real User Feedback

5 Conclusion

The Army Physical Fitness Test is currently a monotonous and lengthy process in which tables of data including how to calculate scores are carried around on pieces of paper and scores are calculated by hand and never seen by the soldiers until their next APFT, in six months. This six month gap is one that is typically filled with other obligations such as school, other jobs, or kids. During this time, off duty soldiers often forget or don't feel they have the time or motivation to keep up with their fitness regimen.

myAPFT will tackle these problems by creating an experience that can be tailored to the most simplistic or to the most engaged and competitive users. Leveraging libraries such as Google Maps, Parse, and open-source graphing tools to track user data, users can now calculate their APFT scores with ease, and now keep a history of their scores using Apple's Core Data functionalities. The simple user may stop here, but the competitive user will go on to share their high scores with their local feed, as well as set fitness goals and earn as many achievements as possible. No matter the user, no personal information entered within myAPFT, such as the user's name, age, or gender, will ever be stored on a server. All of their information will be stored on the user's secure device, with the ability to clear their phone of all stored data through the settings view.

No matter the user type, they will find that not only is myAPFT attractive because it is the first free APFT app on the App Store and built with the latest UI/UX standards, but because it will allow soldiers to have a personalized fitness tool to help them go above and beyond the Army standard.

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