

Senior Project Design Report

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LOOPE



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Introduction

Project Overview

Looped is a crowd-sourced music-making iOS application. It is designed to bring friends together through creating melodies by looping mp3 samples. A user will choose a sound from the Looped sound database, loop that sound however he or she chooses, and then post it to their friends. The next user can then pick another sound, and loop that sound on top of the previously posted loop, creating an overlay of sound samples. The sound database is comprised of mp3's provided by the creators of Patatap. Patatap is a simple online interface for playing sounds with your computer keyboard.

Stakeholders

The users who download our product are the main stakeholders of the project. The app will be available to anybody with an iPhone. There is no target age group, but the app will likely be best utilized by users over the age of 10.

Project Goals and Objectives

The main goal of this project is to provide a fun, intuitive, easy-to-use application for iPhone users who love playing with music. In the future, the objective is to create a social networking version of Looped which will allow users to share loops with their friends and add content to existing loops sent to them.

Project Outcomes and Deliverables

The target outcome of this project is for iPhone users to have a sleek, fun, intuitive application for to share and make short songs. There are similar applications, but none intended

for sharing and collaboration. It is our goal to utilize technology to create Looped for users to enjoy.

The only deliverable of this project is a base version of the final iPhone application. There are many different aspects to be completed before Looped is considered finished. The first is a solid architecture. The software should be able to handle extensive performance testing without creating any slowdown, bugs, or loss of information. Likewise, the app needs to continue to function at the same level regardless of the size of the user database. The user interface needs to be functional and intuitive, and go through usability testing with random users. For the scope of our Senior project, the deliverable is a functional recording screen. The “Explore” and “Newsfeed” are future deliverables.

Team Mission and Objectives

Our mission as Team Looped is to provide a modern day application for music lovers and iPhone users everywhere. As a team, we will strive to:

- come to decisions unanimously
- constantly seek feedback from users
- provide each other and our advisor with updates
- maintain deadlines and attendance for team meetings
- always ask each other questions
- have a positive atmosphere with constructive criticism
- impact each other with positivity

Team Membership and Roles

Lia Zadoyan - Project Manager, Software Designer, System Interface, User Interface

Barbara Wong - Software Designer, System Architect, Financial Officer

Related Work

There are many different audio looping apps available on both Android and iOS markets. Many of the following applications help provide a proof of concept for our project.

[1] The first and most popular application is GarageBand. GarageBand is Apple's own music composition software, containing their "smart" instruments. GarageBand has an arrangement view that allows you to access loops and effects to add on top of your recordings. Garageband costs \$4.99, and is quite difficult to use on an iPhone or iPad, and designed more for use on a computer screen.

[2] The second application, available for iOS devices, is Loopy. Loopy is a live looper app for iPhone and iPad. Loopy allows users to create music by layering looped recordings of singing, beatboxing, or playing an instrument. The app costs \$2.99 for iPhone, and \$3.99 for iPad and an HD iPhone version.

[3] Next, there is FL Studio Mobile. FL Studio Mobile is the iOS version of Fruity Loops, a computer software designed solely for music creation. FL Studio Mobile costs \$14.99 and is designed for serious musical composition. Again, Fruity Loops is best used on a computer screen, but FL Studio Mobile is fun for those who already know how to use Fruity Loops. It is an extremely complicated software, and takes years to master.

The above apps are very similar to Looped in terms of the project goals. These apps are created for music composition. iPhones are not quite a suitable platform to compose entire songs on, which is why Looped serves a slightly different function. Looped is intended for light-hearted use, and uses system provided mp3's to create short duration sound clips rather than recording your own instruments into full-length songs. Furthermore, Looped will be free on the App Store.

[4] The sound library for Looped is derived from Patatap. Patatap is a free, simple, easy-to-use website which incorporates jQuery animations with sounds. Users simply press any key from A-Z on their keyboard to access different sounds. Pressing space shifts to a new sound library. Patatap graciously provided their sound database to incorporate into Looped.

Formal Product Definition

We defined two sets of requirements for the presented problem. One, our marketing requirements, are built to define what the system needs to do for the user. The second, our engineering requirements, are made to be measurable requirements influenced by the marketing requirements.

Need Statement

The general public, without knowledge of music production, does not have access to an application that would allow them to demonstrate their musical creativity without previous knowledge. Furthermore, there is no such application that is free. Looped is designed for the average app user, meaning they don't need to have any previous knowledge of music production to have some music-making fun.

Objectives

The most important objective is to have an intuitive and functional application for iPhone users. Looped is meant to be fun and simple to use or understand.

Marketing Requirements

1. Intuitive
2. Easy-to-use

3. Make sound loops!
4. No musical background necessary for users
5. System will be safe and non-damaging to the environment and users.
6. System supported for iPhones 4, 4s, 5, 5c, 5s.

Engineering Requirements

1. User will be able to navigate to sound library screen in less than 5 seconds after login.
2. User will be able to successfully log in within 3 seconds.
3. System will be free for iPhone users.
4. This software will not break and law in the United States.
5. This system must be implemented in iOS.
6. This system will use Parse framework for the user backend.
7. Software will backup every 5 minutes (Parse).
8. An intellectual property search will ensure there is no infringement on prior patents.
9. Usability testing will be designed so that non-technical audience can learn to use the software in under 10 minutes.
10. Bugs within the software should be fixable in under an hour.
11. New users will be added/updated in the system with a 99.8% success rate.
12. Users will be able to edit their profile information and save it in less than 1 minute.
13. User will be able to make sound loop in under 2 minutes.
14. User will be able to upload a profile picture in under 15 seconds.
15. System will be scalable to support around 200 users with current Parse backend.

Constraints

- System must be able to run on iPhone models 4 and up.

- System must be designed for non-technical audience.
- System must be easily usable by users with no musical background.

Criteria

Software

- Page Depth - Weight (0.2)
 - The number of clicks is proportional to the time it takes to navigate to a certain page. A lower page depth correlates to a faster experience.
- Fields displayed per page - Weight (0.2)
 - In conjunction with page depth, the number of fields and action items per page corresponds to the information from the user, and the necessary input necessary from the user. This should ideally be a density that gives enough information to the user without overloading or confusing them.
- Information retrieval time - Weight (0.2)
 - How long it takes to retrieve user information from the database in the tablet and display their information on their profile
 - How long it takes to display all the sound files on the sound database page
- Loop creating time - Weight (0.4)
 - How long does it take the drag sound clips to the sound measure and create a successful sound

The User Experience

Overview of the User Experience

Upon starting the application the user will be able to easily navigate through the screens to create a functional sound loop. The application is visually appealing and easy to use. The sounds are clear, and the volume is adjustable. After selecting a sound, the user navigates to the looping screen to cut and paste their sound into different timing variations. The user can then play their creation and edit it however they please. Upon completion, the user can connect to Facebook and share their clip with their friends.

Use-cases

A user wants to hear all of the sounds. The user then navigates to the application, logs in, and clicks the Looped button in the middle of the tabs. The user then presses each play button separately to hear each sound.

A user wants to connect with Facebook. The user then logs in, navigates to the Settings tab, and presses “Connect With Facebook”. The user is then taken to a Facebook login screen. The user logs in with their Facebook information, and is officially connected to Facebook through Looped.

A user wants to record a loop. The user logs in, navigates to the main looping screen, selects a sound, and continues to the Looped screen. Here, the user selects the sound clip and drags it to the timing measure. The clip length is adjustable via the draggable button at the top. The user can continuously repeat this clip placement and play back the measure to hear what they have just created.

Design and Justification

Team Process

Our team process is simple yet effective. Before we even started design decisions, we sat down and decided what the priorities for this project are, like cost vs. speed. We collaborate on all of our ideas, and brainstorm together. Nothing is a single-person task. When we have a disagreement, we make it a priority to map out the advantages and disadvantages of each possible action. Even if we both agree on a problem, we still brainstorm on the outcomes. Our decisions impact the overall outcome of the project, so we are careful to think about what each design decision will change in the entire deliverable. For front-end features, we pick the best options available and do usability tests. For back end features, we explore the different options available to us and pick the one that works best through weighing out pros and cons, such as which back-end framework to use as the basis of our user database.

System Architecture

Our system is completely software based. The only hardware present is a working iPhone. Our system relies heavily on Objective-C coded in XCode for iPhones. The system is compatible with iPhone models 4 and above.

Software Architecture

The software architecture to this application consists of integration between views and other platforms. These platforms include the iPhone's camera, iPhone's photo album, Facebook SDK, and Parse. Application programming interface (API) calls are used to save and retrieve information from both the Facebook SDK and the Parse database. With the use of a tab bar and

buttons, the user is able to navigate throughout the app. Below is a flow chart of this software architecture.

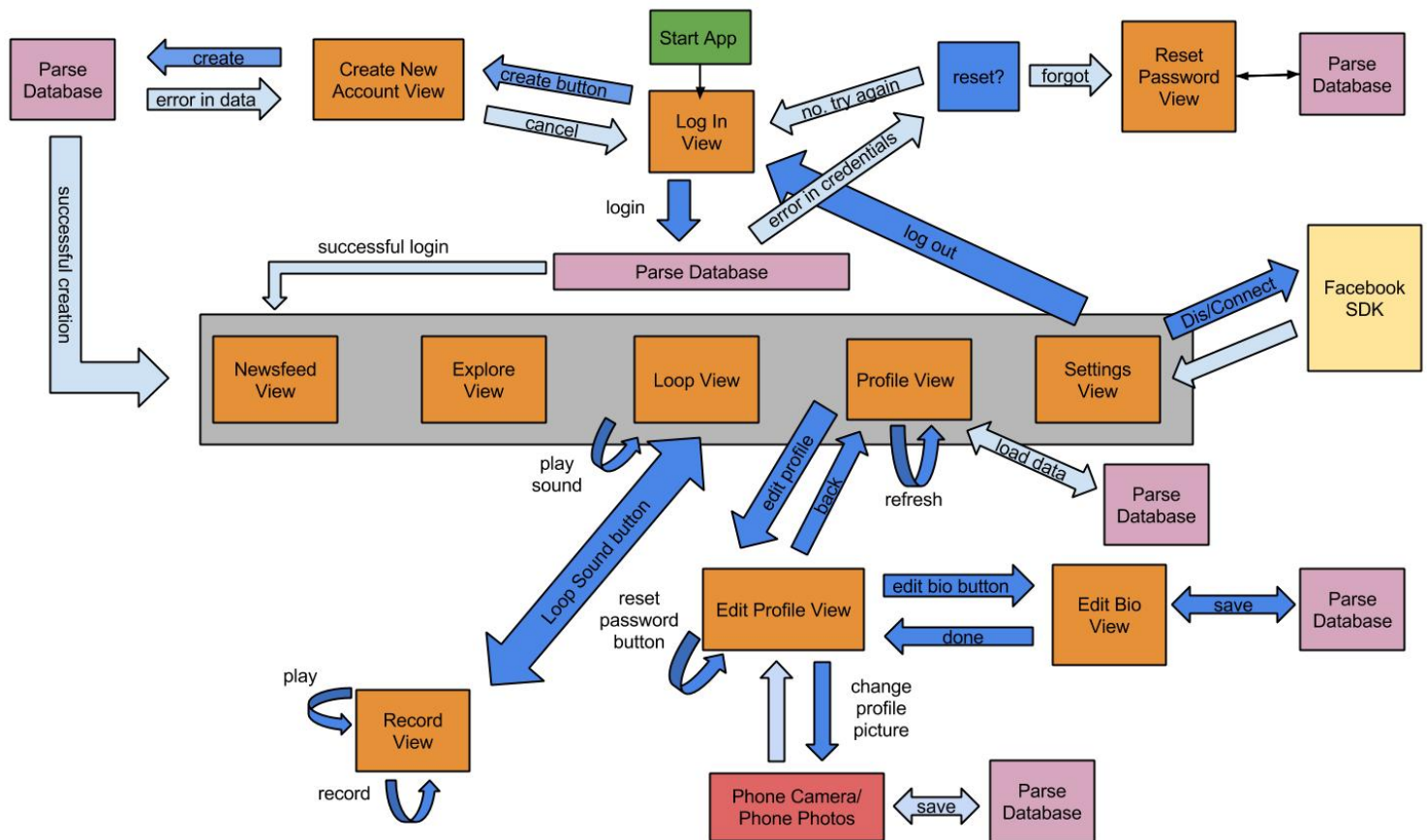


Figure 1 : Software Architecture Flowchart

For the flowchart shown above, main views are in orange, user actions are in blue, automatic actions are in light blue, and the gray section demonstrates the tab bar that allows all five views inside it to be selected at any given time. Other outside software integration is in alternative colors.

Flow Chart

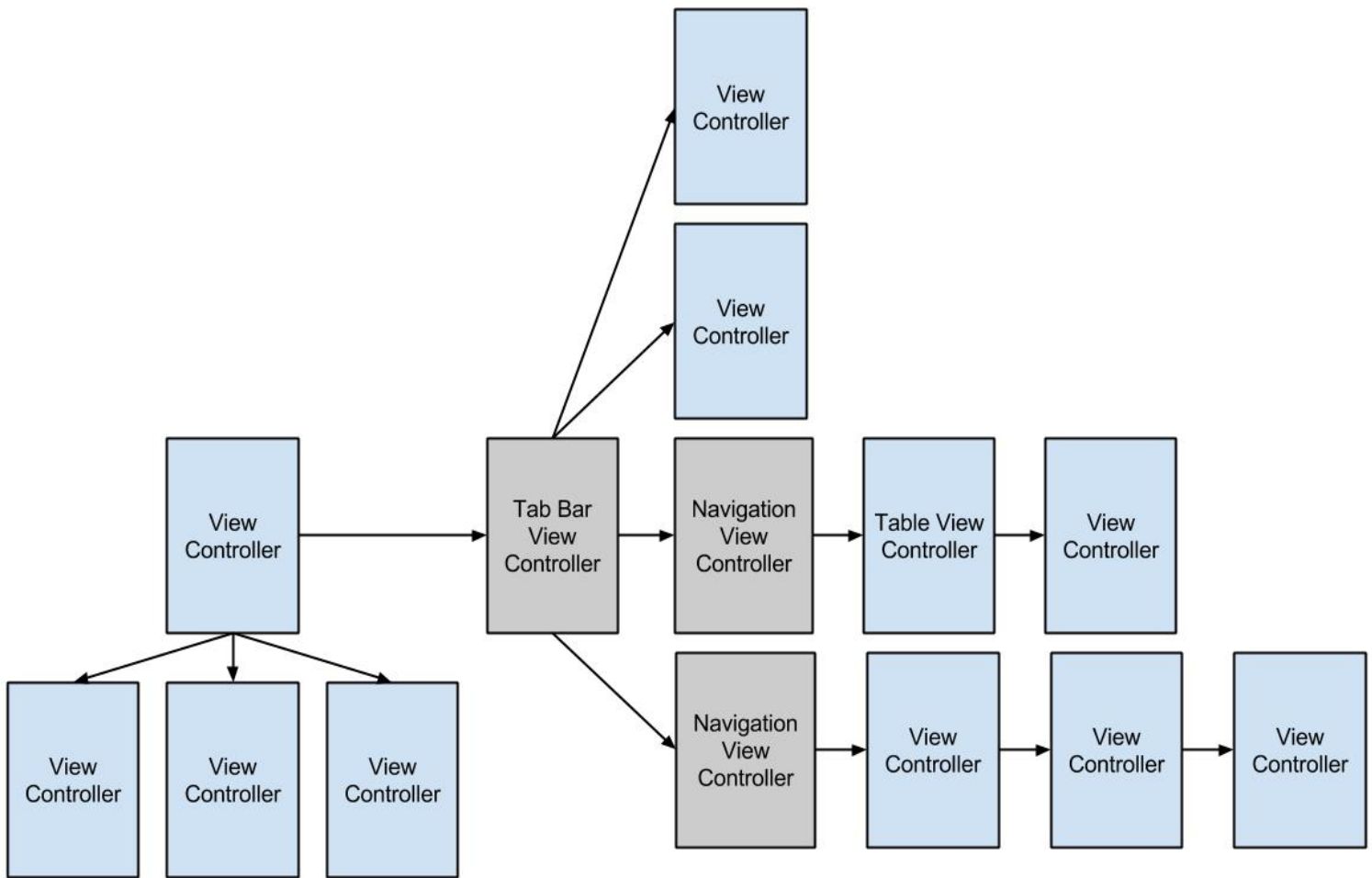


Figure 2 : Major Software Components Flowchart

Major Software Components

Our major software components consisted of view controllers that have certain hierarchical properties assigned to them under the iOS development structure. View controllers are the lowest type of level available to the user but have the most freedom when it comes to design. Tab bar view controllers are used in this app to give priority to five of our main activities (Newsfeed, Explore, Loop, Profile, and Settings). Tab bar view controller have authority over everything connected to it. All other view controllers connected to it will have the tab bar at the

bottom of the screen. Navigation view controllers are used to allow a back-and-forth motion between views connected to each other by adding a toolbar at the top with buttons. Lastly, the app uses a table view controller to allow clean and easy user interaction with our songs list.

Below is a flowchart that shows the connection between view controllers of our app.

System Overview

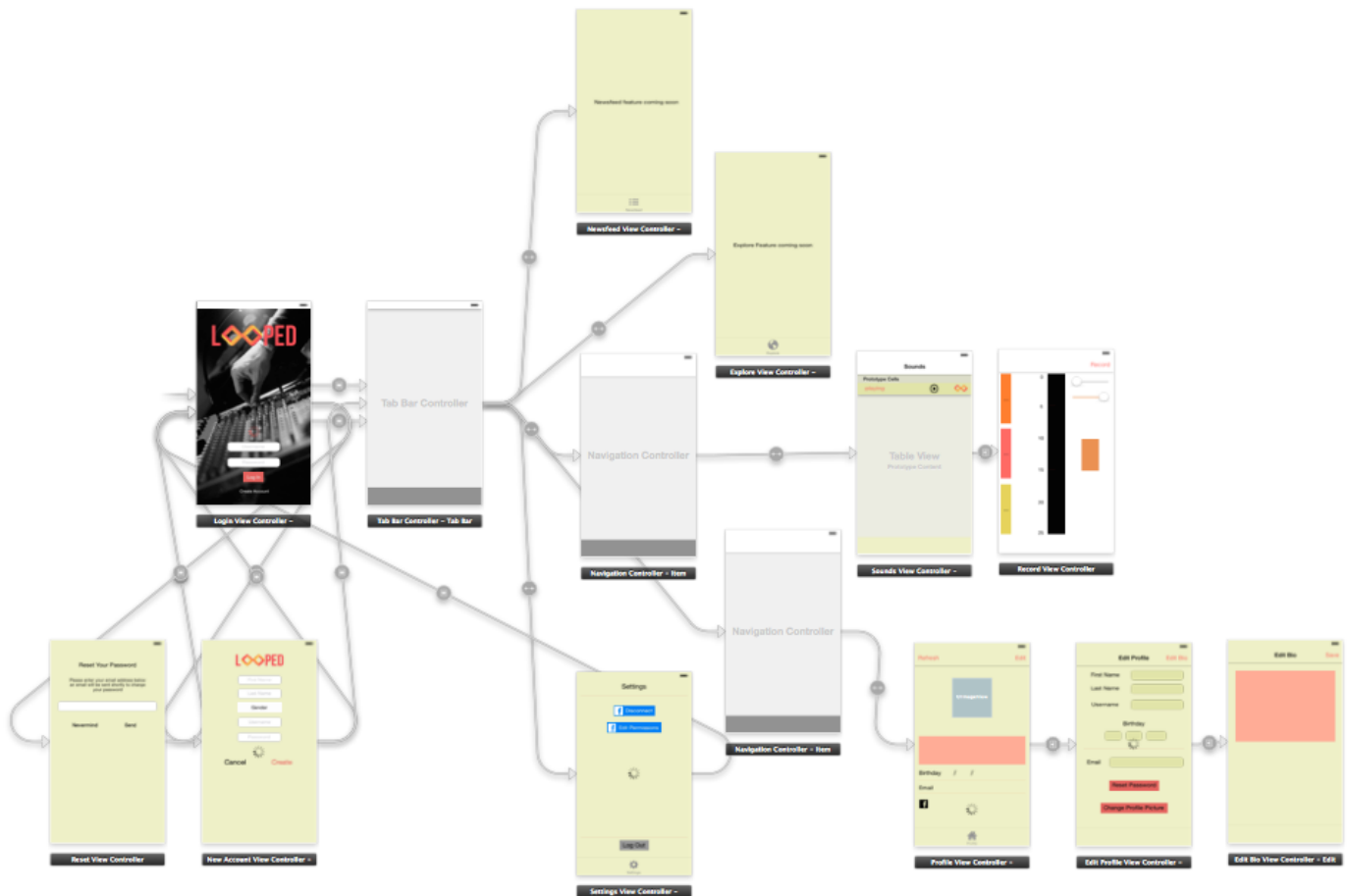


Figure 3: System Hierarchy with View Screenshots

Design Decisions

We closely followed the design of Instagram, a photo sharing application for mobile phones. Instagram is a “Tabbed” application, as is Looped. A Tabbed application has the tabs at the bottom of the screen, with each tab having a specific view. On Instagram, the center tab takes you to the workflow to edit and post a new photo. On Looped, the center tab takes you to the workflow to edit and post a new loop. We decided to closely follow the design of Instagram because it is one of the highest rated apps on the App store. The design is extremely intuitive and simple to use, which was our design goal for Looped.

System Integration and Testing

Test Plan

Our testing consists mainly of usability tests and use-cases. Each page has a set of clickable buttons or interactive text fields which should produce a certain results. We tested each field and its expected result each time code is changed.

For usability tests, we handed the application to our friends and watched them navigate through the app to see which parts were intuitive and which ones were confusing. We would then take these results, make changes to the code, retest the use cases, and then repeat usability testing. The goal was to see if users could figure out what they were supposed to do without any prior knowledge or instructions.

Test Results

There were a few bugs found with the Facebook SDK, which were fixable in under an hour. The main source of error came from the recording screen, as sometimes the sounds are

clipped in the wrong spot. These errors have thus far been fixable in under an hour and are due to the fact that each sound clip has different length, and our algorithm for recording is not 100% dynamic yet.

Usability testing proved to be successful, as on our final design of the recording screen users had between a 96-98% success rate in setting up a sound to be recorded. Furthermore, users easily navigated through the app, asking very minimal questions about the tab bar and its various functions. This was due to the labels we added to the tab bar, clearly illustrating what each tab does.

We plan on implementing automated tests for the use-cases, verifying that each button takes the user to the correct view. All other tests will be done manually to account for edge cases and outlier scenarios. Below is a table demonstrating unique tests ran with their corresponding test result.

Table 1 : Looped Testing and Results

Test Name	Test Description	Test Result
Application Load	Given: I have just downloaded the Looped app When: I click on the app icon the app opens Then: I see the Looped logo at the top, the username and password text fields, login button, and the create new account button	Passed
Creating New Account	Given: I am a first time user and do not have an account When: I click on the "Create Account" button, I am taken to the "Create Account" view Then: I enter all the information needed and click "Create" And: I see a dialog saying "Welcome" and I see the Newsfeed view	Passed
Successful Log In	Given: I have an account When: I enter my username and password Then: I am taken to the Newsfeed view	Passed
Failed Log In + Reset Your Password	Given: I have an account with an email address registered When: I enter an invalid username and password	Passed

	<p>Then: I see a dialog “Incorrect Account Info” with the options to try again or forgot your password</p> <p>When: I click on “Forgot”, I am taken to the “Forgot Password” view</p> <p>Then: I enter my email address and click “Send”</p> <p>And: I should receive an email with reset instructions</p>	
Tab Bar	<p>Given: I have successfully logged in</p> <p>When: I select the other tab bar buttons and should see their corresponding views appear</p>	Passed
Play Sound in Loop List	<p>Given: I am on the Loop tab and on the Sounds list</p> <p>When: I find a sound I want to play I click the play button</p> <p>Then: I hear the sound play</p>	Passed
Loop sound	<p>Given: I am on the Loop tab and on the Sounds list</p> <p>When: I find a sound I want to loop and I click on the loop logo</p> <p>Then: I am taken to the “Record” view and see the title of the sound selected at the top of the screen</p>	Passed
Play Sample in Record view	<p>Given: I have selected a sound from the Sounds List and have entered into the Record view</p> <p>When: I click on the “Play Sample” button I hear the clip of the sound I selected</p>	Passed
Play Timeline in Record view	<p>Given: I have selected a sound from the Sounds List and have entered into the Record view</p> <p>When: I click on the “Play Timeline” button I hear the timeline with the sound samples in it</p>	Incomplete
Crop Sound in Record view	<p>Given: I am on the Record view</p> <p>When: I adjust either the right or left slider I see the sound block cut to the corresponding size</p>	Passed
Add Copy in Record view	<p>Given: I am on the Record view</p> <p>When: I click on “Add Copy”</p> <p>Then: I see another block pop onto the screen of the same sound</p>	Incomplete
Record Sound in Record view	<p>Given: I am on the Record view and I have a block or several blocks on the timeline</p> <p>When: I click on the “Record” button on the top right corner</p> <p>Then: I see a popup with a confirmation of the recorded/created sound file</p>	Incomplete
Profile View load	<p>Given: I have logged in successfully</p> <p>When: I click on the Profile tab and taken to the Profile view</p>	Passed

	Then: I see all my information that was saved previously on the screen	
Edit Profile	Given: I am on the Profile view When: I click on the top right button "Edit", I am taken to the Edit Profile view Then: I change any of the textfields on the screen Then: I click back and on the Profile view click "Refresh" And: I see the updated information load	Passed
Edit Bio	Given: I am on the Profile view When: I click on the top right button "Edit", I am taken to the Edit Profile view Then: I click on "Edit Bio" on the top right corner Then: I see the Edit Bio view and enter new information And: I click Save and return by clicking Done Then: I see the Edit Profile view and click Back Then: I click "Refresh" and I see the updated information load	Passed
Email Verification	Given: I am on the Profile view and I do not have an email registered to my account When: I click on "Edit", I am taken to the Edit Profile view Then: I enter my email address and select back Then: I refresh the screen and see my email address saved but with a red "Not Verified" label And: I am email will be sent to verify the email And: Once verified the label will turn green	Passed
Reset Password In Profile View	Given: I am on the Edit Profile view When: I click on the Reset Password button Then: I dialog pops up with a confirmation that an email has been sent	Passed
Change Profile Picture by taking a new picture	Given: I am on the Edit Profile view When: I click on the Change Profile Picture button Then: I see a dialog with the options to take a photo or upload a photo Then: I select take a photo and see the camera Then: I take a picture and select use and a dialog pops up notifying the user that the picture has been set And: I return to the Edit Profile view and click back Then: I refresh the page and see the new profile picture	Passed
Change Profile Picture by	Given: I am on the Edit Profile view When: I click on the Change Profile Picture button Then: I see a dialog with the options to take a photo or choose from existing	Passed

choosing from existing	<p>Then: I select choose from existing and see the photo album</p> <p>Then: I select a photo and a dialog pops up notifying the user that the picture has been set</p> <p>And: I return to the Edit Profile view and click back</p> <p>Then: I refresh the page and see the new profile picture</p>	
Logout	<p>Given: I am on the Settings View</p> <p>When: I click on the Logout button</p> <p>Then: I see a dialog “Are your sure you want to log out?”</p> <p>And: I select Yes and return to the Login view</p>	Passed
Connect to Facebook	<p>Given: My account has not been connected to a Facebook account</p> <p>When: I enter the Settings view, I see the Connect button in blue (enable) and the Edit Permissions button gray (disabled)</p> <p>Then: I click on the Connect button and see a popup</p> <p>Then: I enter my Facebook Account credentials</p> <p>Then: I authorize my Looped account certain permissions</p> <p>And: I return the Settings view, see the connect button turn to “disconnect”, the edit permission is blue (enabled) and on the profile view the facebook icon has turned blue</p>	Passed
Disconnect from Facebook	<p>Given: My account has been connected to a Facebook account</p> <p>When: I enter the Settings view, I see the Disconnect button in the blue (enabled)</p> <p>Then: I click on the Disconnect button and I see a dialog confirming the action</p> <p>Then: I see the Disconnect button turn to “Connect”, the Edit Permissions button turn gray (disabled) and on the Profile View click on the refresh button and I see the Facebook icon turn gray (disabled)</p>	Passed
Edit Facebook Permissions	<p>Given: I have my Looped account connected to my Facebook account</p> <p>When: I enter the Settings View, I see the Edit Permissions button in blue (enabled)</p> <p>Then: I click on Edit Permissions</p>	Incomplete

Conclusion

In conclusion, Looped was a great learning experience. In terms of design and justification, our design choices changed around 4 to 6 times throughout the entire process. Had there been more time to implement the project, we would have implemented full networking and “back-and-forth” posting which would allow users to loop new sounds on top of their friends current loops. In terms of design, the “record” screen was the most tough. It was difficult to create the most intuitive experience with complete functionality.

The application is intended to be a social networking type application. However, due to the nature of such a project, our time constraint only allowed us to implement the core features of the application, including the login screen, the recording feature and the profile page. The newsfeed and exploring features will be future additions to Looped. The design aspect of the application was the most difficult, as we kept having to change screens to satisfy usability and intuitiveness. Overall, the project was successful in that we gained experience with design, Objective-C, and storyboard hierarchies within XCode. Furthermore, we gained insight on user-friendly design and its implementations.

References

- [1] <https://www.apple.com/mac/garageband/>
- [2] <http://loopyapp.com/>
- [3] <http://www.image-line.com/flstudiomobile/>
- [4] <http://patatap.com/>

Appendices

Sample code for Parse API call (Login)

```
[PFUser logInWithUsernameInBackground:self.userName.text
password:self.password.text block:^(PFUser *user, NSError *error) {

    [statusIndicator stopAnimating];

    if (user)
        [self performSegueWithIdentifier:@"logInSuccess" sender:self];
    else {
        self.statusIndicator.hidden = YES;
        [statusIndicator stopAnimating];

        NSString *errorString = @"Invalid username or password";

        UIAlertView *alert = [[UIAlertView alloc] initWithTitle:@"Incorrect
Account Info" message:errorString delegate:self cancelButtonTitle:@"Try Again"
otherButtonTitles:@"Forgot", nil];

        [alert show];
    }
}];
```

Sample code for Facebook SDK connection request

```
if (![PFFacebookUtils isLinkedWithUser:user]) {
    [PFFacebookUtils linkUser:user permissions:permissions block:^(BOOL
succeeded, NSError *error) {
        if (succeeded) {
            UIAlertView *alert = [[UIAlertView alloc] initWithTitle:@"Successfully
Connected To Facebook" message:@"Woohoo, user logged in with Facebook!"
delegate:self cancelButtonTitle:@"Okay" otherButtonTitles:nil];

            [alert show];
            [connectFacebookButton setTitle:@"Disconnect" forState:normal];
            [editPermissionsButton setEnabled:YES];
            [facebookLogo2 setBackgroundColor:[UIColor colorWithRed:(0.0/255.0)
green:(122.0/255.0) blue:(255.0/255.0) alpha:1.0]];
            [editPermissionsButton setBackgroundColor:[UIColor colorWithRed:(0.0/255.0)
green:(122.0/255.0) blue:(255.0/255.0) alpha:1.0]];
        }
    }];
}else{
    self.loading.hidden = NO;
    [loading startAnimating];

    [PFFacebookUtils unlinkUserInBackground:user block:^(BOOL succeeded,
NSError *error) {
        if (succeeded) {
            UIAlertView *alert = [[UIAlertView alloc] initWithTitle:@"Disconnected
From Facebook" message:@"The user is no longer associated with their Facebook
account." delegate:self cancelButtonTitle:@"Okay" otherButtonTitles:nil];

            [alert show];
            [connectFacebookButton setTitle:@"Connect" forState:normal];
            [editPermissionsButton setEnabled:NO];
            [facebookLogo2 setBackgroundColor:[UIColor grayColor]];
            [editPermissionsButton setBackgroundColor:[UIColor grayColor]];
        }
    }];
}
```

```

    }
    self.loading.hidden = YES;
    [loading stopAnimating];

    }];
}

```

Sample code for AVAudioPlayer call

```

- (IBAction)playButtonPressed: (UIButton*)sender
{
    if(currentDone == YES){

        [sender setImage:[UIImage
imageNamed:@"button-playRed.png"] forState:UIControlStateNormal];

        currentSender = sender;
        currentSoundLabel = sender.titleLabel.text;

        url = [NSURL fileURLWithPath:[NSBundle mainBundle]
pathForResource:currentSoundLabel ofType:@"mp3"];

        NSError *error;

        _audioPlayer = [[AVAudioPlayer alloc] initWithContentsOfURL:url
error:&error];

        if (error)
        {
            NSLog(@"Error in audioPlayer: %@",
[error localizedDescription]);
        } else {
            _audioPlayer.delegate = self;
            [_audioPlayer prepareToPlay];
        }
    }
}

```

```
[_audioPlayer play];  
  
currentDone = NO;  
}  
}
```

For all project code created go to <https://github.com/bwong17/Looped>

Bill of Materials

Table 2: Bill of Materials

Item Name	Quantity	Price Per Unit	Total
iOS Developer Account	2	\$107.66	\$215.32