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The Best Doggone App Since Instagram: Experiences with the iOS SDK

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Dec, 2014

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Cindy Yano Vannoy

A project submitted in partial fulfillment of the requirements for the degree of

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Dec, 2014

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—
Dr. Jonathon Engelsma   **Date**

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Abstract

Many dogs don't get enough exercise and people may be unaware of great hiking locations in their neighborhood. Paw Parks iOS mobile application (app) was created to raise awareness of pet friendly locations and encourage dog lovers to be more active with their pets. Paw Parks uses GPS to obtain the user's current location and displays a map with pins indicating nearby parks. The user can click on the park and see a park description, amenities list, photos, reviews, and can even log a visit. The user can also leave a review or comment on the park, mark the park as a favorite, and edit park information. If the user's favorite dog friendly area is not available on the map, they can easily add it. Paw Parks is a crowdsourced application that relies on users entering park data.

Paws Parks includes a user profile area where the user can enter their dog(s) and dog's profiles along with notes on their favorite food, birthday, and photo. In the profile area, the users will see a collection of all the photos they have posted, their history of check-ins, and quick links to their favorite parks. One challenge of this application is to get users to add data so the app is more useful. However, the love most dog owners have for their pets and social media features make Paw Parks an app that is expected to maintain an active user base. In addition, gamification components are included to encourage interaction and data input. The user with the most check-ins becomes Top Dog of the park and has their profile image, name, and number of check-ins displayed on the park. Each photo also has a number indicating the number of likes it has received.

Many times application development is specific to company use, which can be either confidential or too obscure for family and friends to interact with the application. Mobile application development is unique from other application development since smartphones are widespread and common making it fun and easy to share, which allows you to involve your friends and family. With an idea for a new app, persistence and dedication to learn, anybody could be an iOS mobile application developer.

Introduction

Paw Parks is an iOS mobile application used to find dog friendly parks near the user's GPS location. GPS is one of the primary geospatial tools for gathering and analyzing data and has traditionally been useful for accurately providing static locations [10]. The parks are displayed on a map using geographical information systems (GIS) or geospatial technology. Geospatial

technology refers to a system that is used to acquire, store, analyze, and output data in two or three dimensions. This data is referenced to the earth by a coordinate system, such as a map projection [10]. Paw Parks centers the view finder on the user's current geopoint and executes a query against the database to retrieve parks in the area and displays them in the view finder. The app relies on crowdsourcing geospatial data where users are encouraged to add dog friendly parks they are aware of, as well as post pictures, comments, and verify amenities. When adding a park, a map is displayed with a pin shown at the user's current location, making it easy to add a park if the user is currently at the park. The pin can be dragged to a new location if the user is not currently at the park. Crowdsourcing geospatial data refers to generating a map using informal social networks [11]. The term crowdsourcing has been introduced to denote the process of solving problems with the help of the masses. Different from outsourcing, where the people hired for performing a service are external to the hiring company but hired to perform a service, in crowdsourcing the call is open and directed to an undefined audience. Most crowdsourcing systems are based on the Web, as it provides efficient and inexpensive collaboration tools [1]. The app will allow dog owners to become aware of dog friendly parks they may not have known about as well as filter out parks based on their pet's needs or activity desires. They will also have the opportunity to view photos and review comments to further evaluate the area. There are a few dog parks apps in existence today; however, none of them appeared to be mobile crowdsourced and the apps appeared to pull data from online sources such as Yelp which does not always show relevant data. For example, one app showed veterinary clinics and hotels where dogs were welcome, but did not show well-known dog friendly parks in the area. Crowdsourcing was necessary to find dog parks that may not necessarily be an official "Dog Park" or have the words dog or park in the name or description. It could just be a dog friendly hiking trail, park, walking path, or area. Crowdsourcing is also known as human computation, which is understood as solving difficult computational problems by human effort instead of machine algorithms. This notion is based on the fact that many cognitive tasks that are easy for humans remain extremely difficult for computers to perform [2]. Due to the popularity of social networking and location-based services with mobile devices, public participation in geospatial data collection is now becoming more and more import and useful [12].

Physical inactivity and sedentary behavior are major threats to population health. A considerable percentage of people own dogs, and there is substantial evidence that dog ownership is correlated with higher levels of physical activity. However, not all owners walk their dogs regularly [8]. The motivation behind this app is happy, healthy dogs. If users are aware of dog friendly parks that meet their pet's needs, then hopefully the owner and dog will get out more and enjoy their time out. The park details provide data such as description, hours, and rating as well as the amenities list. The amenities list provides a quick visual using a check mark to indicate if the

feature is present. Some of the amenities include off leash area, fenced perimeter, small dog area, dog swimming, trails, or if the park is an agility park. There are also amenities listed for activities available at the location, such as hunting, biking, and horseback riding. With the data Paw Parks provides, dog owners can be made aware of what dog friendly areas are available around them and retrieve park details on demand so they can decide if it would be an enjoyable place to visit. There is evidence that along with the dog-owner relationship, and obligation to walk the dog, access to suitable walking areas with dog supportive amenities such as an off leash exercise area would encourage owners to walk their dog more frequently [8].

The goals of Paw Parks, is to provide a fun and easy way to find dog friendly parks. Due to the crowdsourcing component, a larger goal is to get dog owners to add dog parks and well written descriptions with an accurate amenities list. To encourage app users, a social component was added allowing users to check-in, set favorites, and to build their and their dog's profiles.
A major challenge for crowdsourcing as well as social search services is how to motivate individuals to contribute work [2]. Paw Parks focuses on social incentives and game-based incentives while monetary based incentives may come in the future, dependent on the success of Paw Parks.

Background and Related Work

An interest in geospatial technology, a background in programming and databases, along with my love for dogs, led to the creation of Paw Parks. Before creating Paw Parks, I searched the App Store to see what already existed for Dog Park Apps. There were a few apps, but most of them were specific to a city such as Doggie Door, which shows dog friendly places and events in San Diego. There is also Dog Park USA which costs $.99 and has poor reviews saying it only has dog parks for New York City. I found a couple apps that appeared to be robust apps, including Dog Finder Plus and Dog Land. Dog Park Finder Plus is the top recommended app in this category, but costs $1.99. The creators of this app appear to be the originators of doggoes.com, supplying the same information via their website. I searched for dog friendly parks in my area and returned zero results, which did not encourage me to spend $1.99 to download their app. Dog Park Finder Plus and doggoes.com displays dog friendly hotels, businesses, and pet supplies shops along with parks and dog friendly beaches. Dog Land has fun graphics and has dog friendly places. The app is free, but forces the user to create an account before allowing the user to do anything. Once logged in the user is directed to the photo stream displaying photos Dog Land users posted. When exploring places you can pick from restaurants, shelters, shops, cafes, hotels, and the great outdoors. When searching the great outdoors there were a few parks listed in my area, but there was not a list of amenities and it appeared comments were powered by Foursquare.

Paw Parks is different because it is free, allows the user to interact with the app without having an account, focuses on dog friendly walking areas, allows users to add and edit parks immediately, has a profile area for the user and their dog, has a check in feature, and keeps a log of the users check-ins, and posted photos.

I found iOS development similar to other programming languages in that you have to plan what you are going to try to accomplish before programming it. Thoughts have to go into code reuse, user interaction, navigation ease, performance, and security. One difference between mobile development and application development is many times application development is specific to company use, which can be either confidential or too obscure for family and friends to interact with, whereas smartphones are widespread and common making it fun and easy to share and involve friends and family. Smartphones are so widespread the total app of downloads for Apple have increased from 3 billion downloads in 2010 to 50 billion downloads in 2014 [9]. While being extremely time consuming, iOS mobile development for the most part is free. Documentation is readily available, hosting solutions have free options, and the tools needed to get started can be easily downloaded with a Mac.

Program Requirements

The requirements of this application include the capability to view dog friendly parks that exist in the system, login with Facebook or create a new user with an email address and password, create a user profile and dog profile(s), post comments/reviews about the park, add photos, check in, set parks as favorites, and even add a dog park.

Users are prompted to share their GPS location when the app is started and upon acceptance the app zooms the view finder to the user's location and executes a query that finds all the dog parks within the view finder screen.

The app allows users to add dog parks they are aware of with a description, location, and amenities list. The biggest hurdle is getting users to use the app because without data it is not very valuable. In order to entice users to be active within the app, gamification components were added. "Gamification" is an informal umbrella term for the use of video game elements in non-gaming systems to improve user experience (UX) and user engagement [3]. It can be used as a tool to improve the participation and motivation to carry out diverse tasks and activities that generally would not be attractive [4].

Paw Parks also has a social component to encourage users to participate along with gamification. Mobile social media can loosely be considered software, applications, or services accessed through mobile devices that allow users to connect with other people and to share information, news, and content [5]. Apps like Facebook, Twitter, and Instagram are widespread, along with recommendation services like Yelp, and location-sharing services like Foursquare, all might be categorized as falling under the umbrella of mobile social media [5]. Using the traction of social media, Paw Parks integrates with Facebook and mimics some features in Instagram, Twitter, and Foursquare. For many in the developed world, our internet use started out on a computer and moved to a mobile phone [5]. Paw Parks makes it easy for users to add parks, check-in, post comments and photos while they are physically out at a park.

Implementation

Paw Parks was developed with Xcode, supported by a Parse backend, with integrations to Facebook and Google Analytics utilizing the Facebook software development kit (SDK) and Google Analytics SDK. The map was created using Apple's MapKit framework. Graphics were created in Adobe Illustrator, and beta testing was performed via Test Flight.
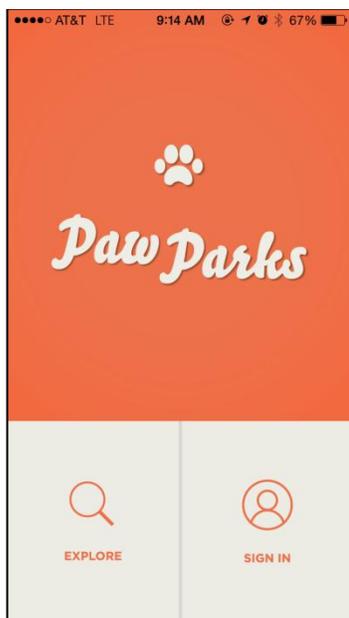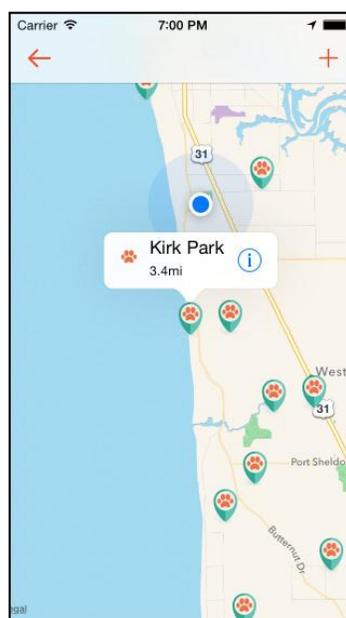

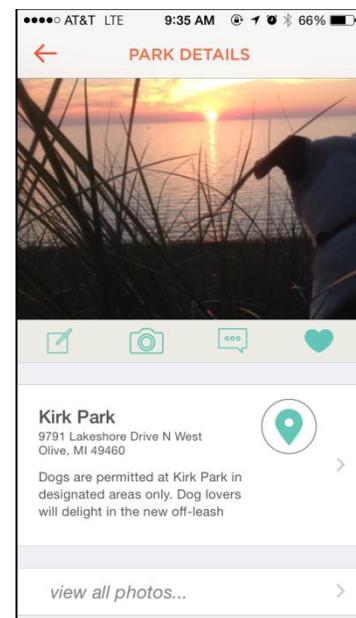**Figure 1 Splash Screen**

Figure 2 Explore Map

Figure 3 Park Details

Xcode is Apple's integrated development environment (IDE) and can be used to build applications for Apple Products such as iPad, iPhone, and Mac. Xcode is a free download and

provides the necessary tools for creating, testing, troubleshooting, optimizing, and submitting the application to the app store. Paw Parks was written in the Objective-C language within the Xcode IDE and targets iPhone iOS 7.1 and later. The map or explore portion of Paw Parks was created using Apple's MapKit Framework (Figure 2). MapKit provides basemaps, location capturing functionality, and the ability to override many elements of the map including pin color, pin style, animation behavior, and annotation properties, allowing the map to be customized for Paw Parks (Figure 2). The app is largely driven from the map and passes park data to each of the subsequent screens, reducing the need to re-query for data. The map and profile are major parts of Paw Parks resulting in a main splash screen allowing you to navigate either way.
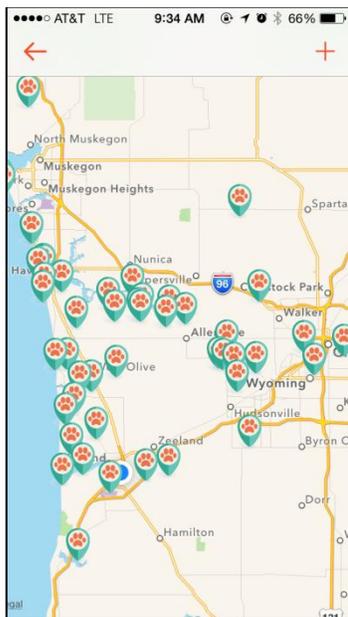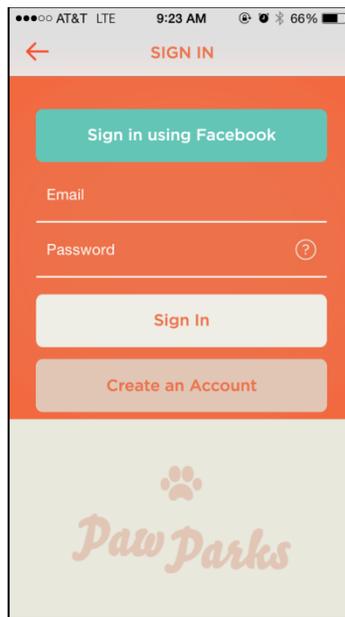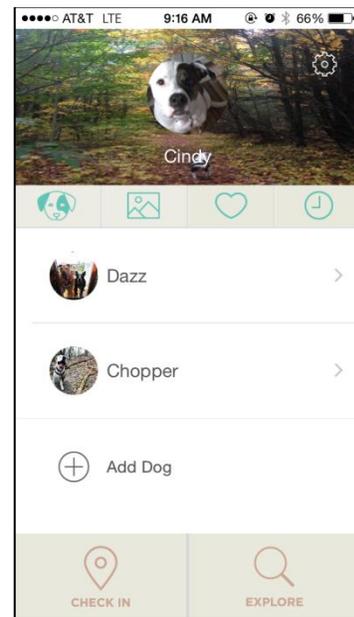
Figure 4 Map Zoom Level	Figure 5 Sign In Screen	Figure 6 Profile

Parse is a mobile application technology backend supporting multiple front-end programming languages. Parse supplies an iOS SDK and allows application developers the ability to easily create a database in the cloud and alleviates the need to worry about servers, security, or database maintenance. Paw Parks utilizes Parse Core for database storage and Parse Analytics. Parse Core is free for up to 30 requests / second, 20GB file storage, 20GB database storage, 2TB data transfer, and 1 background job. Parse Analytics is free and provides information such as number of sign ups and database requests per second. Paw Parks utilizes MapKit functionality along with Parse Geo Queries to query parks pertinent to the user. Once Paw Parks has identified the user's current location and centered the view finder over the users positions, MapKit captures the geopoints at the southwest and northeast corners of the view

finder. The geopoints are used in a Parse Geo Query returning only parks that are within the view finder screen. As the user pans around the screen or zooms out, new parks that were not previously mapped will also appear (Figure 4).

Facebook SDK provides application developers a button to login to the app with Facebook (Figure 5), get Facebook user data such as name, email, Facebook friends, and share content to Facebook. Paw Parks is using the Facebook SDK purely as a method for users to quickly login and capture basic user including First Name, which is shown under the profile photo on the profile screen (Figure 6), Paw Parks may expand to implement more of the Facebook SDK features.

I felt it was necessary for Paw Parks to have a fresh, clean design and user friendly navigation to draw users into downloading and using the app. Fortunately Sara Klele, a good friend of mine and owner of Grand Rapids-based Neapolitan & Co, is a professional graphic designer and

offered to design the screens and icon (Figures 1 - 10) for Paw Parks. We met on a regular basis and discussed navigation, screen design, colors, and function. We started with navigation flow and wireframes to give us both a direction and to provide a plan on how Paw Parks would ultimately look and flow. Once finalized, I worked on coding all the functionality and she worked on graphics and design, and solicited my input. As screens were designed she would send me an Adobe Illustrator file, which I would use to separate each element and create an asset in three sizes to accommodate different iPhone screen sizes and

resolutions. I spent the majority of my time programming, but I also spent a large portion of my time implementing the screen designs she designed and utilizing auto layout to place each element on the screen. Within Xcode you can programmatically create all screen and elements, or you can utilize the storyboard, which is a visual drag and drop method for creating screens and importing assets.

Paw Parks also utilizes the Google Analytics SDK to capture statistics on user interactions such as screen views, button clicks, and device info. It also provides a real-time dashboard showing the number of active users, active screens, and the device used to navigate around the Paw Parks application.

Beta Testing was facilitated through Test Flight, which was recently purchased by Apple. This allows users to bypass the normal App Store process and download the app directly through Test Flight. Testing was extremely valuable and brought up issues with functions I had not previously

tested as well as issues arising from specific combinations of actions. I appreciate all my testers and suggestions, but found the most value from the users who were methodically testing everything and documenting the actions taken to re-create the errors.
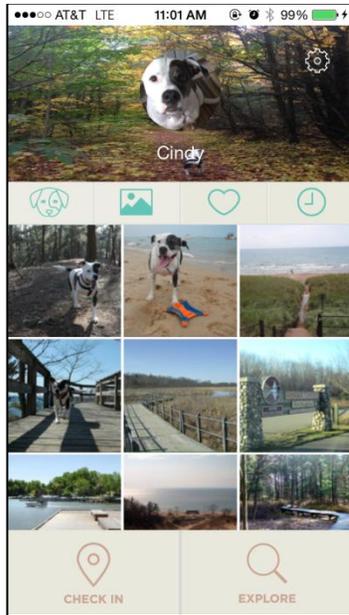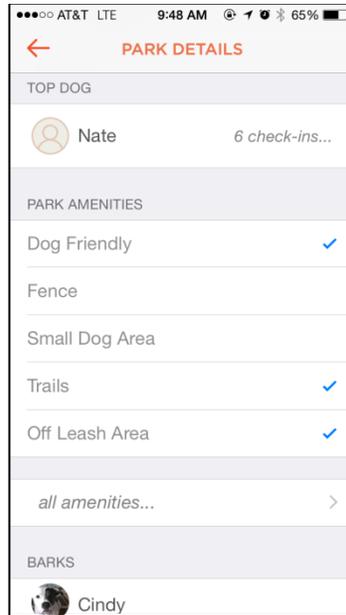

Figure 8 Posted Photos

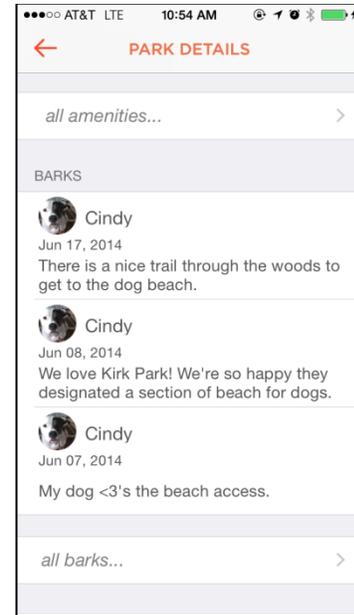**Figure 9 Park Amenities**

Figure 10 Barks

I had prior computer programming and database experience academically and in the professional world, but I had not previously coded in objective-C or used any of the IDEs or SDKs listed above. I also had previous experience with Adobe Illustrator which alleviated some of the work my friend had to do.

Results, Evaluation, and Reflection

I found the process of building an iOS mobile application to be extremely rewarding despite the steep learning curve, late nights programming, frustration, and many days of troubleshooting with zero progress. I learned an incredible amount about objective-C and felt development became easier as time went progressed. I ran into many snags such as breaking code after upgrading to Xcode 6, deprecated code examples, running into multiple ways to do the same thing and having variations of both in my code, new features in iOS8 that simplified programming but still having to handle the same situation in iOS7, auto layout making assets disappear, and hidden hooks (code tied to elements) that needed to be removed. After writing objective-C for many hours, querying the Parse database, and working with Xcode segues, I felt I was understanding the language and

SDKs. Screens became easier and faster to program, and troubleshooting took much less time. I even started cleaning up my code and making it reusable the way object oriented programming is supposed to be.

My suggestions to anyone trying to learn iOS programming are:
- be aware of methods available to you through Xcode, it can save you a lot of time;
- instead of using code snippets/examples exactly the way they are written, take the time to understand what you are trying to do and what the code is doing;
- come up with a naming scheme and stick to it;
- remember to sleep;
- have persistence, you can do it!

Paw Parks is effective in providing a list of park amenities so a user/dog owner can quickly determine if the park is appropriate for the needs of their pup. It is also effective in allowing users to find parks that had previously been added as well as view photos and comments other users have left. The clean design and navigation flow make it easy for a user to locate parks, as well as move around in the profile portion where the user can see their history of check-ins, favorite parks, photos, and set up their pet profiles.

Conclusions and Future Work

There are many components I would like to expand on and introduce in the next releases of Paw Parks. The social and gamification components are important for a steady user base and to encourage interaction and data input. Paw Parks can be expanded in these areas to fully utilize the positive impact of social media and gamification as it relates to user interaction and data input. Some of the items for future work include improving park reviews by adding a rating and flagging system, and sharing of the park via text message, email, or Facebook. Paw Parks contains a limited number of game mechanics, but will see future enhancements that support the needs of human motivation (autonomy, competence and relation). Some examples of these mechanics are: Autonomy: profiles, avatars, macros, configurable interface, alternative activities, privacy control, and notification control. Competence: positive feedback, optimal challenge, progressive information, intuitive controls, points, levels, leader boards. Relation: groups, messages, blogs, connection to social networks, chat [4]. To enhance those components a points system will be included for users to reach higher privilege levels and win prizes.

One of the challenges of studying mobile social media is access to users and content. Despite the prevalence of mobile devices in the world, recruitment of mobile social media users can be

difficult. Privacy concerns may lead many users to close off public access to their mobile social media use. As such, recruitment can be challenging [5]. Features will be added to give users control over their own data. They will be able to delete their own comments, photos, and parks as well as delete their own profile. While satisfying users' desire for security management, points will be need to be removed from the gamification portion of the application. To increase the social media aspect of the app, users will be able to "favorite" parks and people, and have activity from both displayed in a feed as well as have the ability to share their own data with Facebook, Twitter, text messaging and email.

Paw Parks contains a geospatial data visualization, but will be enhanced to include an interactive data visualization component to display statistics of the app where users can interact and gain insight on how the application is used and what states/parks have the most activity. Computer-based information plays a crucial role in our society. As a result, an important responsibility of a user interface is to make intelligent use of human visual abilities and output media whenever it presents information to the user [6]. Like the Paw Parks Explore Map, data visualization will continue to follow Ben Schneiderman's Information-Seeking Mantra: Overview first, zoom and filter, then details-on-demand [7]. This will allow the user to view a data visualization such as a graph at a high level to understand what the data powering the visualization is representing such as check-ins to parks for the entire app. The interactive visualization will also let the user modify the visualization with a set of controls, sliders, and checkboxes to filter more detailed information such as check-ins at a state level or even down to a specific park. The success of direct-manipulation interfaces is indicative of the power of using computers in a more visual or graphic manner. A picture is often cited to be worth a thousand words and, for some (but not all) tasks, it is clear that a visual presentation - such as a map or photograph - is dramatically easier to use than a textual description or a spoken report [7].

Overall, this has been an enjoyable project and I plan to continue enhancing Paw Parks to include the elements listed above.

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