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Project Team 11

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Software Design Document

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PhyloDex

Table of Contents

Revision history

Revision	Status	Publication/Revision Date	By
1.0	Created	June 13, 2013	MengTing Yang
1.1	UML class diagram added to system diagrams section	June 13, 2013	Steve King
1.2	Guidelines section updated	June 13, 2013	Ethan Johanson
1.3	Feature Priority updated	June 13, 2013	MengTing Yang
1.4	General Editing	June 14, 2013	Ethan Johanson
1.5	Added text summary of UML class diagram	June 14, 2013	Steve King
1.6	Data requirements, Process Diagram completed	June 14, 2013	Daniel Hua
1.7	Use Case Diagram, Sequence Diagram	June 14, 2013	Yujie Zeng
1.8	Formatting Cleanup, Compilation	June 14, 2013	Ethan Johanson
1.9	Adjustments to match current implementation of system	June 23, 2013	Ethan Johanson
1.10	Adjustments to match current implementation of system	July 14, 2013	Ethan Johanson
1.11	Added UML Class diagram for Web Search Feature	July 15, 2013	Steve King
1.12	Updated to match version 3, new diagram versions included	July 28, 2013	Ethan Johanson

1. Guidelines

1.1 Development Environment
- All development shall be done using the Xcode 4.6 IDE, available from Apple Inc.
- No third party database development tools are required as the application will be using the CoreData functionality built into iOS.

1.2 Version Management
- Development of the application shall utilize GitHub for version control and management of tracking builds.

1.3 Testing Environment
- Testing shall be done primarily on actual live iOS devices running up to date software, as simulators may not represent the true end user experience.

1.4 Ethical Issues
- User testing shall adhere to SFU Research Ethics standards, utilizing any required forms for participants.
- Design of the application shall remain focused on being free (beyond the requirement of the user having access to an iOS device) and accessible, in the spirit of the Phylo project. [1] This includes designing against the inclusion of microtransactions or exploitative gaming mechanics.
- The project shall encourage observation and engagement with the natural world, but shall not encourage risky behaviours or interactions with animals. This warning should be included on the application's download description at a minimum.
- Development of the application shall adhere to SFU ethical standards for student work. (Including, but not limited to, proper attribution of works cited)

1.5 Legal Issues
- Information and photographic elements accessed through online databases shall have their copyright information properly attributed.
- Any third party code utilized and incorporated shall have its copyright status assessed for the legality of its use and disclosed as required by the IP holder.

2. System Diagrams
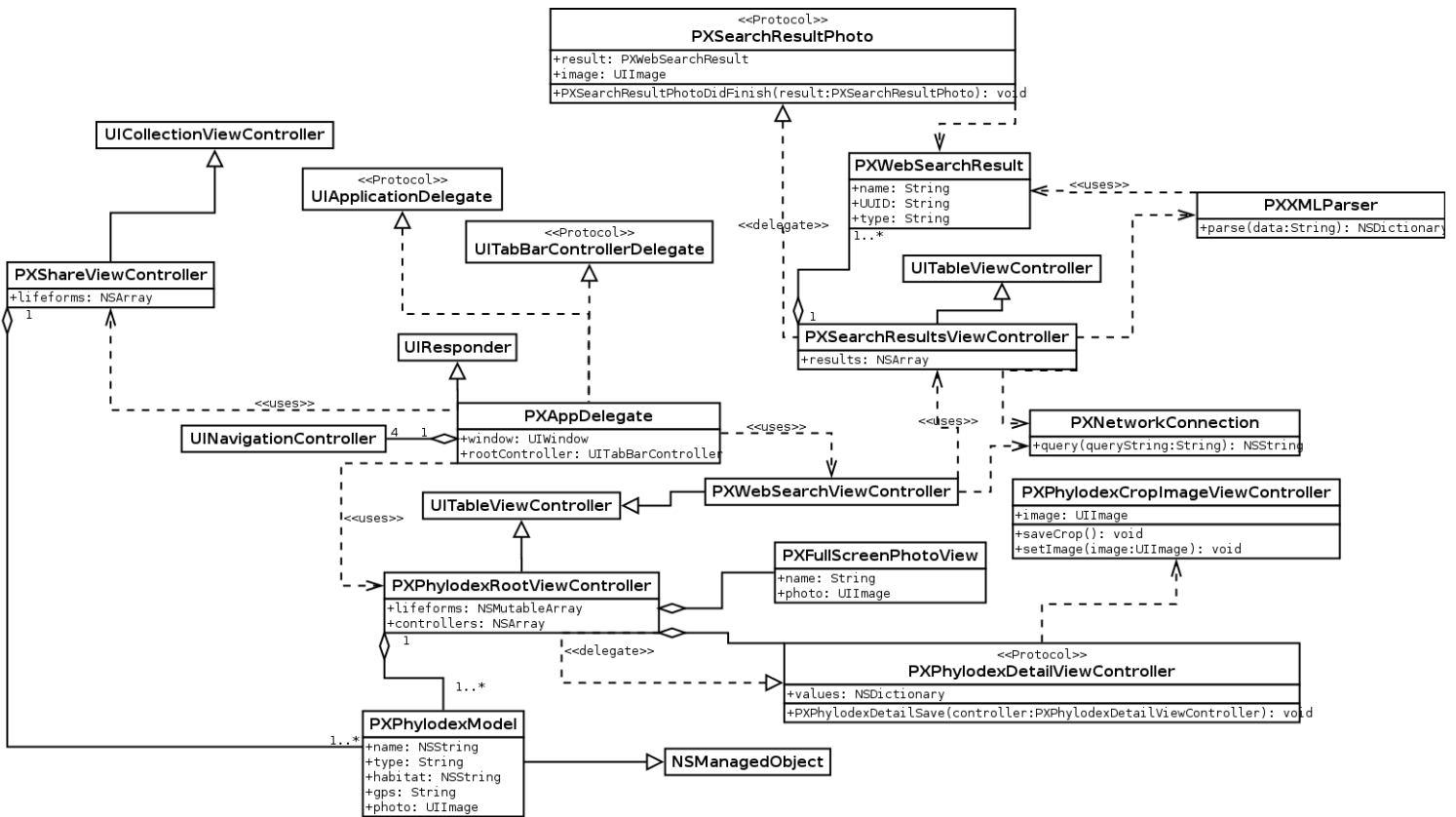### Figure 1.1 – Class Diagram for Application Architecture

Figure 1 shows the UML class diagram for the Phylodex app. At the centre of the diagram is the class PXAppDelegate. PXAppDelegate is the application delegate, and is called from main. PXAppDelegate conforms to the UIApplicationDelegate, and UITabBarControllerDelegate protocols, and is a UIResponder. When the app loads, PXAppDelegate initializes a UITabBarController with four UINavigationController instances. The four UINavigationController instances are pointers to each of the four modes of the app: Phylodex, Web Search, Share and Capture.

The class PXPhylodexRootViewController is an instance of a UITableViewController. This class has an array of view controllers: PXFullScreenPhotoView, and PXPhylodexDetailViewController. The phylodex root view controller has an NSArray of PXPhylodexModel objects, which are generated from the user database using Core Data. The array of PXPhylodexModel objects is used to populate the table view of the Phylodex root view controller. PXPhylodexRootViewController conforms to the user defined protocol PXPhylodexDetailViewController, as well as having an instance of this class in its controllers array. PXPhylodexRootViewController is the delegate for PXPhylodexDetailViewController. The PXPhylodexDetailSave method forms the protocol contract for the PXPhylodexDetailViewController, and is used to handle when a user saves changes made to the details of the photo, and send them back to the delegate.

PXPhylodexDetailViewController uses PXPhylodexCropImageViewController, passing the image to be edited.

The class PXWebSearchViewController is the root view controller for the web search mode. PXWebSearchViewController uses the user defined class PXNetworkConnection to make a network connection and send a search query. Then, it passes the search results to its child, PXSearchResultsViewController. PXSearchResultsViewController uses the user defined class PXXMLParser to extract the search result information from the XML data. PXXMLParser returns a collection of PXWebSearchResult instances generated from the query back to PXSearchResultsViewController. PXSearchResultsViewController uses the returned NSArray of PXWebSearchResult instances to populate its table view. PXSearchResultsViewController conforms to the PXSearchResultPhoto protocol. The method PXSearchResultPhotoDidFinish method is implemented in PXSearchResultsViewController, the delegate, so that recent search result photos can be saved to the application sandbox. This is so that a new network connection is not needed if the image was previously downloaded, and the user clicks it again. The size of the cache will be controlled behind the scenes, so that older cached objects can be released when the space runs out, or a time stamp becomes out-dated.

The PXShareViewController is an instance of UICollectionViewController. This class has an array of "lifeforms", which are gathered from a collection of PXPhyldexModel objects. PXShareViewController will call the email and address applications on the device when the user selects the images to share.

The capture mode is not presented in this UML diagram. There will be a pointer to this mode in the application delegates array of navigation controllers. The capture mode will need to communicate with the crop photo controller and Core data.

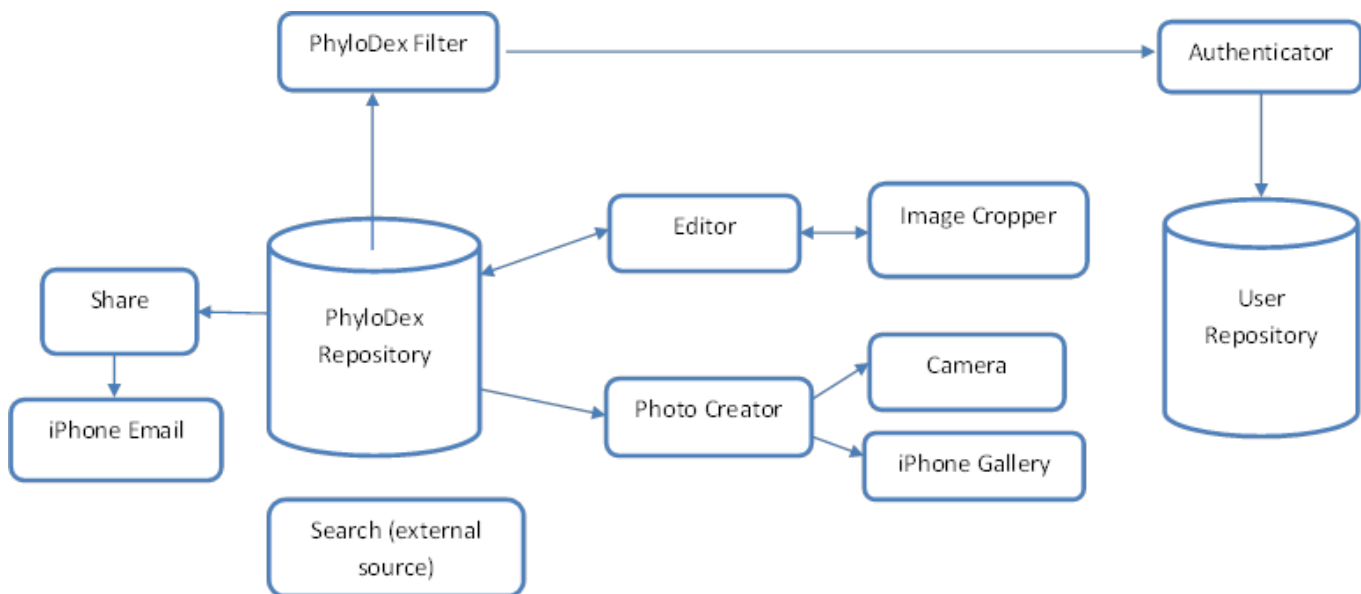Simplified diagram of the system architecture as below:
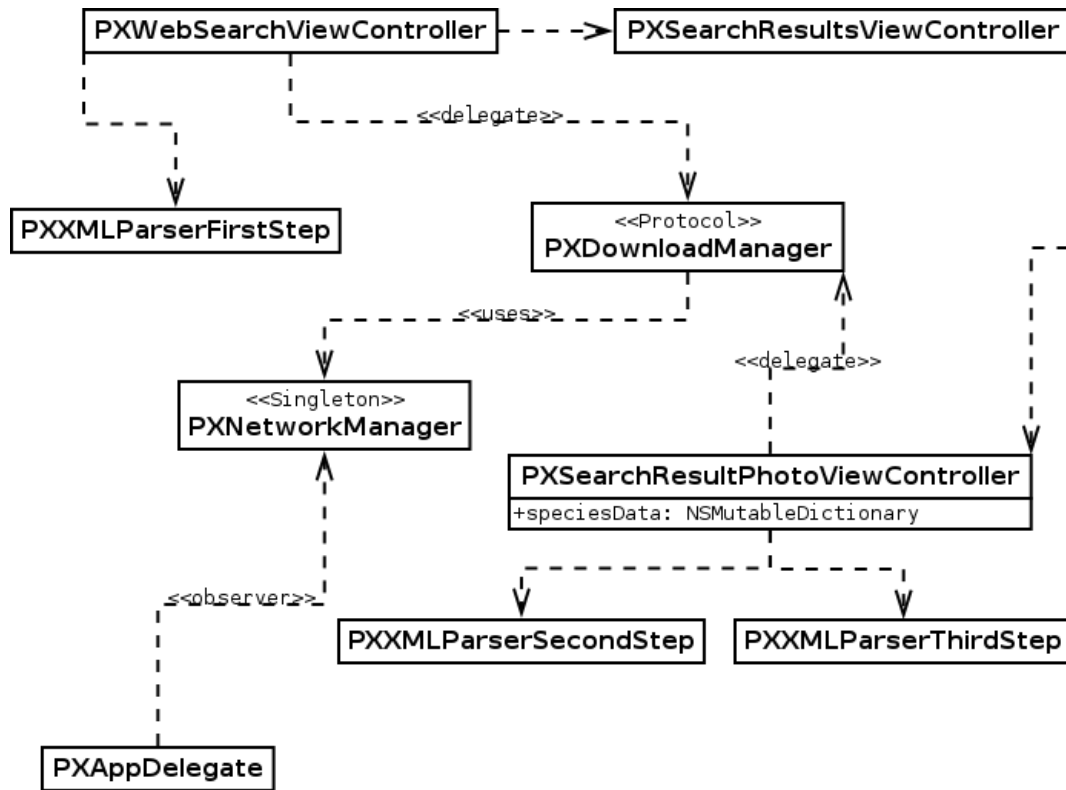
Figure 1.2 – Class diagram for Web Search Feature

Figure 1.2 shows the UML class diagram for the Web Search feature. At the centre of the diagram is the class PXDownloadManager. PXDownloadManager handles all of the network downloads. Its function is to build queries compatible with the natureserve.org web services used for the web search feature, executed these queries, and write data from the web search results into files. PXWebSearchViewController and PXSearchResultPhotoViewController both use PXDownloadManager instances to execute web searches. These view controllers then use the returned data from the download manager, either by parsing a returned xml file, or putting a downloading image file into the user interface. Data from the parsed xml files is used to populate data fields for the user interface of search results. The PXDownloadManager sends a message to the singleton object PXNetworkManager to inform it whenever a download begins or ends. It is the PXNetworkManager singletons job to keep track of the number of downloads taking place. PXAppDelegate observes the PXNetworkManager singleton, and provides feedback globally that there is a download taking place. This feedback is shown as a progress indicator in the status bar of the application.

Figure 2

Figure 2, the Use case model, shows the interactions between users and external functions in the PhyloDex system.

Share mode
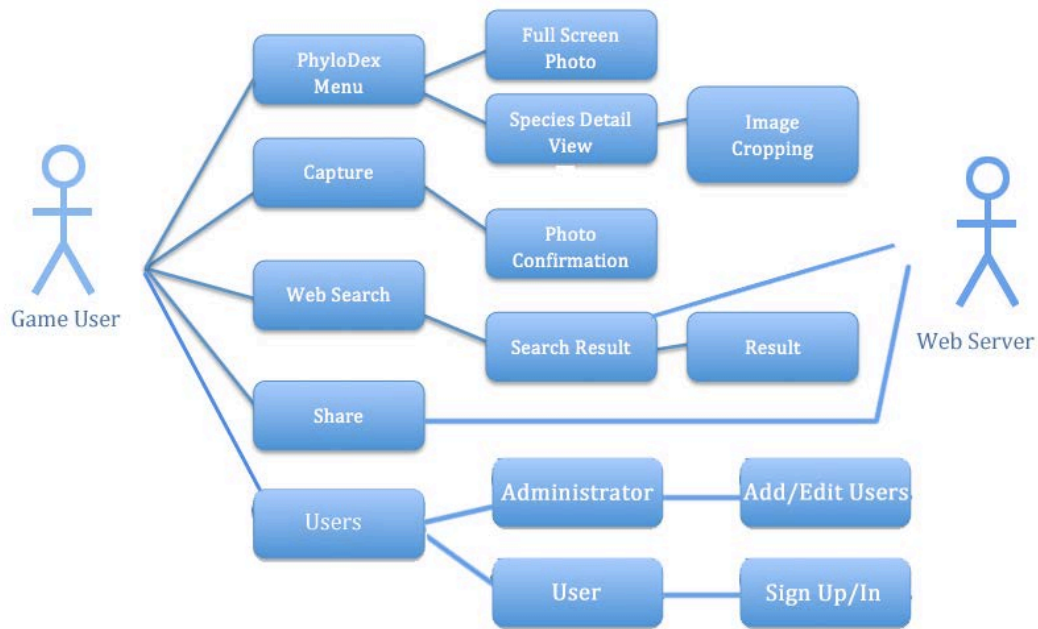
PhyloDex Menu	Contains all Phylo cards with photos and descriptions. Lists in rows.
Full Screen Photo	Display photos in full screen. Be able to zoom photos
Species Detail View	More information including habitat is provided
Image Cropping	Edit photos
Capture	Take photos of creatures
Photo Confirmation	Decide to keep the photos coming from capture part or not
Actors	Game User, Web server
Description	For Share part, users send their photos via emails.
Web Search	Allows search queries to be generated and sent to the natureserve.org service
Users	Manages user accounts on the system
Administrator	View that can manage the user account database

User	Modify your own account settings
Description	For web search, users send search queries to www.natureserve.org
Search result page	Results returned by the www.natureserve.org display in rows. Only basic information (eg. Species, name) about the searched creatures. No photos are provided.
Result page	After choose one of results in search result page, more details will be provided including photos.

Figure 3

The Sequence diagram shows the interactions between users and different functions in PhyloDex.

Users can choose any one of PhyloDex mode, Capture mode, Web Search mode, and Share mode. In Web Search mode and Share mode, Internet connected is necessary. If Internet fails to connect, searching function and share function will not be accessed.
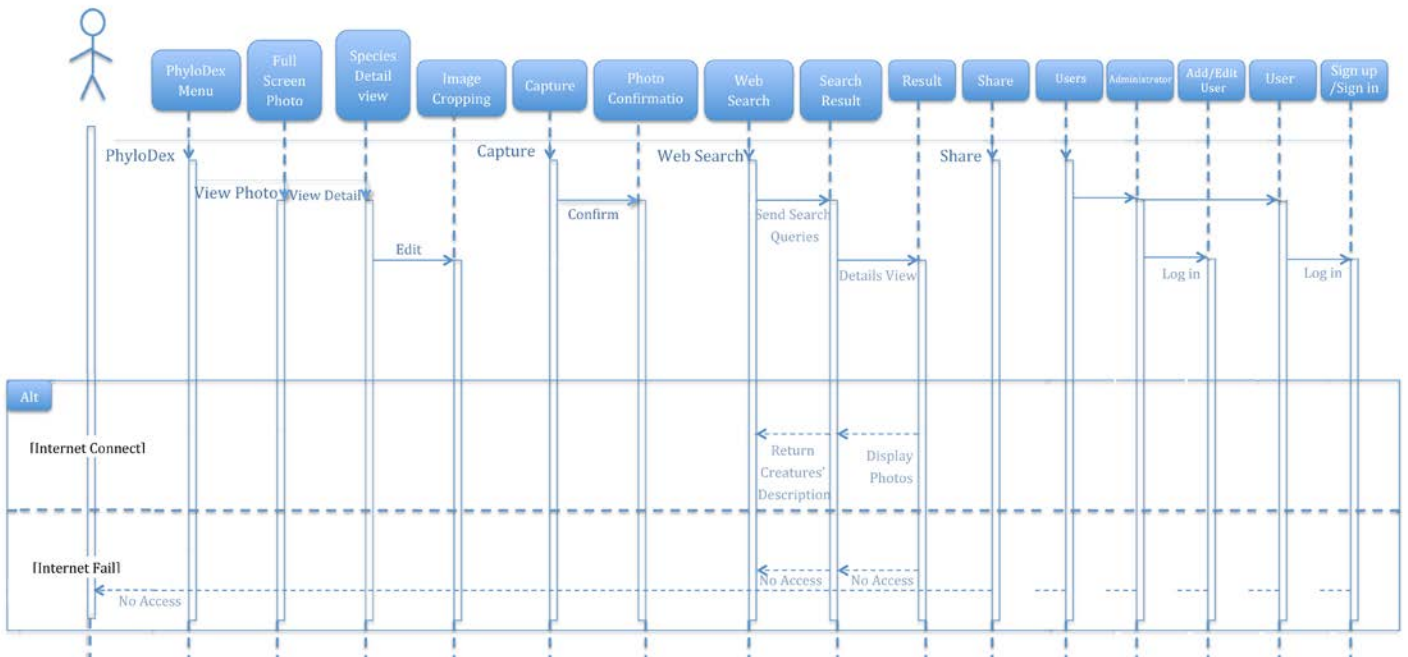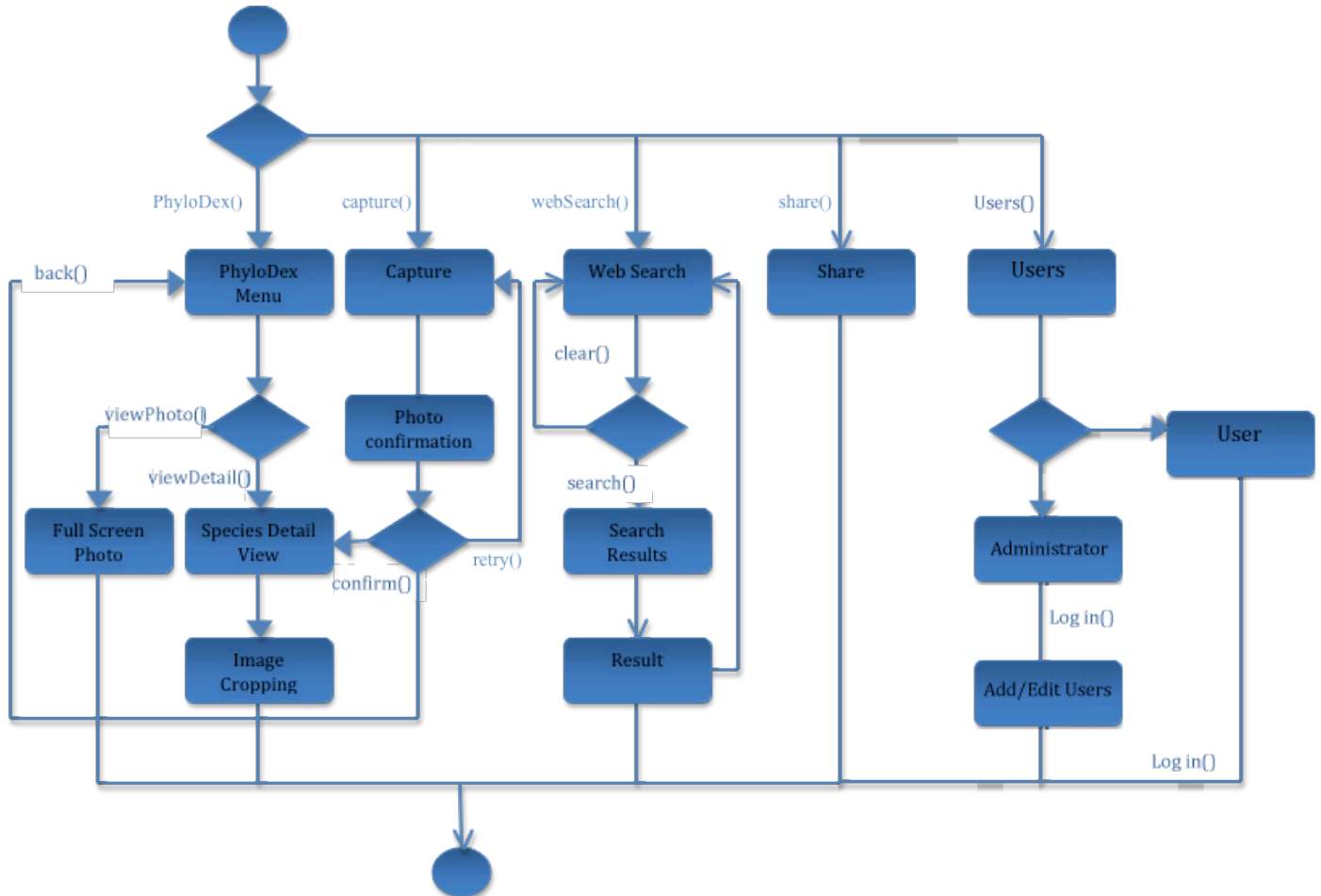
Figure 4

Figure 4 is a Process Diagram showing flow between application states.

3. Data Requirements

User Interface	Interacting Method	Interacting Sub-Method	Input Method	Input Domain (Limit)	Process	Interacting System
TAB Bar	"PhyloDex" Button		Tap		Show the "PhyloDex" page, system will provide the full menu	PhyloDex
	"Capture" Button		Tap		Go to the "Capture" page	Capture
	"Search" Button		Tap		Go to the "Web Search" page	Web Search
	"Share" Button		Tap		Go to the "Share" page	Share
PhyloDex	"Edit" Button		First Time Tap		Show delete button on the same page	
			Second Time Tap		Cancel the delete button	
		"Delete" Icon	Tap		Delete the whole information and photos user selected from the database	
	"Information" Field		Tap		Go to the "Species Detail View" page	Species Detail View
	"Photo" Field		Tap		Go to he "Full Screen Photo" page	Full Screen Photo
	"Back" Button		Tap		Return to the "PhyloDex" page without saving any change	PhyloDex
	"Crop" Button		Tap		Go to the "Crop" page	Crop
	"Name" Textfield		Virtual Keyboard	String (20)	User can edit name of the animal in the photo by typing new contents in it	
	"Habitat" Disclosure Indicator		Tap		Open the habitate pickers for user to pick	
		"Habitat" Pickers	First Time Tap		User can choose which pciker of the habitat of property list for the animal	
			Second Time Tap		Cancel the first tap, and set the button to untaped status	
Species Detail View		"Back" Button	Tap		Go back to "Species Detail View" page without pick any picker	
		"Apply" Button	Tap		Go back to "Species Detail View" page with picker user pick	
			Tap		Open the "Type" pickers for user to pick	
	"Type" Disclosure Indicator	"Type" Pickers	First Time Tap		User can choose which pciker of the type of property list for the animal	
			Second Time Tap		Cancel the selection, and set the picker to unselected status	
		"Back" Button	Tap		Go back to "Species Detail View" page without pick any picker	
		"Apply" Button	Tap		Go back to "Species Detail View" page with picker user's pick	
	"Notes" Textfield		Virtual Keyboard	String (200)	User can edit the features of the animal	
	"Save" Button		Tap		Save all the changes in the "Species Detail View" page and back to "PhyloDex" page.	PhyloDex
Full Screen Photo	"Back" Button		Tap		Return to the "PhyloDex" page	PhyloDex
Capture	"Photo-taking" Icon		Camera		Taking Photo when user tap on "Photo" icon and go to "Photo Confirmation" page automatically	Photo Confirmation
Photo Confirmation	"Back" Button		Tap		Return to the "PhyloDex" page without saving the photo	PhyloDex
	"OK" Button		Tap		Go to the "Species Detail View" page	Species Detail View
	"Retry" Button		Tap		Return to the "Capture" page and take photo once more	Capture

Page	Element	Detail	Data	Gesture	Description	Result
Crop	"Constain" Button			Tap	User can using general image cropping tool to choose which part is necessary to them by first taping on the photo and then holding and dragging until that part of photo covered by a rectangle that fulfill user's needs	
	"Crop" Button			Tap	Save all the changes in the "Crop" page and return to the "Photo Confirmation" page	Photo Confirmation
	"Back" Button				Go back to "Photo Confirmation" page without saving the cropped image	Photo Confirmation
	"Name" Textfield	Virtual Keyboard	String (20)		User can type the name of animal he/she wants to search into the textfield. If user leaves the textfield as blank, it will show an error when the user tap on "Search" button	
	"Type" Disclosure Indicator			Tap	Open the Type pickers for user to pick	
		"Type" Pickers	First Time Tap		User can choose which pciker of the type of property list for the animal	
			Second Time Tap		Cancel the selection, and set the picker to unselected status	
		"Back" Button	Tap		Go back to "Web Search" page without pick any picker	
		"Apply" Button	Tap		Go back to "Web Search" page with picker user's pick	
	"Habitat" Disclosure Indicator			Tap	Open the habitate pickers for user to pick	
Web Search		"Habitat" Pickers	First Time Tap		User can choose which picker of the habitat of property list for the animal	
			Second Time Tap		Cancel the first tap, and set the button to untaped status	
		"Back" Button	Tap		Go back to "Web Search" page without pick any picker	
		"Apply" Button	Tap		Go back to "Web Search" page with picker user's pick	
	"Search" Button			Tap	System will firstly check if the name textfield is empty. If it does not, system will generate an error message to tell the user to re-type in the name of the animal. If it does, system will send a query to the online database. If the Internet is available, the online database will send back result(s) of the search and system will push the page from "Web Search" to "Search Result"; otherwise, system will generate an error message to tell the user to check the Internet connection	Online Database (www.natureserve.org), Search Result
Search Result	"Back" Button			Tap	Return to the "Web Search" page	Web Search
	"Detail" Disclosure Indicator			Tap	Go to the "Search Result Photo" page	Search Result Photo
Search Result Photo	"Back" Button			Tap	Return to the "Search Result" page	Search Result
	"Animal" Checkbox			Tap	Select the animal that user pick and system will generate a Phylo card automatically	
				Tap	Open the share method for user to choose	
Share	"Send" Button	"Cancel" Button		Tap	Return to the "Share" page without saving user's pick	Share
		"Email" Button		Tap	Open the email page with web browser	Web Browser
		"SMS" Button		Tap	Open SMS	SMS
		"Air Drop" Button		Tap	Open Air Drop	Air Drop

Name	Type	Habitat	Note	Photo Location	Note Location	Property List Location
Eagle	Bird	Wetland	Large, powerfully built birds of prey, with a heavy head and beak	../Phylodex/User/Data/Animal/Eagle/Eagle.xcdmode	../Phylodex/User/Data/Animal/Eagle/Eagle.txt	../Phylodex/User/Data/Animal/ AnimalPropertyList.xml
Salmon	Fish	Ocean		../Phylodex/User/Data/Animal/Salmon/Slamon.xcdmode	../Phylodex/User/Data/Animal/Salmon/Salmon.txt	
Husky	Mammal	Arctic		../Phylodex/User/Data/Animal/Husky/Husky.xcdmode	../Phylodex/User/Data/Animal/Husky/Husky.txt	
Lizard	Reptile	Desert		../Phylodex/User/Data/Animal/Lizard/Lizard.xcdmode	../Phylodex/User/Data/Animal/Lizard/Lizard.txt	
Frog	Amphibian	Wetland		../Phylodex/User/Data/Animal/Frog/Frog.xcdmode	../Phylodex/User/Data/Animal/Frog/Frog.txt	

Temp Data

Search Results	../Phylodex/User/Data/ Animal/Temp/SearchR esults

File Definitions

Location	File
../Phylodex/User/Data/Animal/	<Animal's Name>..xcdmode
../Phylodex/User/Data/Animal/	<Animal's Name>.txt
../Phylodex/User/Data/Animal/	AnimalPropertyList.xml
../Phylodex/User/Data/Animal/Temp/	SeachResults.xml

4. Feature priority

The priority of feature implementation for our application is listed in the section below. There will be three major build versions of the application delivered, and targets are structured below based on those three versions. As of version 1.9 of this document, there have been some significant changes and reprioritizing based on difficulties encountered in the version 1 development phase due to limited time and resources.

4.1 Version One

4.1.1 Tab Bar

A tab bar shall exist at the bottom of a screen, allowing the user to select amongst 4 icons and change the current 'mode' of the application. In certain conditions such as camera usage or fullscreen image viewing, the tab bar will be hidden. This navigation method is core to the application and targeted to version 1. The available modes are:

- **PhyloDex**
  The PhyloDex is a viewable library that contains information on all of a users' cards/captures.

- **Search**
  The Search mode is designed for users to lookup creatures based on input parameters using the natureserve.org service, and obtain information on them.

4.1.2 PhyloDex

The PhyloDex is the very first interface of our application that users will see. It is composed of a status bar, a navigation bar, a table view of creatures, and a tab bar.

- **Status bar**
  The status bar is an area showing basic information about cell signal, carrier, cellular (Wi-Fi), time and battery remaining. It will appear all the time. As a basic feature of iOS, having the status bar included is targeted for version 1. For example:

 [2]

- **Navigation bar**
  The title of the mode, "PhyloDex" will be shown in the middle of the navigation bar, with an edit button located at the rightmost part of this bar. The edit icon allows users to reorganize their list and creates red delete buttons shown at the left area of each row when users tap the edit button. Reorganization is not targeted for version 1, but deletion should be supported.

- **Table view of creatures**
  The main content of the Phylodex mode, the table view provides a list of users' cards/'captured' creatures. The table is organized with the information of each creature on the left of each row and its picture on the right. This being primary

functionality of the app, as well as a testable use of our method of data storage, is targeted for version 1.

- **Tab bar**
  The tab bar, following Apple's Human Interface Guidelines, provides a toggle to swap between modes used in this application. Further details of the tab bar are as listed in section 4.1.1

4.1.2.1 Detail Editing

Tapping on an item's details in the table view of the Phylodex mode should open a new view with some fields to fill in or edit the data of. While field editing is useful for dynamic tests of our database system and the primary way to differentiate 'captures', issues with development of the database have pushed back editing functionality. Display of content, however, remains implemented in version 1. This view should have the following components:

- **Navigation bar**
  The navigation bar will have a back icon and a save icon. If users choose the back button, they will go back to the previous step, discarding any changes. The save button will accordingly save changes and update the database of stored entries as required. Both options return the user to the main index page.
- **Photo area**
  The photo area shows the picture associated with the entry.
- **Data Fields**
  There shall be various required data fields, including those such as *Name* and *Notes*, where the user enters values with a virtual keyboard, and fields such as *Habitat* and *Type*, which will display pickers when selected in order to limit the users' options to predetermined fields. In version 1 these have had to be limited to static fields, but editing support will be added by version 2.

4.1.4 Search

The Search mode is used by users to find out information about creatures they may not know or are not familiar with. The Search interface is comprised of a Navigation bar, a text field, two buttons named "Search" and "Clear", and detail information fields. For version one, the extra information fields are not implemented as their addition to the search query at present would not be of any use.

- **Navigation bar**
  A bar with a back button at the left and "Web Search" in the middle
- **Text field**
  The text field is for users to type key words to search information about creatures or their names. A key board will pop-up when users tap the text field.
- **Search and Clear Buttons**
  Search button is used to search information related to the words. In addition, the clear button will erase everything in the text field.

After users click the search button, a table view of search results will appear. Each row shows a name and a type of a creature, and a detail disclosure indicator for an image and more detailed information about the creature. This is the secondary main function of our application, and is thusly targeted for version 1, though the web interaction is simulated with a dummy response in version 1, to primarily get the population and detail disclosure functionality working first.

4.2 Version Two

4.2.1 Tab Bar

The tab bar will be expanded from the limited implementation in version 1 to accommodate two more mode options:

- **Capture**
  The Capture mode is used for taking pictures, and it is the main method for users to 'capture' creatures to add them to their library of encountered animals.
- **Share**
  Users can share/export information on their cards with others using the Share mode.

4.2.2 PhyloDex

All features from version 1 shall remain supported, with the following additions:

- **Image Cropping**
  From the detail editing view, a button shall be added that users can tap on to access a standardized cropping interface, with an adjustable rectangle with guide corner highlights on top of a darkened version of the source image. There shall be a constrain option to restrict the rectangle to a certain proportion. When saved, this crop should be noted, saved, and used as the new display image for the new entry in all lists.

- **Detail Editing**
  The available parameters in the detail editing view may be adjusted for better matches to the results in search mode or to fit user feedback. More fields than the initial concept may also be added as required.

4.2.3 Capture

The primary function of the Capture mode is taking pictures of creatures. The interface of the Capture function consists of a display area and a camera icon at the middle of the toolbar.

After capturing an image with the camera icon, a new view will occur, with a navigation bar and the picture just taken beneath the bar.

- **Navigation bar**
  The navigation bar contains two parts, which are a back button at the left and a next button at the right. If users choose the back button, they will go back to the capture photo step and the picture the user just took will be abandoned. This effectively functions as a functionality allowing the user to try for a better shot more efficiently. If users tap the next button, the picture they just captured will be saved and the users will be brought to the next information entry field, in the Phylodex mode on the Details Editing view, displaying the

just taken picture and asking users to input values as they would when editing any other entry.

4.2.4 Search

For version 2, the search functionality will be refined in search terms and web usage to properly get full results from the natureserve.org service in comparison to version 1 which was designed to implement the display functionality of the data. Results will be displayed in a more cohesive fashion and search requests will be asynchronous so as not to cause a blocking operation.

4.2.5 Share

The Share mode is designed for users to improve the capability of recognizing creatures, and to export their content from the application. Users could have more chances to see some creatures from other places through mutually sharing their cards with friends. The components of "share" are a navigation bar and a collection view of creatures.

- **Navigation bar**
  The navigation bar has the title "Share" in the middle of it, along with a "send" button on the right. After users tap the send button, a message will pop up if Internet service is unavailable. Otherwise, users will be presented with an email composition view pre populated with the information of their selected creatures. In this view users can enter an addressee and send/export their data.
- **Collection view of creatures**
  Pictures of creatures are listed in a collection view. When users tap on an image of a creature, this image will be highlighted with a yellow border. Furthermore, if users tap the same image again, the highlight will be removed.

The Share mode should support data export in a cohesive format in version 2 that attempts to accurately represent the user's data in the context of the Phylo project/card game. More modes may be added as options as well depending on access to the various APIs and the ability to meet security standards.

4.2.6 Other

Any outstanding bugs from version 1 should be resolved in version 2 and any input from user testing into refining the application's UI should also begin being implemented.

4.3 Version Three

4.3.1 Sharing

At this point, the data of creatures in the application should be coherent enough that the export mode should be able to export a file for sharing that matches the Phylo card game format adequately. This is done separate HTML+CSS+Image files. Though it would be optimal to be able to create a single pdf or image for each shared card, this is not quite possible within the constraints of an iOS application.

4.3.2 Phylodex + Search

Search results from natureserve have been improved to be far more comprehensive and include much more of the available data. Various bugs have also been fixed.

4.3.3 User Accounts

User accounts that can be logged in and out of are now integrated into the system and tied to photos taken by the user. Admin accounts can manage users, while each user login provides access to their own photo collections.

4.3.3 Detail View Improvements

A wide variety of changes and updates have been added to the detail view. Based on user feedback, display and editing have been integrated into the same view and all of the relevant Phylo Trading Card Game fields have been added as editable properties.

5. Reference

[1] Phylo, "About - Why Are We Doing This?" 2013, [Online]. Available: http://http://phylogame.org/about/ [Accessed May. 17, 2013].

[2] iPhone Development 101, "iPhone Development 101: User Interface: The Status Bar" 2003,[Online]. Available: http://www.idev101.com/code/User_Interface/StatusBar.html [Accessed May. 17, 2013].