

## **CS3714 iOS Mobile Software Development**

Fall 2013

# **iLearnGeography**

**SANCHIT CHADHA**

Department of Computer Science  
Virginia Tech  
Blacksburg, VA 24061

Date: 12/16/2013  
Email: schadha@vt.edu  
Submitted to: Prof. Osman Balci

## **EXECUTIVE SUMMARY**

### **Problem Specification**

- iLearnGeography is an application designed to teach world geography to children in elementary school. It is an iPad application that is intuitive, easy-to-use and is a valuable teaching tool and resource for children to memorize where countries of the world are located.
- The application is designed for the iPad and based on a sliding view user interface. There are seven sections of the application that allow students to have fun, study the material, and learn about countries, and get quizzed on countries of the world based on continents, world regions and on the US states.

### **Requirements Specification**

- The app shall provide a study section, multiple quiz sections and a fact sheet.
- The app shall save user information as a plist file in the application's document directory.
- The app shall use the ECSlidingViewController class provided by Michael Enruiquez to create a sliding view architecture.

### **Architecture Specification**

- The application does not use a client server based architecture.

### **Design Specification**

- The main screen of the application can be swiped right to reveal the menu table view.
- The jigsaw puzzle section features two difficulties, easy and hard, for the user to complete as quickly as possible. The pieces are all interactive and can be moved around by touching and swiping the piece.
- The study section is designed like a flash card. The user looks at an image that has a country highlighted and when the user taps the image, the name of the continent and country is revealed.
- The easy quiz only tests the knowledge of identifying the continent a country is a part of.
- The medium quiz tests the knowledge of identifying the continent given only the name of a country.
- The hard quiz section allows users to test their knowledge of identifying the location of a country in a specific continent.
- The bonus quiz section is designed to be a fun activity for the users to test their knowledge of identifying the location of states in the USA when given a state through the UIPickerView.
- The facts section provides users additional information about each country they have learned about.

### **Conclusion**

- This application provides a very high level of interactivity and education for elementary school and middle school students to learn about geography. Using colorful visuals, interactive games and quizzes, students will enjoy learning about geography and will be able to identify countries around the world more easily.

## TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>II</b>
<b>1. PROBLEM SPECIFICATION .....</b>	<b>1</b>
1.1    WHAT IS THE PROBLEM? .....	1
1.2    WHY IS THE PROBLEM IMPORTANT TO SOLVE BY ENGINEERING AN IOS APPLICATION? .....	1
1.3    WHO WOULD BE INTERESTED IN THE SOLUTION PROVIDED BY THE APP? .....	2
1.4    WHY WOULD A USER PAY \$0.99 TO PURCHASE THE APP?.....	3
<b>2. REQUIREMENTS SPECIFICATION.....</b>	<b>3</b>
<b>3. ARCHITECTURE SPECIFICATION .....</b>	<b>3</b>
<b>4. DESIGN SPECIFICATION .....</b>	<b>3</b>
<b>5. DELIVERED SOFTWARE.....</b>	<b>5</b>
<b>6. CONCLUSIONS .....</b>	<b>10</b>
<b>REFERENCES.....</b>	<b>10</b>

## **1. Problem Specification**

iLearnGeography is an application designed to teach world geography to children in elementary school. It is an iPad application that is intuitive, easy-to-use and is a valuable teaching tool and resource for children to memorize where countries of the world are located.

### **1.1 What is the problem?**

World geography is taught in schools, but children still have trouble remembering where countries are located. There are many maps and globes available for teachers to use to give students a visual aid that helps them learn these countries and their locations. These maps and globes are just a visual aid and don't provide a level of interactivity with children that makes them intrigued to learn more. Such a level of interactivity can be accomplished by developing an iPad application.

### **1.2 Why is the problem important to solve by engineering an iOS application?**

Since interactivity is such a key feature of this type of educational application; engineering an iOS application is the correct approach in solving the problem of teaching children world geography in a more cohesive manner. An interactive iPad application that teaches and quizzes students on the locations of countries and allows students to focus on a specific region of the world gives students a greater flexibility in what they want to learn about and at the same time gives the teachers a helping hand in conveying geographical knowledge while still testing what the students have learned.

### **1.3 Description of Your App's Expected Functionality**

The application will be designed for the iPad and will be based on a sliding view user interface. There will be seven sections of the application that allow students to have fun, study the material, and learn about countries, and get quizzed on countries of the world based on continents, world regions and even quizzed on the US states.

#### Sections

- Jigsaw Puzzle (World Map)
  - A jigsaw puzzle game with an image of a world map. This page is based off of the JigsawPuzzle application that was done for Assignment 4. The student can select a difficulty level which changes the number of puzzle pieces used to complete the puzzle.
- Study Section
  - Presents the user with flash cards with the following layout:
    - Image of where the country is located in with respect to a continent.
    - When the user taps the image, the name of the country and the continent it is located in will show.
  - The user will be able to click next/previous to see the next or previous flash cards or click random to see a random flash card.



- Easy Quiz
  - Quiz will have a similar format to the flash cards, but the image of the country's location and the name of the country will be alternatively shown
  - Either way, the user will have to pick a continent where that country (based on the name or image of location) is located in. The continent will be picked through a UIPickerView.
  - The quiz is a minute long and an evaluation is given at the end of the minute to see how many questions the student got correct.
- Medium Quiz
  - User is presented with a large map of the world.
  - When the user hits start, a one minute timer is started and the name of a country is given.
  - The user must correctly touch the corresponding continents that the country belongs to.
  - An evaluation is given at the end of the minute to see how many questions the student got correct.
- Hard Quiz
  - User is prompted to select a region/continent of the world based on a table view cell they select.
  - The view changes to a map of the selected region/continent.
  - When the start button is hit, the user must drag and drop the country labels that pop up onto the country corresponding to it on the map shown. The timer is set to 2 minutes.
  - The label will snap into its correct place if the position the user dropped the label is close to the correct country.
  - If the country is not correct, a new country label will not be generated until the correct country on the map is found and linked with the corresponding label.
  - An evaluation is given at the end of the two minutes to see how many questions the student got correct.
- Bonus: United States - States Quiz
  - Same concept as the hard quiz, but label is an abbreviation of a state and the image is a map of the 50 states of the USA.
  - No time limit, but just a fun activity to see how many states the student can get correct.
- Facts Section
  - Table view with information about all countries of the world.
  - Searchable and indexed.
  - When clicked, the Wikipedia page of the country is opened.

#### **1.4 Who would be interested in the solution provided by the app?**

Students who want a challenge and want to learn about world geography will be interested in this application. Teachers who usually use globes and maps to help students visualize geography will be able to incorporate this technology that allows them to create a more interactive classroom session. Teachers will also be interested in this solution because it both teaches and tests their students about world geography, thus accomplishing two tasks with one application solution.

## 1.5 Why would a user pay \$0.99 to purchase the app?

A user such as a teacher would definitely pay the nominal price of \$0.99 for this application if it means that their job of teaching a specific topic such as world geography will be made easier. Students and their parents would also be willing to pay \$0.99 for the app because it ensures that the students get the best knowledge about the world's geography and at the same time get tested on what they have learned. The application creates an interactive and fun learning experience that justifies its price of \$0.99 and why teachers, students and parent would all be willing to buy the app.

## 2. Requirements Specification

The app shall teach children in elementary and middle school world geography.

The app shall provide a study section, multiple quiz sections and a fact sheet.

The app shall save user information as a plist file in the application's document directory.

The app shall use multiple map images that are colorful and easy to read.

The app shall use pan gesture handlers for the jigsaw puzzle and hard quiz sections.

The app shall use the UISpinnerView to pick countries/regions for various quizzes and exercises.

The app shall retain user information such as scores and completed sections even when the app is closed.

The app shall use the ECSlidingViewController class provided by Michael Enruiquez to create a sliding view architecture.

## 3. Architecture Specification

This iPad application can perform all of its processing on the device and thus there is no need for a client-server architecture.

## 4. Design Specification

Key	Type	Value
Root	Dictionary	(7 items)
Jigsaw Puzzle	String	red-dot
Study Section	String	red-dot
Easy Quiz	String	0
Medium Quiz	String	0
Hard Quiz	Array	(6 items)
Item 0	Number	0
Item 1	Number	0
Item 2	Number	0
Item 3	Number	0
Item 4	Number	0
Item 5	Number	0
Bonus Quiz	String	0
Facts Section	String	red-dot

Figure 1

The Sections.plist file is used to store information about each section. The file is saved in the documents directory of the application. When a user completes a section, the value for that section is changed to a green-dot, which in turn changes the color of the ImageView for the corresponding TableViewCell in the MenuViewController. Likewise, when a user

completes a quiz, the number of correct answers is assigned to that section's value and then a label is updated on the corresponding TableViewCell to represent a fractional score value.

Key	Type	Value
▀ Root	Dictionary	(6 items)
▀ Africa	Dictionary	(10 items)
▀ Algeria	Array	(2 items)
Item 0	String	370,250
Item 1	String	<a href="http://en.m.wikipedia.org/w/index.php?title=Algeria">http://en.m.wikipedia.org/w/index.php?title=Algeria</a>
▶ Congo	Array	(2 items)
▶ Egypt	Array	(2 items)
▶ Kenya	Array	(2 items)
▶ Madagascar	Array	(2 items)
▶ Morocco	Array	(2 items)
▶ Niger	Array	(2 items)
▶ Nigeria	Array	(2 items)
▶ South Africa	Array	(2 items)
▶ Sudan	Array	(2 items)
▀ Asia	Dictionary	(6 items)
▶ India	Array	(2 items)
▀ China	Array	(2 items)
Item 0	String	509,308
Item 1	String	<a href="http://en.m.wikipedia.org/w/index.php?title=China">http://en.m.wikipedia.org/w/index.php?title=China</a>
▶ Indonesia	Array	(2 items)
▶ Japan	Array	(2 items)

Figure 2

The core information for a country is stored in the CountryInformation.plist file. It is a dictionary that contains separate dictionaries for each continent and those dictionaries contain arrays representing each country in the continent and those continents contain a coordinate string value for the Quiz Section map pins and a URL string value for the facts section web pages.

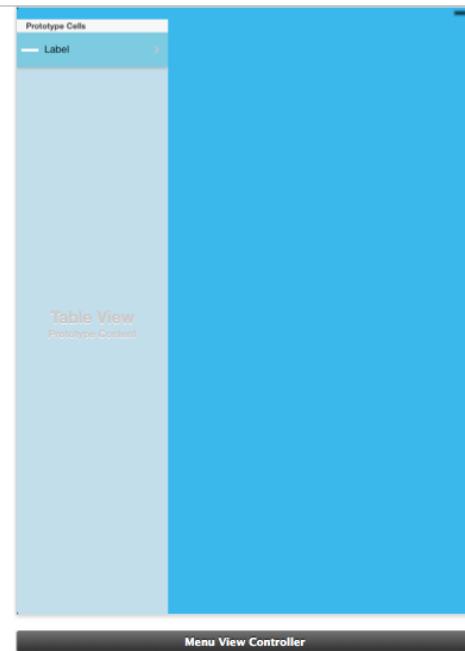
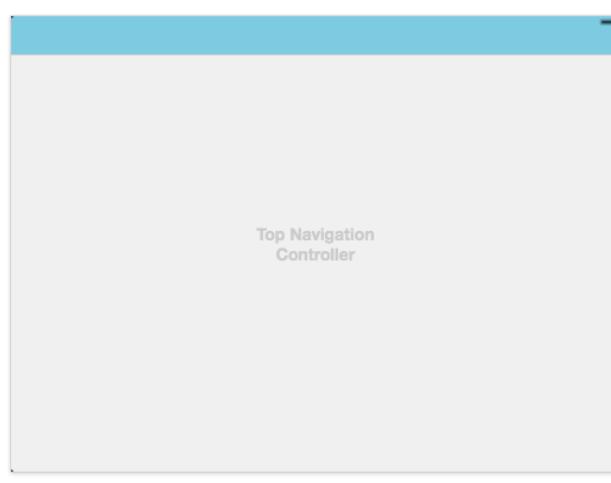
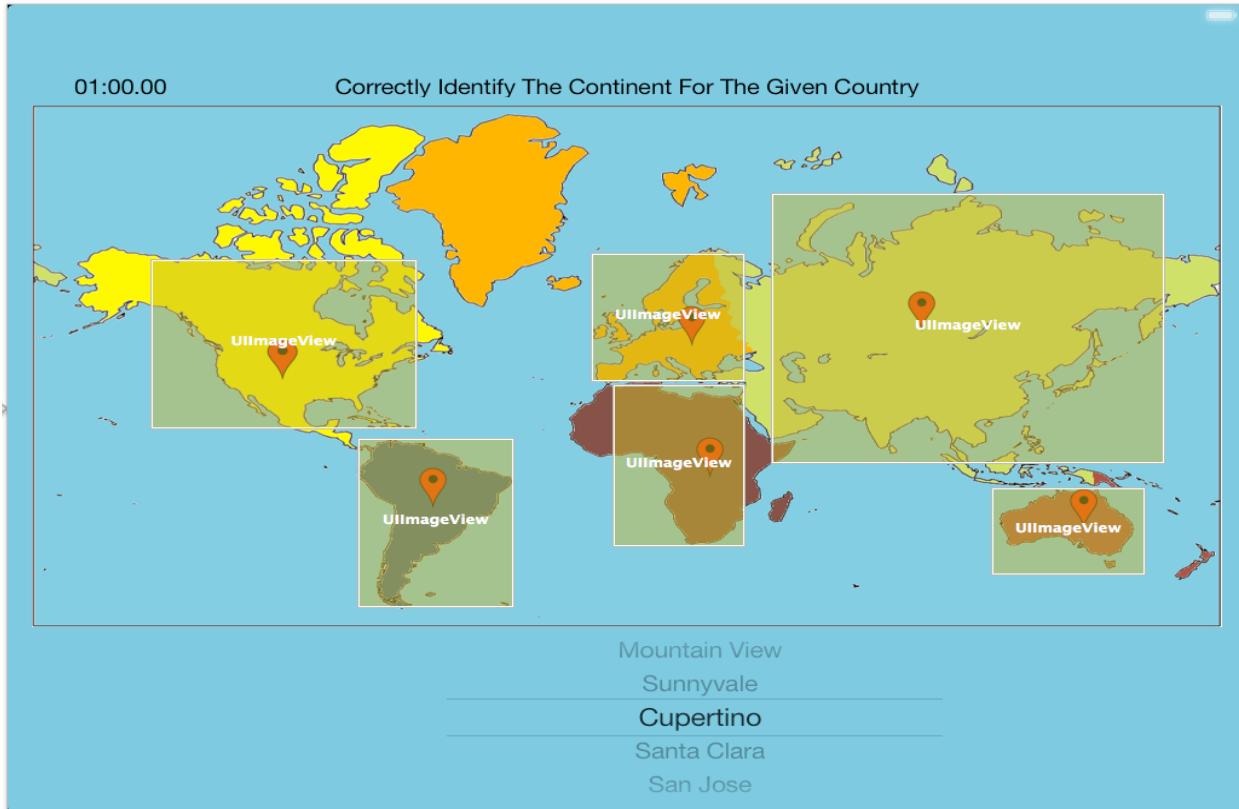


Figure 3: Primarily a sliding view based application. The Initial View Controller sets the Top Navigation Controller as the core view for pushing and instantiating new views. The Menu View Controller is the table view that is revealed when the Detail View Controller detects a right swipe. Michael Enriquez's, EdgeCase SlidingViewController is used to handle the gestures and design to reveal a Menu View Controller under multiple views.



**Figure 4**

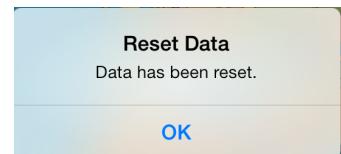
Figure 4 shows a view controller for the Medium Quiz section where the user has to touch the continent corresponding do the country displayed randomly by the UIPickerView. The user is given one minute to get as many answers correctly, and a UIAlertView is displayed with the score once the time is up.

## 5. Delivered Software

The application is designed for the iPad and based on a sliding view user interface. There are seven sections of the application that allow students to have fun, study the material, and learn about countries, and get quizzed on countries of the world based on continents, world regions and on the US states. The application stores user information such as scores and completed sections in a plist file that is saved in the documents directory of the application. Each section of the application has a different way of teaching the user about world countries and continents and allows for a unique way of interacting with the application. Here are some screenshots and detailed information about each section.

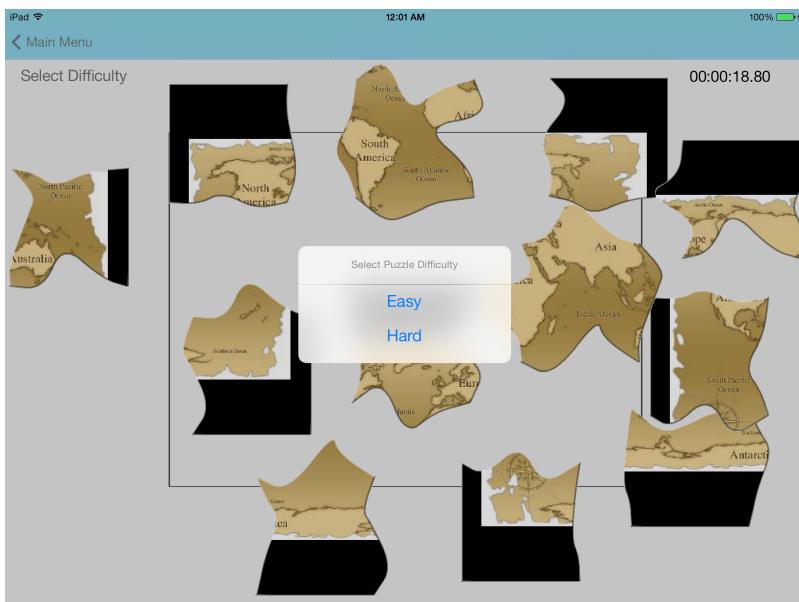


The main screen of the application can be swiped right to reveal the menu table view. The menu button can also be tapped to reveal the table view. The Reset Data button resets the data stored in the plist, which allows for all scores and completed sections to be reset.



iPad		iPad		Menu
● Jigsaw Puzzle	>	● Jigsaw Puzzle	>	ARCTIC
● Study Section	>	● Study Section	>	United States of America
0 / 40 Easy Quiz	>	26 / 40 Easy Quiz	>	
0 / 40 Medium Quiz	>	36 / 40 Medium Quiz	>	
0 / 40 Hard Quiz	>	18 / 40 Hard Quiz	>	
0 / 50 Bonus Quiz	>	45 / 50 Bonus Quiz	>	
● Facts Section	>	● Facts Section	>	

Initially, the menu table view starts off with red dots for the Jigsaw Puzzle, Study and Facts sections and a score of 0 for each of the Quiz sections. Once the user completes a section or quiz, the image for the table cell is updated to reflect the completion or score. The jigsaw puzzle completion image is special, because it depends on the completion of both the easy and hard difficulties.



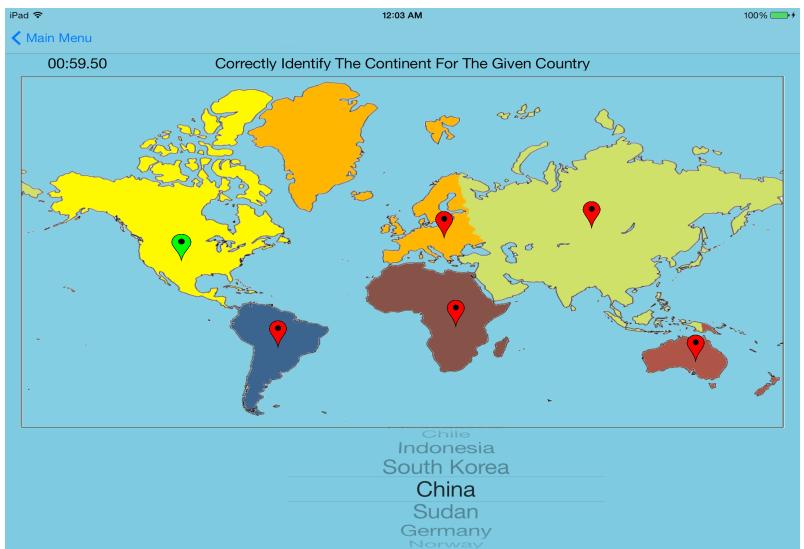
The jigsaw puzzle section features two difficulties, easy and hard, for the user to complete as quickly as possible. The pieces are all interactive and can be moved around by touching and swiping the piece. When the piece is brought near its correct location, it is snapped onto its place and a click sound is played. The faster the user completes the puzzle, the better result he/she gets.



The study section is designed like a flash card. The user looks at an image that has a country highlighted and when the user taps the image, the name of the continent and country is revealed. This is an effective tool for studying. The random button is tapped to get the next flash card. When the user goes through all 40 flash cards, the image for the study section's table view cell is changed to a green dot.



The easy quiz only tests the knowledge of identifying the continent a country is a part of. The user is presented with a highlighted image of the country and the name of the country underneath the image. Using the UIPickerView, the user must select the correct continent and tap 'Submit' to submit their answer. They are given one minute to see how many answers they can get right. The score is updated on the section's table view cell.



The medium quiz tests the knowledge of identifying the continent given only the name of a country. The user has one minute to correctly identify the continent for the given country that is randomly selected and displayed on the UIPickerView. The user does not necessarily have to tap on the pin to select the continent, as each continent has an overlay image view that is tapable anywhere. The score is updated on the section's table view cell.

iPad 12:04 AM Main Menu

Pick A Continent To Begin  
Complete All Continent Quizzes To Get Credit

- Asia
- Africa
- Europe
- Oceania
- North America
- South America

iPad 12:04 AM Back Drag The Country Name Under The Correct Pin 100% +

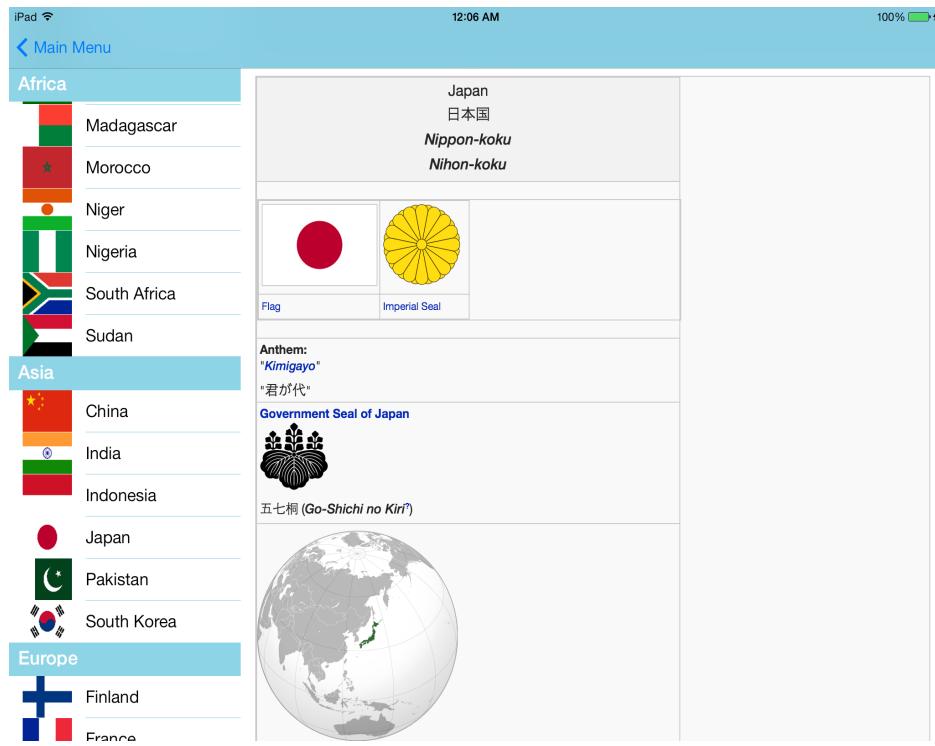
The hard quiz section allows users to test their knowledge of identifying the location of a country in a specific continent. When the section is selected, the user is presented with a table view representing 6 continents. When a continent is chosen, its map is shown and a label is created on the right hand side of the view. The user must drag the label representing a country name under the pin that corresponds to the location of that country. If the label is set correctly, it turns green, but if it is not, then it turns red. The user must get all the labels correctly placed in order for that continent's table view cell image to be a green dot. The table view cell for the hard quiz section in the menu table view handles the score received for the entire section.

iPad 12:05 AM Main Menu

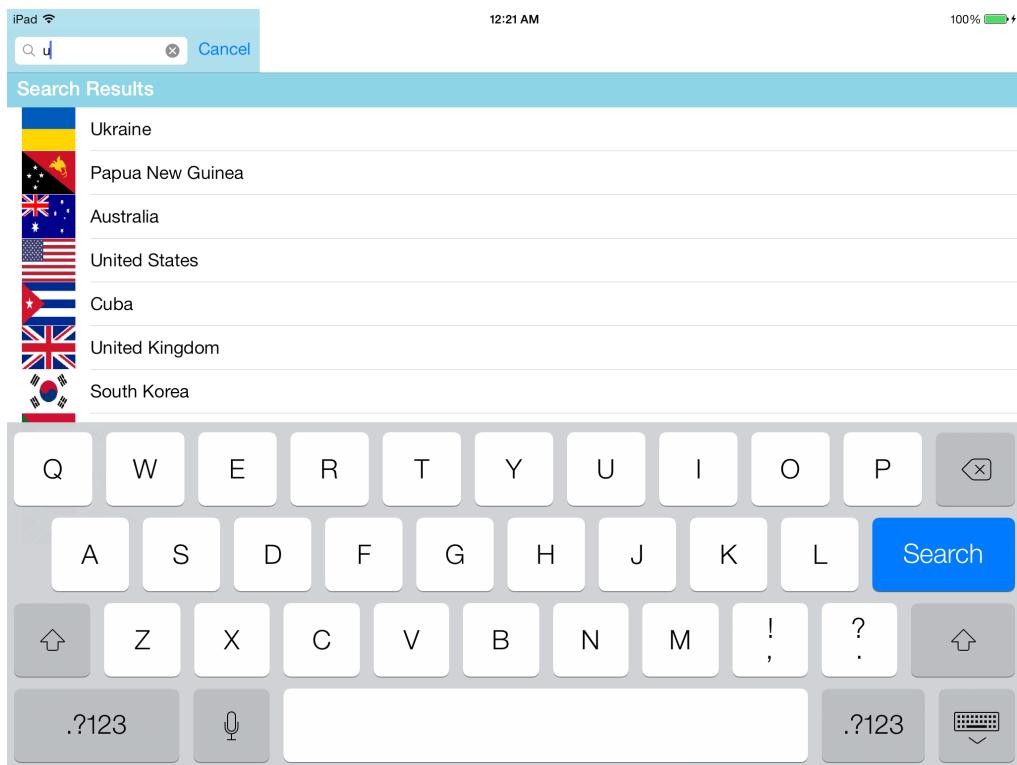
Correctly Identify The State

Texas	TX
Utah	UT
Vermont	VT
Virginia	VA
Washington	WA
West Virginia	WV
Wisconsin	WI

The bonus quiz section is designed to be a fun activity for the users to test their knowledge of identifying the location of states in the USA when given a state through the UIPickerView. When a state is shown, the user must tap the red dot for the corresponding state on the map. If the state tapped is correct, that red dot changes into the two letter code for that state. The table view cell for this section keeps track of how many states the user has gotten correct out of 50. If the user manages to identify all states, then the cell image shows a green dot.



The facts section provides users additional information about each country they have learned about. When a country cell is tapped, the Wikipedia page is opened up in the web view next to the table view. The table view is searchable and allows for users to quickly find more about a country that they are looking for.



## **6. Conclusions**

This application provides a very high level of interactivity and education for elementary school and middle school students to learn about geography. Using colorful visuals, interactive games and quizzes, students will enjoy learning about geography and will be able to identify countries around the world more easily. The application is worth the price of \$0.99 because it allows children to learn more about the world in a fun and easy manner. Teachers can use the application to test or quiz their student's knowledge because the application provides a way to save scores for a single user. This application can be used as a very helpful educational resource for teachers to use in their classroom.

### iOS Features

- Animations
- Audio
- Pass data to upstream view controller
- Gestures (pan, swipe, tap)
- Plist Files (Read from application main bundle, and read/written from documents directory)
- Split View
- Storage/Retrieval of User Data
- Table Views (Custom cells)
- Sliding View
- UIPicker View
- Create/resize/reposition Objects At Runtime
- Web Browser
- Searchable Table View

## **References**

- Apple, Inc. (2012), “iOS Developer Library,”  
<https://developer.apple.com/library/ios/navigation/index.html>
- Balci, O. (2012), “CS3714 iOS Mobile Software Development Course Website,”  
<http://manta.cs.vt.edu/cs3714>
- Enriquez, M. (2012), “ECSlidingViewController GitHub Code”  
<https://github.com/ECSlidingViewController/ECSlidingViewController/tree/1.x>