MAPPING APPLICATION FOR LARC STUDY ABROAD PROGRAM

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DEDICATION

This thesis is dedicated to my parents, my brothers and my friends for the love, support and encouragement. I appreciate their support and patience during this period.
ABSTRACT OF THE THESIS

Mapping Application for LARC Study Abroad Program
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Language Acquisition Resource Center (LARC) is a national Language Resource Center at San Diego State University, which has many international programs. One of them is Study abroad project, where SDSU students travel to different countries. Managing and maintaining the students activities manually, involves many resources and is a tedious and time-consuming process. My thesis will help to easily shape this to a dynamic way by using forms, ArcGIS, the course management system - Moodle and other relevant tools. It will enable the students and teachers to view the activities of other students. They can view the location on map along with the other information. This will be an attempt to keep the students and teachers in constant touch and share the experiences about the location they have visited. All these features simplify and accelerate the need to have a better communication outside classroom.
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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The Language Acquisition Resource Center (LARC) is a national Foreign Language Resource Center at San Diego State University (SDSU), California that has many international programs. SDSU is renowned for its study abroad programs; many programs here, have the requirement that the students do their study abroad. LARC supports this because through this students get a higher level of proficiency in foreign language and learn more about foreign culture. LARC is assisting the Italian program that has a study abroad project in Florence. Italian program is a part of Department of European Studies under College of Arts and letters. International experiences - especially long-term experiences such as a semester or year abroad - provide lasting benefits that shape an individual's life both personally and professionally. Beyond the obvious reasons to study abroad such as opportunities to see the world and experience other cultures, there are true benefits to those experiences [1].

1.2 MOTIVATION

LARC has many study abroad programs and the faculty, staff and students do not have access to the places the students visit. Students use the Moodle LARC site for the course work, but it will interesting to know the activities of the students during their spare time when they are studying abroad. There is a need for a central application that can do this easily and maintain track of everything that they need to. Learning can be a great experience and sharing what students have learnt or seen can be even more exciting. Additionally, this can be helpful for students who are going to visit these countries later. Staff and other students can share their experiences with these students and provide some guidelines easily.

With time, new places are visited and no one keeps track of the previously visited places. So an attempt to have all the visited places by the students has to be made. This will be useful for the current study abroad batch. If such data is available, it will be beneficial for
the future study abroad batches. Thus, we will attempt to understand the country in a better way and share this data with the LARC family.

1.3 **Objective**

The best way to learn a foreign language is to visit a foreign country. The advantages includes easy access to native speakers that you can converse with the opportunity to perfect your listening skills and the opportunity to learn useful everyday words which are not frequently heard on TV or in movies [2]. But all these benefits are achieved only if the students expand their horizons and mix with the native people.

Another good thing to have would be a place where the students can share their information of the places they visited and the new stuff that they learnt there, may it be new word, historic event, interesting places and history behind that etc. If the shared information is visible on map then the students will be able to orient themselves geographically.
CHAPTER 2

TOOLS & TECHNOLOGIES USED

This chapter furnishes details about the main tools and technologies used in the design and implementation of the thesis. ArcGIS.com map viewer displays the student data on the map. Google form and spreadsheet, efficiently collects the student data and saves it. The translator tool is built on HTML, JavaScript. The following subsections give a brief explanation of these technologies. The Appendix A contains a summary list of all abbreviations used in this paper.

2.1 ESRI's ArcGIS

ArcGIS is one of the most important tools used in this thesis. Esri's ArcGIS is a geographic information system (GIS) for working with maps and geographic information. It is used for: creating and using maps; compiling geographic data; analyzing mapped information; sharing and discovering geographic information; using maps and geographic information in a range of applications; and managing geographic information in a database. The system provides an infrastructure for making maps and geographic information available throughout an organization, across a community, and openly on the Web [3].

ArcGIS includes the following Windows desktop software [3]:

1. ArcReader, which allows one to view and query maps created with the other ArcGIS products;
2. ArcGIS for Desktop, which is licensed under three functionality levels:
   • ArcGIS for Desktop Basic (formerly known as ArcView), which allows one to view spatial data, create layered maps, and perform basic spatial analysis;
   • ArcGIS for Desktop Standard (formerly known as ArcEditor), which in addition to the functionality of ArcView, includes more advanced tools for manipulation of shapefiles and geodatabases; or
   • ArcGIS for Desktop Advanced (formerly known as ArcInfo), which includes capabilities for data manipulation, editing, and analysis [3].

There are also server-based ArcGIS products, as well as ArcGIS products for PDAs. Extensions can be purchased separately to increase the functionality of ArcGIS [3].
ArcGIS is a platform for designing and managing solutions through the application of geographic knowledge. It enables you to perform deep analysis, gain a greater understanding of your data and make more informed high-level decisions [4].

- Create web mapping applications that make it easy for stakeholders to access authoritative geographic information.
- Bring information that others have shared into your projects.
- Create mashups from shared services.
- Browse maps and apps published by others using ArcGIS and then incorporate these into your own maps [4].

This thesis uses map to show the location entered by the students. For the purpose, it uses ArcGIS.com map viewer extensively.

2.2 HTML

For this thesis, I use HTML to develop translator tool, to embed the map and form into the Moodle Site. This section explains more about HTML.

HTML (Hyper Text Markup Language) is the main markup language for creating web pages and other information that can be displayed in a web browser [5]. It is a language for describing web pages. The features of HTML are as follows:

- HTML stands for Hyper Text Markup Language
- HTML is a markup language
- A markup language is a set of markup tags
- The tags describe document content
- HTML documents contain HTML tags and plain text
- HTML documents are also called web pages [6]

HTML5 is a markup language for structuring and presenting content for the World Wide Web and a core technology of the Internet. It is the fifth revision of the HTML standard (created in 1990 and standardized as HTML 4 as of 1997) and, as of December 2012, is a W3C Candidate Recommendation. Its core aims have been to improve the language with support for the latest multimedia while keeping it easily readable by humans and consistently understood by computers and devices (web browsers, parsers, etc.). HTML5 is intended to subsume not only HTML 4, but also XHTML 1 and DOM Level 2 HTML [7].
The purpose of a web browser is to read HTML documents and compose them into visible or audible web pages. The browser does not display the HTML tags, but uses the tags to interpret the content of the page [6]. HTML allows Web designers control over the size, color, font and positioning of text and graphics on their pages by the use of special instructions referred to as tags. When viewed with compatible browser software, the tags allow a page to be viewed on any computer, regardless of the operating system, in the same format the designer intended [8].

2.3 JavaScript

JavaScript (JS) is used with HTML for the Language translator tool. JS is an interpreted computer programming language. It was originally implemented as part of web browsers so that client-side scripts could interact with the user, control the browser, communicate asynchronously, and alter the document content that was displayed. JavaScript is a prototype-based scripting language that is dynamic, weakly typed, and has first-class functions. Its syntax was influenced by the language C. JavaScript copies many names and naming conventions from Java, but the two languages are otherwise unrelated and have very different semantics. The key design principles within JavaScript are taken from the Self and Scheme programming languages. It is a multi-paradigm language, supporting object-oriented, imperative, and functional programming styles. JavaScript's use in applications outside of web pages—for example, in PDF documents, site-specific browsers, and desktop widgets—is also significant. Newer and faster JavaScript VMs and frameworks built upon them (notably Node.js) have also increased the popularity of JavaScript for server-side web applications. JavaScript was formalized in the ECMAScript language standard and is primarily used as part of a web browser (client-side JavaScript). This enables programmatic access to computational objects within a host environment [9].

JavaScript is a Scripting Language. A scripting language is a lightweight programming language. JavaScript is programming code that can be inserted into HTML pages. JavaScript inserted into HTML pages, can be executed by all modern web browsers [10].

- All browsers have JavaScript interpreters built in. Zero other languages have this tremendous advantage, and it's unlikely this will change soon.
- JavaScript is a pretty nice language once we get past the little annoyances.
- A function as objects is extremely, extremely powerful. Programming JavaScript is like throwing around super-intelligent play-doh that can be re-molded in mid-air.
- There is not one, but THREE ultra-fast JavaScript engines around (FireFox SpiderMonkey, Google V8 and Safari JavaScriptCore) and they are all fiercely competing to become faster and faster [11].

2.4 Google Forms and Spreadsheets

For student data collection and storage, this mapping application uses Google Forms and Spreadsheets. A Google doc is a web based application which currently contains word processing, presentation, and spreadsheet and forms applications. Since it is web based, it has the advantage of being cross-platform which is helpful when working collaboratively with individuals which may use different types of computer systems [12].

2.4.1 Forms

Google Forms can be used to create forms which will automatically create a spreadsheet to store data collected on the form. Apply themes to forms. This project is an example for using Google Docs: Forms as a tool to facilitate collaboration during research and data collection. It includes instructions as well as the sample form and spreadsheet. This project could be easily adapted to fit most research based group projects [12].

Google Docs: Forms also has the capability of having the forms embedded in a blog or web-page so instructors would not have to have students' email addresses in advance for sharing the form [12].

This is useful for soliciting sign ups, surveys, or any other things where you would need other people’s opinions and inputs [13].

2.4.2 Spreadsheets

Google Sheets is an online spreadsheet app that lets you create and format spreadsheets and simultaneously work with other people. Here's what you can do with Google Sheets [14]:
- Import and convert Excel, .csv, .txt and .ods formatted data to a Google spreadsheet
- Export Excel, .csv, .txt and .ods formatted data, as well as PDF and HTML files
- Use formula editing to perform calculations on your data, and use formatting make it look the way you'd like
- Chat in real time with others who are editing your spreadsheet
• Create charts with your data
• Embed a spreadsheet — or individual sheets of your spreadsheet — on your blog or website [14]
CHAPTER 3

DESIGN OVERVIEW

This chapter explains in detail about the roles and design of the LARC Study Abroad Mapping application. The main aim is to make sure that, it will be easy to create and maintain by non-technical people and to find the simplest way of usage. The teachers and lab assistants should be able to use it with very little effort. The benefits of describing architecture are:

- Will be easy to create similar application for future LARC study abroad programs.
- Help in gaining a clear understanding between the different modules.
- Will be easy to figure out the scope of each module.

3.1 ROLES

Every System has vast number of users. Each user of a system can be divided into different sets of roles. A system can be said to be well designed if all these roles are clearly defined. Some roles may have more responsibilities as compare to others. Another advantage of having a role based system is that it helps you hide some parts of the system from users of specific roles.

Here we have three roles as shown in the Figure 3.1

![Figure 3.1. Roles in LARC study abroad program.](image)
• Admin: Admin has access to all the modules and can create and maintain new mapping course.
• Staff: Staff has access to mapping course, data submitted by the students and the map.
• Student: A student has access to the instruction manual, input form and the map through the Moodle course.

3.2 Design

The design is simple and easy to understand. Main modules are as follows:

• Moodle course
• Student Instruction manual
• Student Form
• Spreadsheet (converted to CSV)
• ArcGIS map
• Language Translator
• Survey

Figure 3.2 shows the flow between the different modules as explained below. The main user of this system is student. So the design is explained by the student’s point of view. All the students of the LARC Study abroad program will be enrolled in a Moodle course. The data present in this course will be available to the enrolled students. From the Moodle course, a student can access instruction manual, student form, and map and language translator modules.

• Students have to follow the simple instruction manual to fill the form. This instruction manual contains guidelines on how to get some of the fields like latitude, longitude etc. It contains easy to follow instructions and will be needed only till the student get familiar with the process. Please refer to Appendix B to see the student instruction manual.

• Students then fill and submit the form with information related to the places they visited. They can change the data submitted in the form. Also, a student can submit the form multiple times with different locations.

• When the student submits the form, the data gets saved in a spreadsheet. Each submission by the student corresponds to a single row in the spreadsheet. The column headers correspond to the fields on the form. The students do not have access to this and only the admin and staff can access it.

• Next, the data from this spreadsheet has to be used to fill into the map. For this CSV form of the spreadsheet is used to add a layer on the map. This layer will display
points on the map for the location entered by the student in the form. When the point representing particular location is clicked, a small pop-up opens next to it, which displays the data submitted by the student. Once the student submits the form, he can view the location on the ArcGIS map.

- The ArcGIS map is embedded on the Moodle course along with the language translator tool. This translator tool will be useful, if the data entered by the students is not in English. Having a language translator is a workaround as there are many sites present such as Google translator, Bing translator etc. which have same or even better translate features but it's important to send a message that this application is dealing with students studying foreign language. It might encourage the students to write in the language they are currently studying and they might get more immersed in the language.
CHAPTER 4

IMPLEMENTATION AND USAGE

Three roles in this system are administrator (admin), staff and student. The features and responsibilities of these roles are explained in detail in the sections below.

4.1 FEATURES OF ADMIN ROLE

Admin is responsible for creating all the modules of the application. The features are described in detail in the below subsections.

4.1.1 Student Form Creation and Sharing

The admin needs to create a form where the students enrolled in the Study Abroad course can submit their data. For this, the admin must create a Google form. The admin can discuss the input fields for the form with the concerned staff. Examples for input fields are shown below:

- Name
- Site of Interest
- Site Description
- Additional information (new word, historic event, history)
- Image URL
- Latitude and Longitude

Once the form fields are finalized, the admin creates form. The snapshot of the form is shown in Figure 4.1. It is ready to be embedded into the Moodle course so that the admin need not provide the student form URL separately. To embed the form, click on file and from dropdown select embed... Now copy the embedded HTML code. To embed on Moodle course, the admin should click add a resource dropdown and select page. Now, in page content select HTML. In the pop up, paste the HTML embedded code and click update, then save and return to the course. Now, we can see that form is embedded in the course and the admin need not provide the student with the form URL. The student can access the form from the Moodle course. Embedding the form in Moodle course also protects the form from
malicious use as only the students registered in the course have access to it. The student form embedded in the Moodle course looks as shown in Figure 4.2

The data from every form submission will be saved in Google spreadsheet. Each row corresponds to single form submission. This sheet has to be shared with the staff as they might want to modify the data, remove rows etc. And this sheet will be used to add location points on the map.

4.1.2 ArcGIS Map Creation and Integration of Form Data

For using ArcGIS maps one need to sign up and have an account. Only the admin needs an account and student and staff does not require signing in. Once the admin creates an account and logs-in, in my content, click on create map to create a new map. Next, we need to add a new layer on this map. Figure 4.3 shows the map as seen in ArcGIS. This layer will contain data the students submit through the form in the form of .csv file. The data will appear as points which corresponds the location of the student data.
Figure 4.2. Student form integrated in Moodle course.

To get this .csv file, we go to the Google spreadsheet, click on File and select publish to web... from the dropdown. In the pop up window, select the check box for Automatically republish when changes are made and click Start publishing. Next, in Get a link to the published data section, select CSV (comma-separated values) for web page and copy the link generated.

Now, on ArcGIS map, click on Add and select Add layer from web from the dropdown. In the pop up for What type of data are you referencing?, select A CSV File and
paste the csv link which is generated as shown in the paragraph above. Click on Add Layer. Now, we see the layer on map with the points of the locations added by the student. When a location point is clicked it shows in a pop up all the data entered by the student. Save the map. Figure 4.4 shows ArcGIS map snapshot after adding layer.

Next, we have to display the image which has been provided by students using image URL, in the pop up window. When we add a layer, in contents we can see a new layer named pub is created. Click on the arrow icon next to it and select Configure Pop-up as shown in Figure 4.5. In pop-up media section, click on add and select image from the dropdown. On the pop-up that opens, click on the plus icon next to URL and select the column from the spreadsheet which corresponds to Image URL. Click Save Pop-up and now save the map again. The Figure 4.6 shows the pop-up when clicked on location. In this figure, we can also see the image which is displayed from the image URL from student’s data.

If there are multiple submissions on the same location then as show in Figure 4.7, on the pop up window the total number will be shown and using the right arrow the other submission can be viewed.
4.1.3 Sharing Form Spreadsheet with Staff

The forms submitted by the students are saved in Google spreadsheet. Every row in the spreadsheet corresponds to a single form submitted by the students. When the admin creates the form, it is a good practice to share the form's spreadsheet with the staff. The staff will be able to edit or delete the data from the spreadsheet if required.

4.1.4 Integration Map and Translator with Moodle

When the ArcGIS map and student data is integrated we can view all the submissions made by students on the map. Moodle (abbreviation for Modular Object-Oriented Dynamic Learning Environment) is a free source e-learning software platform [15], which is used at LARC for all course management. It will be easier for participants of Study Abroad program if they can view the ArcGIS map directly through Moodle without having to login into ArcGIS. So to achieve this we need to share the map.
On the ArcGIS map, click on *share* and in the pop-up where you can see *Choose who can view this map*, select *Everyone (public)*. Now, click on *Embed this Website* button and copy the HTML embedded code. On the Moodle course *add a resource* dropdown we select *page*. Next, in page content we select *HTML* and paste the HTML embedded code and then click *update*, then click *save and return to the course*. Now, we can see the map on Moodle course directly.

Language Translator module is below the ArcGIS map. This translator will be useful if the data submitted by the students in the form is not in English. For this, we need to paste the HTML, JavaScript code for Language translator below the HTML embedded code for map as shown in the paragraph above. Figure 4.8 shows the language translator module. The translator uses the Microsoft Translator API. Microsoft Translator developer offerings.
Figure 4.6. ArcGIS map showing the image in pop up.
Figure 4.7. ArcGIS map showing multiple submissions at same location.
provide developers a wide spectrum of translation and language APIs for integration into their applications and services [16].

The translator works on nine different languages. Student can enter information in Italian, English, Russian, German, Chinese, Japanese, Arabic, Persian (Farsi), and French languages. This is shown in Figure 4.9. Figure 4.10 shows ArcGIS map and language translator embedded in Moodle course.

4.2 FEATURES OF STAFF ROLE

The responsibility of staff is managing the data submitted by the student. Google form's corresponding spreadsheet has to be shared with the teacher and helping staff of the course. This will help them to monitor the data entered by students. A student might mistakenly submit the same data multiple times or might have submitted the wrong coordinates of the location. So, in such cases the student can report it to the staff via e-mail and the malicious data can be deleted from the spreadsheet and hence will be removed from the map.
4.3 FEATURES OF STUDENT ROLE

Student has one of the most important roles in the system. In the sections below we will discuss these responsibilities in detail.

4.3.1 Form Submission

Students are provided with the instruction manual which can be accessed through the Moodle course. The student has to follow these instructions to fill the form data. The Google form is embedded in the Moodle course. The fields of this forms are describe below along with the instructions needed to find the field (if applies).

- Name
- Site of Interest
- Site Description: The description of the location in students own words
- Additional information (new word, historic event, history)
- Image URL: This will be used to get the image for location on map. The following instructions have to be followed to get an image URL.
- Latitude and Longitude
Figure 4.10. ArcGIS map and language translator embedded in Moodle course.

Figure 4.11. Spreadsheet showing header and data.
- Image URL:  Upload your own photo of the location in flicker. Go to the flicker source page & copy the image source code. Paste this in from where Image URL is asked.
- Latitude and Longitude: Two ways of finding lat/long are explained here

1. Finding latitude and longitudes for each point can often be done by searching Wikipedia. Information about locations can generally be found in the information box on the top-right of each page as shown is Figure 4.12. Click on these coordinates to get these values in decimal point. The WGS84 coordinates can be found in decimal format. This is shown in Figure 4.13.

Figure 4.12. Co-ordinates from Wikipedia.

Figure 4.13. Co-ordinates in decimal format.
2. If you cannot find your point in Wikipedia, you can also using Google Maps to find the latitude and longitude of places. By going to Google Maps Labs (https://maps.google.com/maps?showlabs=1), it will give you the option “LatLng Marker” and “LatLng Tooltip”. Right click on your destination and select “Drop LatLng Marker” to place the co-ordinates on the map. You will then see co-ordinates as shown in the Figure 4.14.

![Google Maps Lab](https://maps.google.com/maps?showlabs=1)

**Figure 4.14. Co-ordinates from Google Maps lab.**

### 4.3.2 Viewing Map and Locations on Moodle Course

The embedded ArcGIS map can be viewed by the student. Once a student submits a form, the data point is visible on the map. Students can view the location and data submitted by other students of the course. In this way the students can share and understand the views of each other about different places.
CHAPTER 5

TESTING

Testing is an important part of the project development. It is the process of detecting errors. Without a well-thought testing effort, the project will undoubtedly fail overall and will impact the entire operational performance of the solution. With a poorly tested solution, the support and maintenance cost will escalate exponentially, and the reliability of the solution will be poor. Therefore, project managers need to realize that the testing effort is a necessity, not merely as an ad hoc task that is the last hurdle before deployment [17].

Application testing deals with tests for the entire application. This is driven by the scenarios from the analysis team. Application limitations and features are tested here. The application must successfully execute all scenarios before it is ready for general customer availability. After all, the scenarios are a part of the requirement document and measure success. Application testing represents the bulk of the testing done by industry [18]. Below mentioned sections describe the list of functionality tests performed on this project.

- The student form module has been tested for the basic functionality and negative test cases. If invalid data is entered and form is submitted then the data row was deleted by the staff and checked if the location is removed from the map. It is tested if the student form is properly embedded into Moodle course.

- The LARC lab machine had two browsers installed on the machine. JavaScript should be enabled on these web browsers to view the web pages properly. This application has been tested successfully with the following web browsers:
  o Microsoft Internet Explorer Version 8
  o Mozilla Firefox 3.6.11
  o Apple Safari 5

- The ArcGIS map module is tested if the locations submitted in the form matches with the location seen on the map. If there are multiple submissions for the same location, then all the submission description should appear on the location on map. This functionality has been tested with proper input, successfully.

- The translate module is an interesting feature of this application. Since, students are visiting different countries they can share their experiences in any language that they want. So it is important to test this feature on all different browsers with different versions.
CHAPTER 6

RESEARCH

This section discusses about the different approaches that were tried for student data collection and showing it on map before choosing the one currently used.

6.1 STUDENT DATA COLLECTION

The collection of data from the students is foremost step which is one of the important tasks. This has to be done precisely.

Our initial approach of data collection was to:

- Create a web page form using HTML, PHP and JavaScript.
- Store the data submitted by students in database.
- Create an excel sheet on server which will be linked to ArcGIS map.
- Write a scheduler to periodically extract the new rows and updated data in spreadsheet so that the new points will be seen on the map.

This entire procedure can be followed by a person having computer science background. And the main aim is to have a system which can be built and used by non-technical people. And this turned out to be the main drawback of this approach.

So the next approach was to start looking for alternatives, which will make this procedure easy and efficient. We could have this data collection process direct into spreadsheet from the HTML form and need not have database. Though, this was a better approach, there was a need to create a new HTML form for every Study Abroad course.

Moreover, when it was learned that the entire process of data collection can be done using Google form including the automatic periodic publishing of spreadsheet, then this seemed to be the best approach.

6.2 MAPPING TOOL

One of the popular mapping tools is Google maps. Google has its strengths; it is a great tool to visualize a few points on a map and everyone already knows how to use it. Google also has some drawbacks, especially when integration to an existing GIS
(Geographic Information System) is needed. Enter Esri, a complete GIS solution with software components for every conceivable application (desktop, mobile, server, custom development, etc.). Esri has the ability to work with a variety of data formats; usually the data we work with (or acquire from Data warehouses) is already in one of these formats because the data custodians are already using Esri. All this means less data conversion (which in turn reduces possibility of error), automation of workflows for updating data (property boundaries, civic points, etc.), and of-course maintaining the integrity of an existing GIS [19].

A main advantage of using a GIS is that it allows more complex modeling of your data, either online or offline. For example, using Esri technology out-of-the-box models/scripts can be deployed to a server environment where an end user can invoke the task right on the web app. The range of geo-processing tasks that can be published online is vast; there are hundreds of possibilities and also the option to code custom tasks. The power of a GIS is the ability to answer complex questions, and nowadays the technology is in place to allow us to ask these questions, and get answers, online [19].
CHAPTER 7

STUDENT SURVEY

The survey is a non-experimental, descriptive research method. Surveys can be useful when a researcher wants to collect data on phenomena that cannot be directly observed. Surveys are used extensively in research, library and information science to assess attitudes and characteristics of a wide range of subjects. In a survey, researchers sample a population. Since populations can be quite large, normally researchers directly question only a sample (i.e. a small proportion) of the population [20].

At the end of Study Abroad course the students will be asked to fill as survey and submit it. This survey is created on surveymonkey and present at the URL https://www.surveymonkey.com/s/3JS7SDH. Appendix C contains the questions asked in student survey. This student survey is will give admin and staff the following information:

- The level of interest of students in this kind of exercise
- How educative and successful was the project according to the students.
- Recommendations made by the students.
- The parts of the exercise which the students thought were difficult.
CHAPTER 8

CONCLUSION

In conclusion, the mapping application can be used for the study abroad courses for setting up a friendly and communication efficient environment in the Study Abroad course. This is illustrated through analysis of the current Study Abroad courses and the new mapping application. Chapter 1 talks in brief about the existing Study Abroad course, its limitations and the need for a new exercise for students. Chapter 2 talks about the technologies used in developing this application. Chapter 3 explains the design overview. It gives the high-level idea of the roles and their responsibilities. An in-depth explanation of working and functionality of the system is given in Chapter 4.

This mapping application aims at improving communication among students and staff. It helps students get a better geographical understanding of the country they are visiting. There are many ways in which this application can be modified according to the teachers and the course requirements. This thesis helps the admin and the staff in understanding how they can alter the course to make it more interesting and improve the communication among the students and the staff.
CHAPTER 9

FUTURE ENHANCEMENTS

The current LARC mapping application for Study Abroad program supports basic functionalities. This application can be improved in many ways. Some of enhancements are mentioned below:

- Provide new features such as like button
- Expand the LARC study abroad program for all Study abroad programs at SDSU.
- Explore more features of ArcGIS which can be used to enhance the application.
REFERENCES


APPENDIX A

LIST OF ABBREVIATIONS
The following is a reference list of commonly used abbreviations.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>LARC</td>
<td>Language Acquisition Resource Center</td>
</tr>
<tr>
<td>SDSU</td>
<td>San Diego State University</td>
</tr>
<tr>
<td>GO</td>
<td>Global Officers</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic information system</td>
</tr>
<tr>
<td>ESRI</td>
<td>Environmental Systems Research Institute</td>
</tr>
<tr>
<td>HTML</td>
<td>Hyper Text Markup Language</td>
</tr>
<tr>
<td>AJAX</td>
<td>Asynchronous JavaScript and XML</td>
</tr>
<tr>
<td>PHP</td>
<td>Hypertext Preprocessor</td>
</tr>
<tr>
<td>CSV</td>
<td>Comma-separated values</td>
</tr>
<tr>
<td>URL</td>
<td>Uniform resource locator</td>
</tr>
<tr>
<td>ODS</td>
<td>Open Document software</td>
</tr>
<tr>
<td>TXT</td>
<td>Text File</td>
</tr>
<tr>
<td>PDF</td>
<td>Portable Document Format</td>
</tr>
<tr>
<td>CS</td>
<td>Computer Science</td>
</tr>
<tr>
<td>WGS</td>
<td>World Geodetic System</td>
</tr>
</tbody>
</table>
APPENDIX B

STUDENT'S INSTRUCTION MANUAL
1 How the application works

Step 1: Go to Moodle Italian Study abroad course
Step 2: Open the student form. Fill all the form details and submit it. Guideline for some of the fields is mentioned in next section.
Step 3: On submitting the form, after sometime this location will be displayed on the map in the Italian Study abroad course. Location is displayed as a point on the map and on clicking the point a pop up window displays all the data filled in the form.

2 Guidelines for form fields

2.1 Image URL
Step 1: Upload your own photo of the location in flicker.
Step 2: Go to the flicker source page & copy the image source code.
Step 3: Paste this in the form where Image URL is asked.

2.2 Latitude/Longitude
Step 1: Finding latitude and longitudes for each point can often be done by searching Wikipedia. Information about locations can generally be found in the information box on the top-right of each page.

Click on these coordinates to get these values in decimal point.

Step 2: If you cannot find your point in Wikipedia, you can also using Google Maps to find the latitude and longitude of places. By going to Google Maps Labs
(https://maps.google.com/maps?showlabs=1), it will give you the option to enable a “LatLon Tooltip”, which gives you the latitude and longitude of a point when you hover over it. Now, you can search for locations like you would with the standard version of Google Maps, but now when you hover over a point, it will show the latitude and longitude.
APPENDIX C

STUDENT'S SURVEY
The objective of using a mapping application for the Italian study abroad program was to have a better geographical understanding of Italy and to improve communication between the students. We would like to have your feedback on this. Please take time to fill out & submit this small survey.

1. This exercise helped you get better understanding of Italian geography and places to visit around.
   - Strongly Agree
   - Agree
   - Neither Agree nor Disagree
   - Disagree
   - Strongly Disagree

2. The exercise improved your communication with the class as whole
   - Strongly Agree
   - Agree
   - Neither Agree nor Disagree
   - Disagree
   - Strongly Disagree

3. The instructions were easy to follow
   - Strongly Agree
   - Agree
   - Neither Agree nor Disagree
   - Disagree
   - Strongly Disagree

4. Which part of the data collection caused you the most difficulty?
   - Latitude and Longitude
   - Image URL
   - Description
   - All
   - None

5. The translator feature was helpful
   - Strongly Agree
6. After this pilot, would you recommend mapping software for other classes at LARC?
   - Yes, strongly recommend
   - Yes, somewhat recommend
   - Would neither recommend nor not recommend
   - No, probably not recommend
   - No, definitely not recommend

7. Were you able to indicate your sites of choice on the map?
   - Strongly Agree
   - Agree
   - Neither Agree nor Disagree
   - Disagree
   - Strongly Disagree

8. How much external help did you need?
   - No help needed
   - Very little help needed
   - Don't really know
   - A little help needed
   - Lots of help needed

9. Please provide any suggestions you have for improving this project in future semesters.