INTERACTIVE WORLD MAP: MAN MADE DISASTERS

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Achal Piyushbhai Shah

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The Undersigned Faculty Committee Approves the

Thesis of Achal Piyushbhai Shah:

Interactive World Map: Man Made Disasters

Joseph

Joseph Lewis, Chair
Department of Computer Science

Carl E Eckberg

Carl Eckberg
Department of Computer Science

Gary Girty

Gary Girty
Department of Geological Sciences

6/26/2012

Approval Date

DEDICATION

I thank my parents, family and faculty of CS Department at SDSU for their faith in me and allowing me to be as ambitious as I wanted. It was under their watchful eyes that I gained so much drive and an ability to tackle challenges head on. I dedicate my work to my father Mr. Piyush Shah, my mother Mrs. Pratixa Shah, my brother Tapan Shah and all my friends, without their endless support it would have been a difficult task to achieve.

ABSTRACT OF THE THESIS

Interactive World Map: Man Made Disasters
by
Achal Piyushbhai Shah
Master of Science in Computer Science
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With the changing culture, one of the biggest challenges faced by school teachers is keeping students interested in reading books and keeping them mentally engaged in the subject. Teaching students in the current culture is more difficult, since that culture is now rooted in the web and they are used to multimedia interfaces. Making lessons more interactive and animated can help teachers motivate and interest today's internet addicted students.

The initiative behind the development of this tool is to develop a software program which provides high school teachers an easy and interactive way to represent Man Made Disasters of the last century. It can be used for describing data in a graphical fashion on a map, by linking the data to various geographical features. This tool hopefully will motivate students to learn information about the Man Made Disasters. It includes data in the form of text, pictures, and links to various related web information. It also incorporates games to provide students an opportunity to exercise what they have learned in a fun way. For self analysis there are some practice quizzes and it also has the capability to create new practice/graded quizzes. The tool is easy to deploy, easy to use and can be configured manually by making changes to a configuration file.

By utilizing modern computer technology to present an important subject in an engaging and interesting fashion, this work could become an effective learning tool in the modern classroom not just for students, but also the instructors..

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ACKNOWLEDGEMENTS

I want to express my gratitude to my advisor Dr. Joseph Lewis for giving me an opportunity to work on this thesis project and for his constant guidance, support and motivation throughout this project.

I am grateful to Dr. Carl Eckberg and Dr. Gary Girty for being a part of my thesis committee and for their kind co-operation and guidance.

Finally, I would also like to express my sincere thanks to Mr. Richard Sutton from Helix High school for trusting me with this project and providing his kind support, guidance and co-operation throughout the project.

CHAPTER 1

INTRODUCTION

Today, with all the wonderful advances in technology and the use of internet, it is extremely difficult for a teacher to keep the interest of a student in information just from books. It is therefore imperative that a teacher uses various visual aids to educate their students while keeping the student interested in the subject matter. The Interactive World Map for Man Made Disasters was designed and implemented for the students of Helix High School to aid them in their history class.

The intention of this tool is to help students understand the major Man Made Disasters of the last century in the world. The motivation of getting involved in this project was to help the student in a better understanding of their school material and to expose them to some fun with electronic media learning through pictures, quizzes and games. The Man Made Disasters tool is an easy to deploy and fully configurable tool which provides high school teachers with an easy and interactive way to represent data related to Man Made Disasters. Students can interact with the tool to explore the different Man Made Disasters of the last century and learn more about them.

Interactive World Map: Man Made Disasters tool has been designed to easily navigate and access information. It exhibits information in bold text and pictures to capture student's attention and motivate them to explore further. The tool also incorporates an interactive quiz to provide the student an opportunity to analyze what they have learned. The tool is flexible and can be modified easily by tutors. It is a graphic interface tool to help students understand and learn about the Man Made Disasters in a fun but effective way.

ESRI has the most prominent presence in the industry in the field of Geographic Information System (GIS). The release of MapObjects Java Standard Edition allows developer to build custom map applications using the open standard Java Programming language. So the Interactive World Map for Man Made Disasters GIS tool has been developed using Java and MapObjects as a software platform. MapObjects is a suite of Java-based developer components for creating client or server side mapping and GIS applications [1]. Also NetBeans is used as a Java IDE in which we can compile and run Java programs.

This thesis has been organized into nine chapters, the first two chapters concentrate on explaining the Introduction and the technologies I have used for developing the tool. Chapters three and four are about collecting the requirement from Helix High School and about the prototyping that is used to achieve the final result. In chapters five and six I have described the class diagram of the tool, how the tool is implemented and then explained the functionality in brief. Chapters seven shows us the various tools provided by MapObjects. It dives more into the coding of these tools and explains step by step how it works. Chapter eight is all about the map layers we are using in the Interactive World Map for Man Made Disasters tool; it shows the step by step creation of a sample layer so in future if the tool needs to be extended it would be easy to create new layers with more data in it. The last chapter covers the future enhancement of the Interactive World Map for Man Made Disasters tool.

CHAPTER 2

TECHNOLOGY

This chapter discusses the technologies used in the creation of this tool. As suggested by Dr. Joseph Lewis and Dr. Carl Eckberg, MapObjects Java Edition and Java will be best suited to implement the Interactive World Map for Man Made Disasters. Java is a platform independent programming language and MapObjects gels well with Java. The next section will discuss these technologies in detail.

2.1 JAVA

- Platform Independence: Java has the advantage of being platform independent i.e. it can be moved from one computer system to another. [2]
- Object Oriented: Java is object-oriented because programming in Java is centered on creating objects, manipulating objects and making them work together. This allows the user to create modular programs and re-useable code.
- Robust: Robust means reliable. Java puts a lot of emphasis on early checking for possible errors, as Java compilers are able t o detect many problems that would first show up during execution time in other languages.
- Simple: Java was designed to be easy to use and is therefore easy to write, compile, debug, and learn. Java is much simpler than other object oriented languages because Java uses automatic memory allocation and garbage collection where else other languages like C++ require the programmer to allocate memory and to collect garbage. [2]
- Multithreaded: Multithreaded is the capability for a program to perform several tasks simultaneously within a program. In Java, multithreaded programming has been smoothly integrated into it, while in other languages, operating system-specific procedures have to be called in order to enable multithreading. Multithreading is a necessity in visual and network programming. [2]
- To give any software component a long life it has to be developed with reusability and extensibility in mind. From above it is clear that Java enables you to do just that; the individual classes can be extended and reused to add more features and provide the capability to identify and fix bugs fast. Because of Java's robustness, ease of use, cross-platform capabilities, security features it has been chosen as the language of choice for this thesis project.

2.2 MAPOBJECTS JAVA EDITION

MapObjects Java Edition is a powerful collection of client and server side components that the developers can use to build custom, cross-platform Geographic Information System (GIS) Applications [3]. MapObjects Java Objects (MOJO) is not an end user application; it's a developer's tool kit. It includes a set of JAR files containing pure Java components that can be used to develop a usable stand-alone GIS application or to add maps or map functionality to other applications. Since it is written in Java, applications using MOJO can be cross platform. Java classes and components are easily integrated with classes supplied by ESRI in MOJO [4].

Dr. Carl Eckberg also teaches a class at San Diego State University which covers MapObjects in depth and has published a comprehensive guide on MapObjects. For implementation of the Interactive World Map for Man Made Disasters I have used MapObjects Java Edition version 2.1.

Key features as cited from the MapObjects Java Edition brochure includes [3, 4]:

- Display of real-time geographic data.
- Ability to combine multiple data sources.
- Helpful Tools for Building a User Interface. By using the rich Swing components included with MapObjects Java Edition, you can quickly build applications that include functional toolbars, dynamic symbol control, query dialogs, overview and insert maps, and intelligent legends that make your custom applications easy to use and even easier to develop.
- Major GIS capabilities such as labeling map features, specifying projection, displaying thematic map layers, performing geometric processing, zooming and panning map layers, measuring distances, querying spatial data and creating layouts etc.
- Ability to Deploy Your Applications over the Web. You can easily distribute MapObjects Java Edition applications over an Internet or Intranet through browser hosted applets or simplify Web delivery of your application with the use of Sun Java Web Start technology, the industry standard launching mechanism for distributing Java applications over the Web.
- Access to ESRI's ArcIMS web services, as well as building map application for distribution over the Internet through simple applets or JSP and servlets.
- In addition to the major feature listed above, MOJO includes many helpful tools in the development kit. Using swing components of MOJO, you can build Table-of-Contents, helpful toolbars, map overview and map legends.

2.2 DEVELOPMENT PLATFORM

In this section I would like to go over the various software applications used in the development of this tool.

- Map Objects Java Edition 2.1: Map Objects comes in two editions: Windows and Java. Here as per our requirement, I have used Map Objects Java Edition.
- Java (SE) Development Kit 1.6: This is intended for standard programming applications.
- NetBeans IDE 6.9: It is an IDE for writing, compiling, and running Java programs.
- JavaScript and HTML: Used for creating the quizzes. It returns Correct/Incorrect verdict.

CHAPTER 3

THE REQUIREMENTS

This tool has been developed to encourage high school students to learn more about the various Man Made Disasters occurring in the last century. This tool has been developed under the guidance and requirements given by Dr. Joseph Lewis of San Diego State University and Prof. Richard Sutton from the history department at Helix High School. The requirements gathered have been classified into the following:

- Software Platform Requirements
- Data Requirements
- Functional Requirements
- Student Centric Requirements

3.1 SOFTWARE PLATFORM REQUIREMENTS

The Software Platform Requirements constitutes the development language to be used, the GIS Solution that needs to be employed and the Operating System to be used for the development of the tool. These requirements were gathered from Dr. Joseph Lewis. The GIS tool shall be developed using:

- Java
- Map Objects Java Edition
- Windows XP. This tools need to be platform independent. But I used Windows XP to develop and test it.

The rationale behind using these technologies has been discussed in depth in Chapter 2.

3.2 DATA REQUIREMENTS

The Data Requirements for the Interactive World Map for Man Made Disasters were collected from Prof. Richard Sutton from Helix High School. The Data Requirements specified what data should be provided in the tool. How this data is provided is covered under the functional and student centric requirements. Prof. Sutton helped me in selecting

10 major Man Made Disasters of the last century. Each Disaster will cover the following topics:

- Name(s) of the disaster
- A description of the disaster
- When did the disaster take place? E.g. start and end date (sometimes with the time of the day)
- Where did the disaster take place?
- Causes of the disaster
- Main Events taking place during the disaster
- Casualties due to the disaster
- Consequences of the disaster
- Images of the disaster

3.3 Functional Requirements

The functional requirements cover the functional details of the tool and specify what shall be provided in the tool, the behavior of the tool to different actions and other GUI requirements. These requirements were gathered from Prof. Richard Sutton and Dr. Joseph Lewis.

- The tool shall display the world map with the selected disaster on it when it first starts.
- The tool shall be able to zoom in and zoom out and should be capable of adding new layers during runtime e.g. rivers, cities etc.
- Hot Links: This feature displays a webpage, which contains the summary of the disaster, by clicking on the Disaster point on the world map.
- Hyperlink: This tool should allow the user to go to external links over the internet to learn more about the disaster.
- This tool should have a game which requires the user to click the country corresponding to the disaster. This will help the user to test his knowledge about the data that he has seen.
- A picture game to learn about the disasters.
- Quiz: There will be an option for the teacher to create quizzes and for the students to take them. The quiz will be helpful to measure a student's knowledge regarding a disaster. The quiz should be interactive so that it gives a Correct/Incorrect verdict. The teacher has the option to create a graded or practice quiz in the form of multiple choice questions.

- The tool should be capable of labeling the disaster sites also user should be able to clear the labels.

3.4 STUDENT CENTRIC REQUIREMENTS

The student centric requirements are developed to represent how the data shall be seen by the user of the tool .These requirements were gathered keeping in mind the high school students. The requirement gathering was done under Prof. Richard Sutton from Helix High School.

- The Interactive World Map for Man Made Disasters should be easy to use, handle and configure.
- Since the intended audience for this tool is high school students who don't have much experience using a tool similar to this, this tool should be easy to learn. Providing tool tip text will enable a student to learn this tool faster.
- The language used to describe the summary and other facts of each disaster should be simple and easy so that high school students can understand it.
- Usage of images and games will attract the attention of the student and he will be encouraged to learn more about Man Made Disasters.
- The text used to represent the information should be neat, bold and clear.
- The tool shall represent the data in a format that does not overwhelm and intimate the students. The data shall be depicted with the least amount of details first and then it shall be easy to view more details.

CHAPTER 4

PROTOTYPING

Prototyping the development cycle of your project helps in reducing the risk during implementation of the software tool. A prototype is an original type, form, or instance of something serving as a typical example, basis, or standard for other things of the same category. A prototype is often used as part of the product design process to allow engineers and designers the ability to explore design alternatives, test theories and confirm performance prior to starting production of a new product. The project cycle include 5 important phases as shown in Figure 4.1, which are discussed in brief below [5].

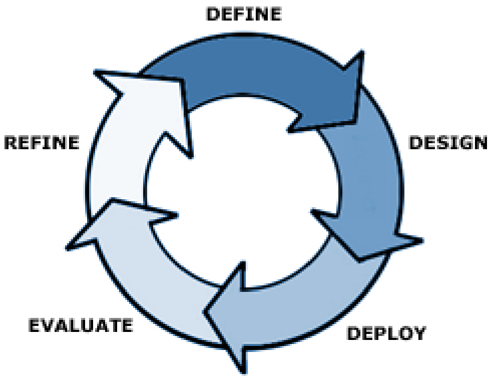


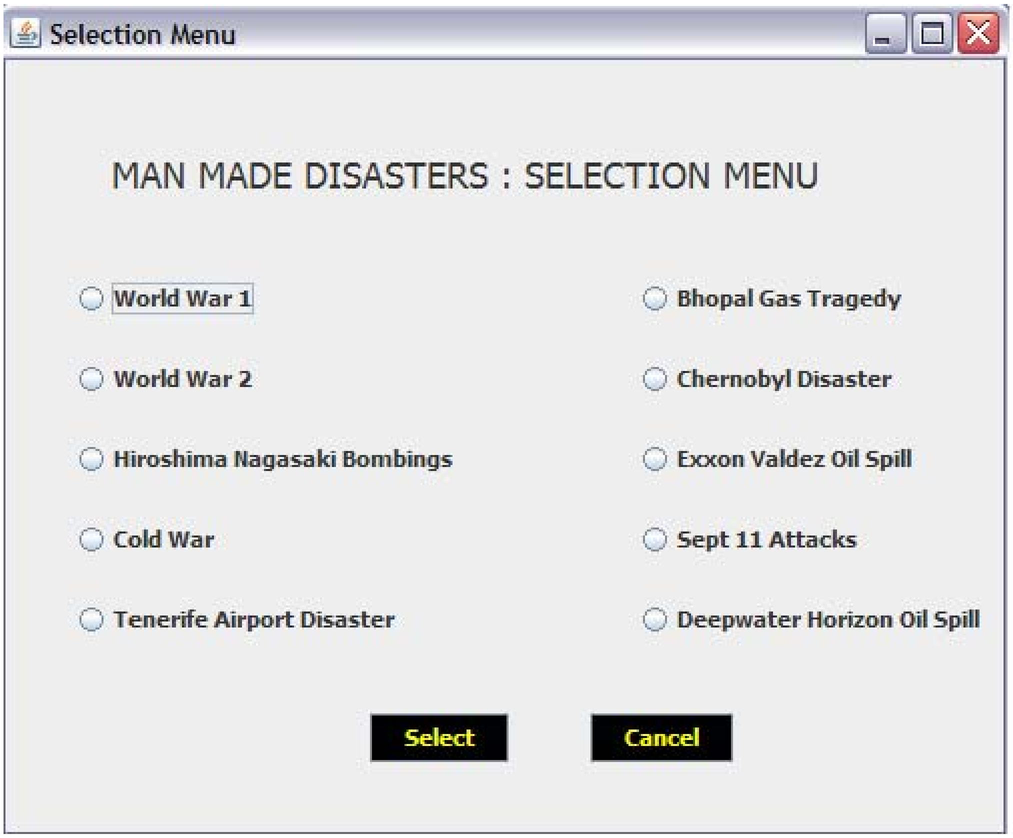
Figure 4.1. Project development cycle.

- Definition: The important task in creating a software product is extracting the requirements or requirements analysis. A clear definition of requirements is essential in designing the tool. We already discussed the requirement gatherings in an earlier section. The final output of this phase is that you will have a problem set defined to work on in this case it was an Interactive Map for Man Made Disasters.
- Design: This steps involves coming up with the architecture of the project based on the specification provided, the functionalities and the GUI which the user expects will help in designing the outer layer of the project. It also includes the implementation and testing of software code which is ready for deployment. This is discussed in detail in chapter five
- Development: The development cycle consists of successful prototypes where the actual testing is done from the user perspective. The feedback and suggestion is taken

from the user after each prototype and the design redefined to accomplish the end result. This process goes on until the project is ready to deliver. I found this process very helpful to keep track of the requirements and implementation of the project.

- Deployment: The actual deployment starts after the code is appropriately tested and all other aspects of the project including documentation, has been taken care of. We have created User Manual for the software.

During the development of the Interactive World Map for Man Made Disasters tool a prototype was developed. Screen shots of the prototype follow. The screen in Figure 4.2 is of the main screen which is launched when the tool is started.



Selection Menu

MAN MADE DISASTERS : SELECTION MENU

○ World War 1
○ World War 2
○ Hiroshima Nagasaki Bombings
○ Cold War
○ Tenerife Airport Disaster
○ Bhopal Gas Tragedy
○ Chernobyl Disaster
○ Exxon Valdez Oil Spill
○ Sept 11 Attacks
○ Deepwater Horizon Oil Spill

Figure 4.2. Interactive World Map: Man Made Disasters main screen.

Figure 4.3 is the configured screen of Interactive World Map for Man Made Disasters with one of the disasters chosen which includes the labeled disaster and the country with a menu bar showing various option.

Figure 4.4 shows a screen shot of a picture game, which asks the user to identify the picture of one of the disasters. The user has to select one out of three answers and if the

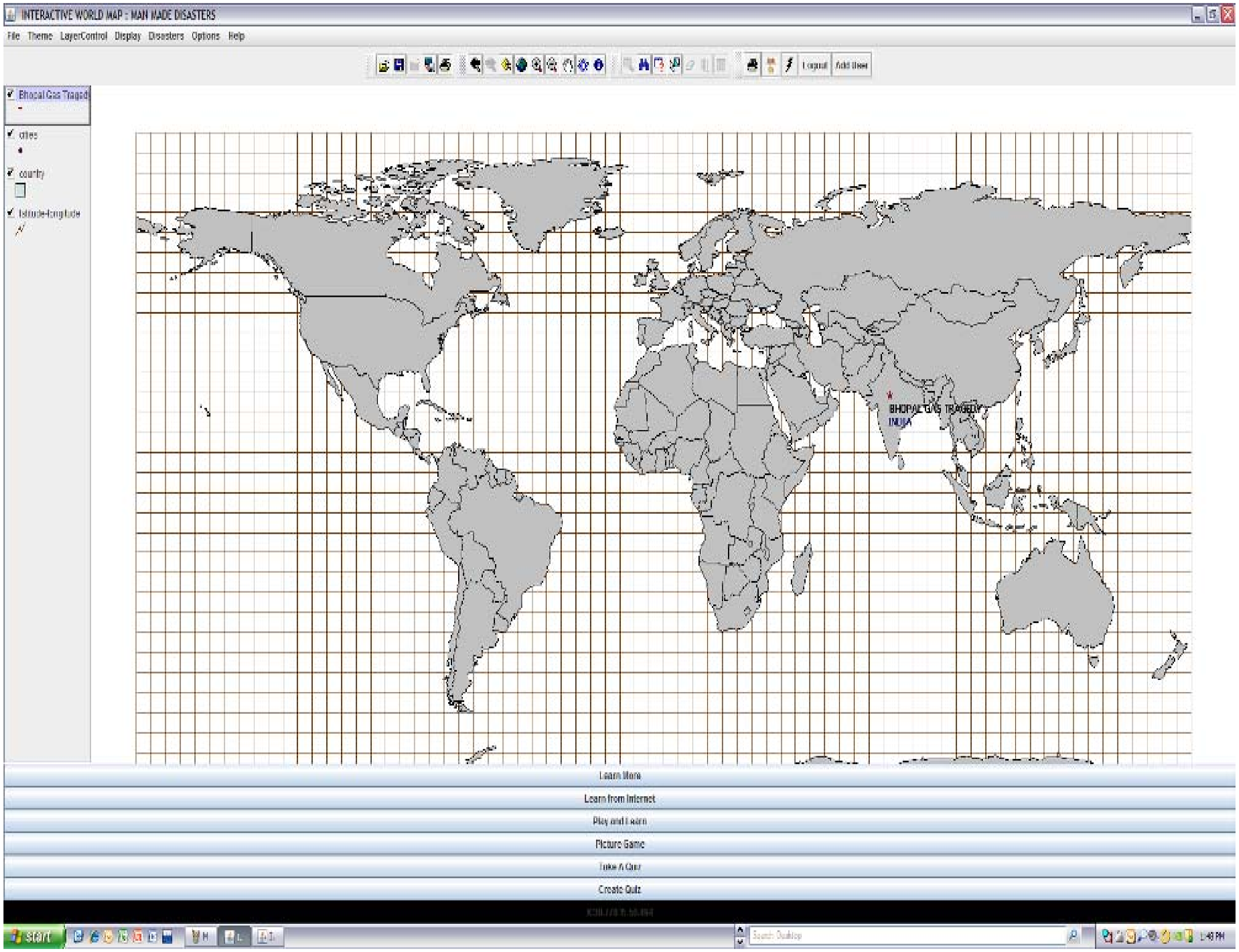


Figure 4.3. Interactive World Map: Man Made Disasters disaster screen.

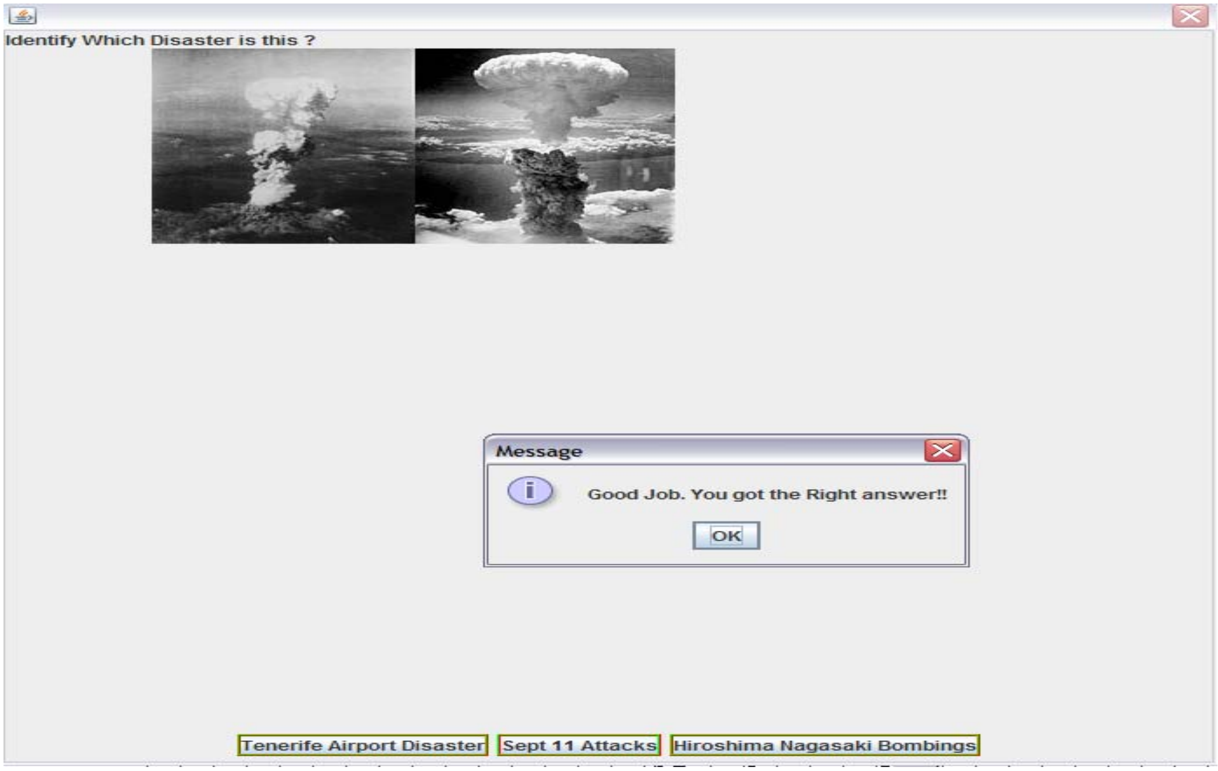
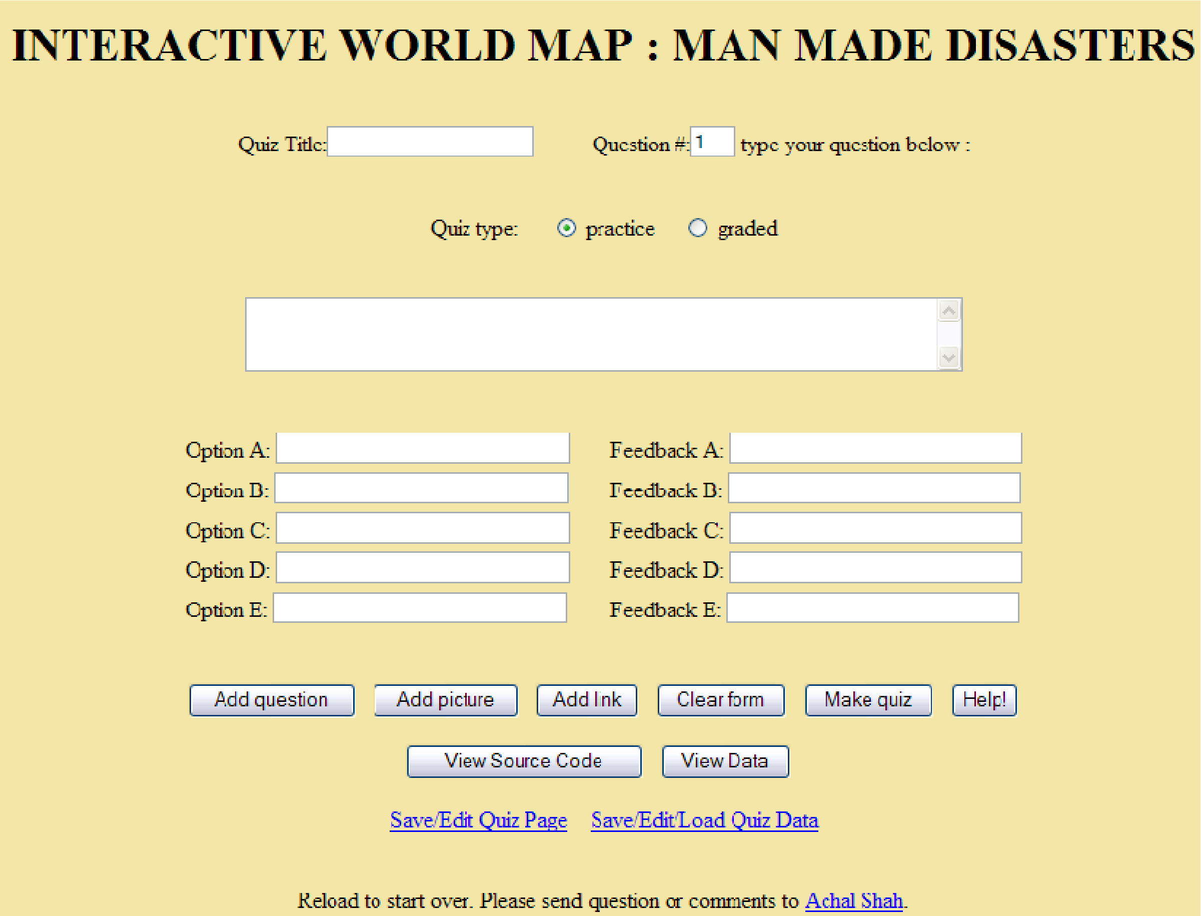

Identify Which Disaster is this ?
Message
Good Job. You got the Right answer!!
OK
Tenerife Airport Disaster
Sept 11 Attacks
Hiroshima Nagasaki Bombings

Figure 4.4. Interactive World Map: Man Made Disasters picture game screen.

answer is correct it then gives feedback, but if the selection is wrong it asks the user to try again.

Finally I would like to show the practice quiz prototype. It is a self evaluation exercise which can also be configured as a graded quiz while creating the quiz. It is interactive in the sense that it returns feedback to the user so that the user will evaluate if there is something wrong with their selection of an answer. They can go back to the Man Made Disasters Learn More option to learn more about the correct information in detail. Figure 4.5 shows the screen to create quiz, and a sample quiz screen.



INTERACTIVE WORLD MAP : MAN MADE DISASTERS

Quiz Title: 　　　Question #: 1 type your question below :

Quiz type: ● practice ○ graded

Option A: 　　　Feedback A:
Option B: 　　　Feedback B:
Option C: 　　　Feedback C:
Option D: 　　　Feedback D:
Option E: 　　　Feedback E:

Save/Edit Quiz Page 　Save/Edit/Load Quiz Data

Reload to start over. Please send question or comments to Achal Shah.

Figure 4.5. Interactive World Map: Man Made Disasters quiz screen.

CHAPTER 5

THE DESIGN

After collecting the requirements for the project, the following design was proposed. The tool has been names as Interactive World Map: Man Made Disasters. The design created includes the High Level Architecture diagram and the Class diagram.

5.1 HIGH LEVEL ARCHITECTURE DIAGRAM

Figure 5.1 depicts the high level architecture diagram for the Interactive World Map: Man Made Disasters tool. The figure depicts the high level structure of the system.

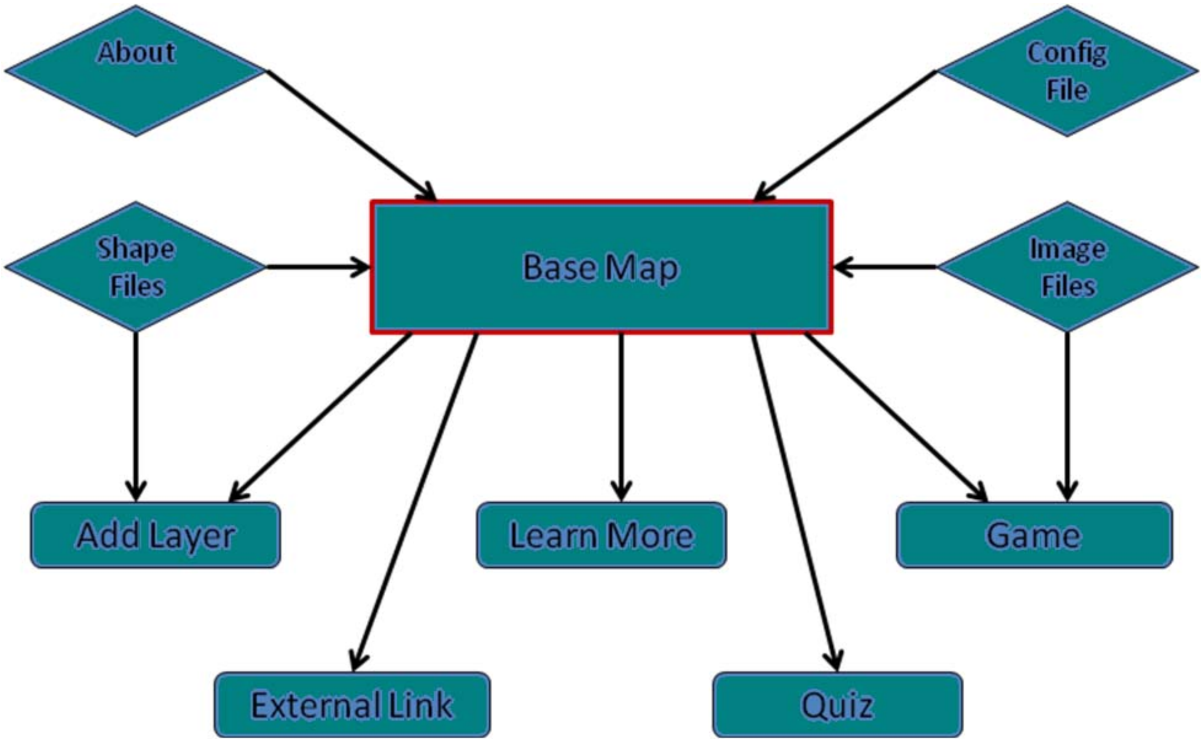


Figure 5.1. High level architecture diagram.

The architecture is broadly divided into three different levels:

- User Interface: This is the default map screen that will be displayed to the user when the application is launched and the user has selected a disaster. The default map screen shall have Menu options to display and clear disaster names,, add user facility, Help Window, Option to change the disaster, Map Object and custom toolbars and a menu with buttons to launch the Picture Game, Create Quiz, Take Quiz, Learn More, Learn from Internet.

- Map Objects and Java Classes: The functionality and the action of all the above buttons, custom toolbar and default GIS toolbars are defined in the java classes created. Further discussion about the class diagrams and java classes will be done later.
- Resources files: The default user interface uses the above classes for accessing the different resource files such as shape files, images, text files and help documentation.

5.2 CLASSES AND CLASS DIAGRAM

The class diagram helps in streamlining the overall code and its structure; it also provides the developer a stencil to use for code development. A class diagram shows the set of variable and functions present in the class. It also explains the interdependency of classes used for the development. Table 5.1 [6] shows the base class Disaster and its imported classes.

Table 5.1. Importing Classes and Classes Used for Development

Importing Classes	Classes Used for Development
import javax.swing	JButtons, JPanel, JSplitPane, JToolBar, ImageIcon, JMenuBar, JMenuItem, AbstractTableModel, TableColumn
import com.esri.mo2.ui.bean	Map, Layer, Toc, TocAdapter, TocEvent, Legend, Tool
import com.esri.mo2.ui.tb	ZoomPanToolBar, SelectionToolBar, ProjectToolBar
import com.esri.mo2.file.shp	ShapefileFolder, ShapefileWriter
import com.esri.mo2.map.dpy	Layerset, FeatureLayer, BaseFeatureLayer

Source: Deepak Kundra. Natural disasters GIS teaching aid. Master’s thesis, San Diego State University, San Diego, CA, 2008.

The classes shown in Table 5.1 have been used for completing the basic functionality provided by MapObjects in the Interactive World Map: Man Made Disasters project. After initializing the tool parameter using config file, shape files and image files, the Interactive World Map: Man Made Disasters tool is launched and the above classes enable the basic GIS tool functionality.

There are other functionalities which are triggered using the buttons present on the Interactive World Map: Man Made Disasters tool. These buttons basically give the simplest way to interact with the tool and learn about the various Man Made Disasters. Figure 5.2 highlights the buttons and the class invoked by the buttons. Let’s discuss it in detail.

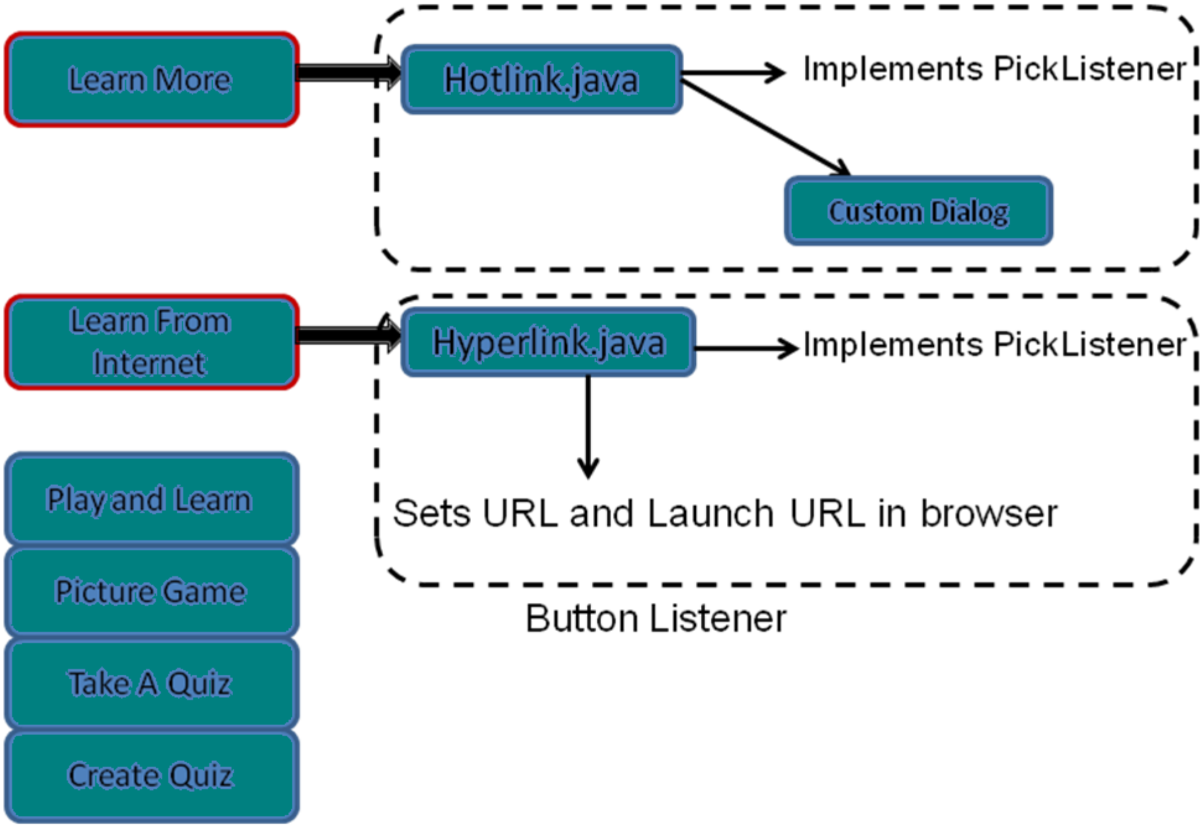


Figure 5.2. Class diagram for learn more tabs.

The Learn More Button creates an object of class Hotlink which implements the PickListener Interface of MapObjects. A Pick "operation" occurs when a Tool such as Pick or Identify is selected. In this case it occurs after the Learn More button is clicked, and the end-user clicks in the Map. An initial beginPick() will be signaled, followed by zero or more foundData() with a final endPick() to signal the completion of the Pick operation.

After creating the object when the user clicks on a disaster a custom dialog pops up and shows the user detailed description of the disaster including pictures.

The Learn More from Internet button creates an object of class Hyperlink and it also implements the PickListener interface of MapObjects. After creating the object by clicking on the button when the user clicks on one of the disaster the foundData() method looks inside the .dbf file of the active layer and sets the string url value corresponding to the disaster. We then use the following piece of code in java to launch the external URL using the default browser.

```
Runtime.getRuntime().exec("rundll32 url.dll,FileProtocolHandler " + url);
```

Figure 5.3 shows the block diagram of the game buttons in the tool.

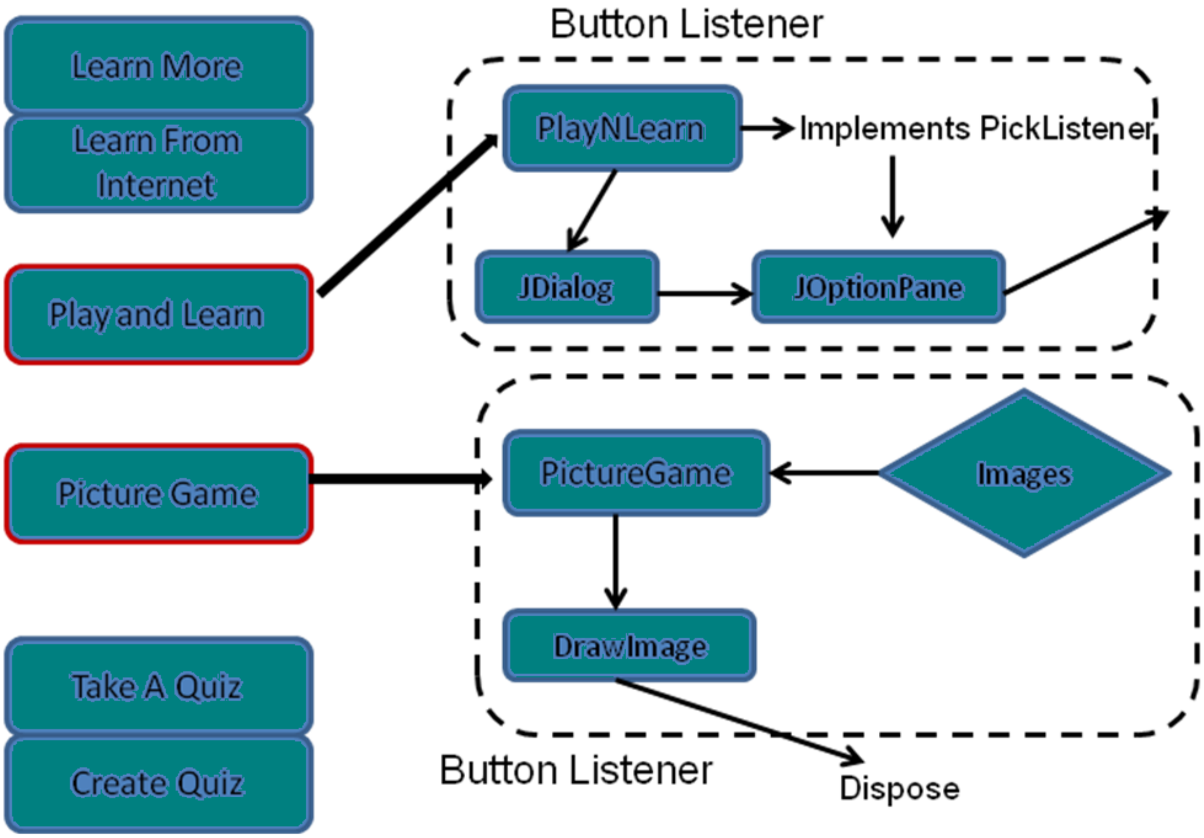


Figure 5.3. Class diagram for gaming tabs.

The Play and Learn button when it is clicked the button listener creates an object of class PlayNLearn which again implements the PickListener interface from MapObjects. When the button is clicked it also invokes a dialog box asking the user a question about the disaster. The user then has to respond to the question by selecting one of the options provided, followed by selecting the country where the disaster took place. If the user is right we verify the answer using the PickListener method and provide a feedback in the form of a dialog box.

After clicking on The Picture Game button a dialog box pops up with an image of one the disasters that the student has learned from the list of disasters and shows three options on the screen. One of the random images is selected from the Images folder and it’s drawn on the panel of the dialog window using the DrawImage Class. If the user selects the right answer, a feedback is provided in the form of a dialog box displayed on the screen.

Figure 5.4 shows the block diagram for Quiz Buttons.

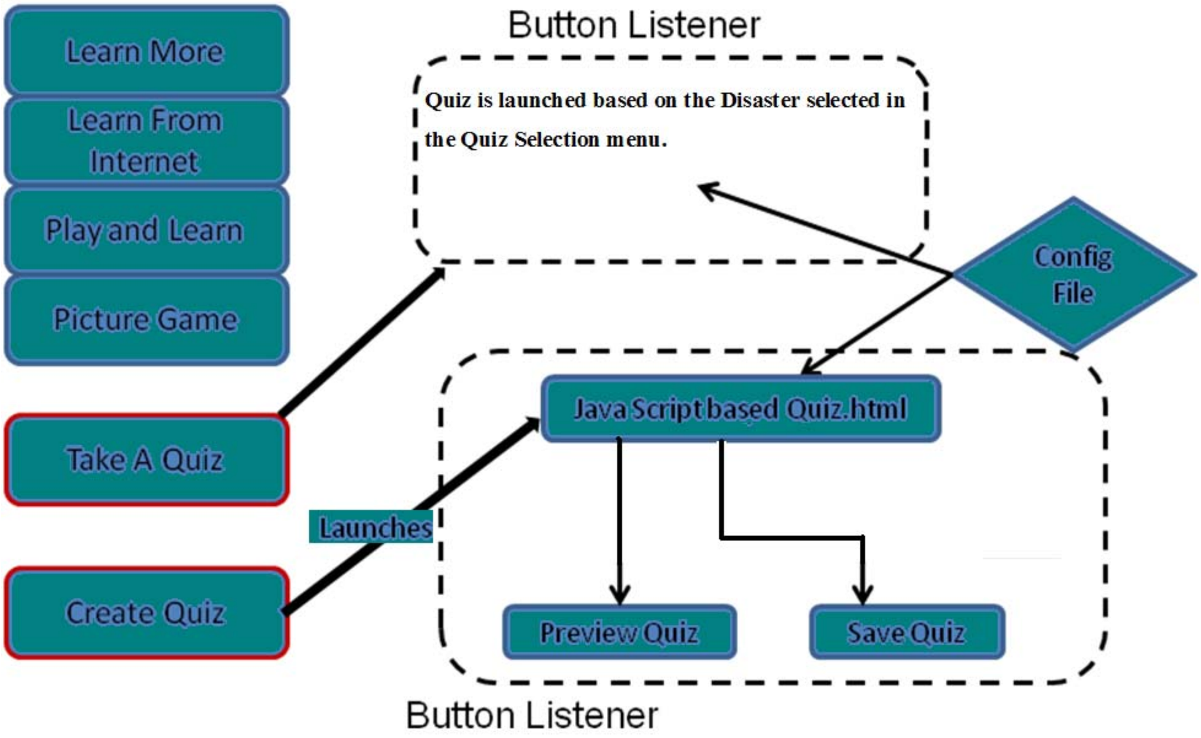


Figure 5.4. Class diagram for quiz tabs.

When the Take A Quiz button is clicked by the user a Quiz selection menu pops up. Once a quiz is selected related to a disaster a HTML Page is displayed which contains the quiz for the disaster selected. The name of the HTML page is set in the configuration file, which can be changed if a new quiz is created using the Create Quiz button discussed below.

The Create Quiz button is meant for faculty to design new quizzes for students. When this button is clicked it launches a HTML page based on JavaScript which is then used to create a new quiz. For each question faculty can add images, hyper link, multiple choice and feedback for every answer clicked. There is the capability of making it a practice quiz or graded quiz. For a practice quiz the student will get feedback with every answer clicked, and for a graded quiz the faculty has to enter an email address where all the answers are sent after completion of the quiz. The student won’t get any feedback in graded quiz.

CHAPTER 6

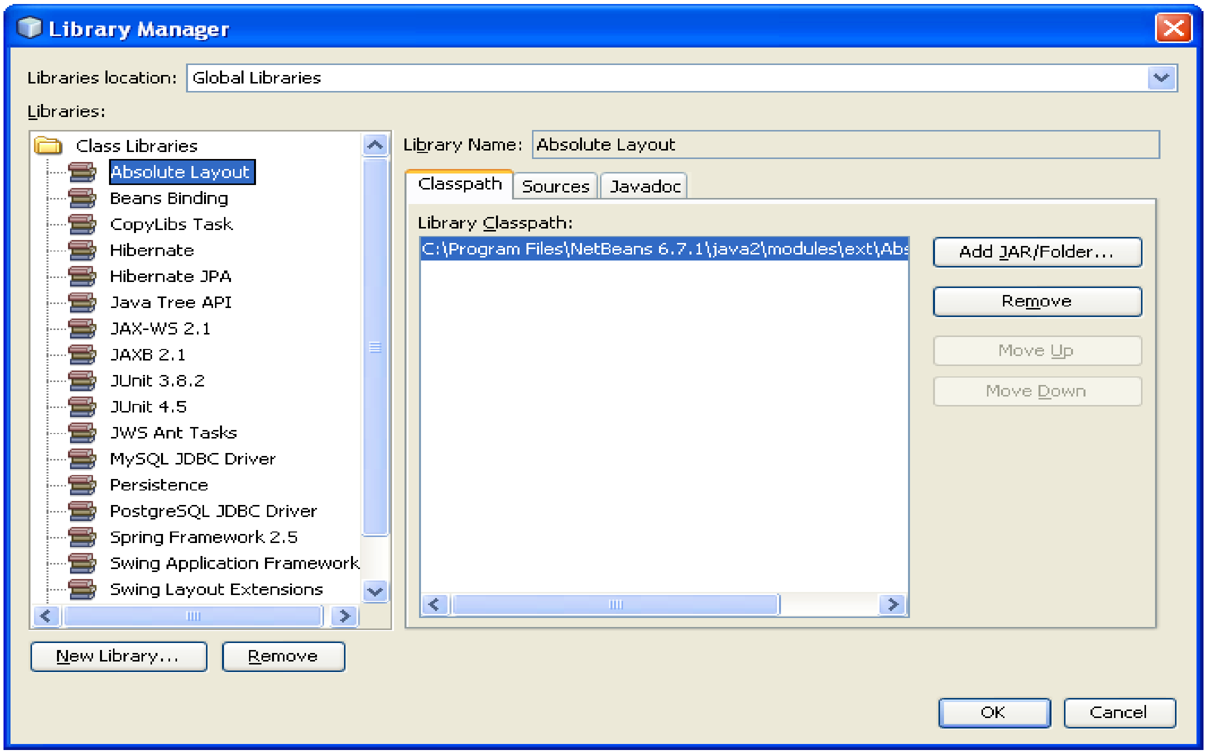
INSTALLATIONS

The project was developed in java and edited and compiled in NetBeans IDE (Integrated Development Environment). NetBeans works really well with MapObjects when appropriate libraries are added.

The following installations were done to build and run the project:

1. Install Java (SE) Development kit 1.6 from sun java website. [7]
2. Install NetBeans IDE 1.0.6 from their website. [8]
3. The Installation of MapObjects Java Edition was obtained from Dr. Carl Eckberg in one of his classes on GIS.
4. Integrating MapObjects and NetBeans, the libraries need to be added to NetBeans.

Here are the steps to go to the Library Manager (Figure 6.1) in NetBeans from where we find an option to add MapObjects libraries to the NetBeans IDE.



Libraries location: Global Libraries

Library Name: Absolute Layout

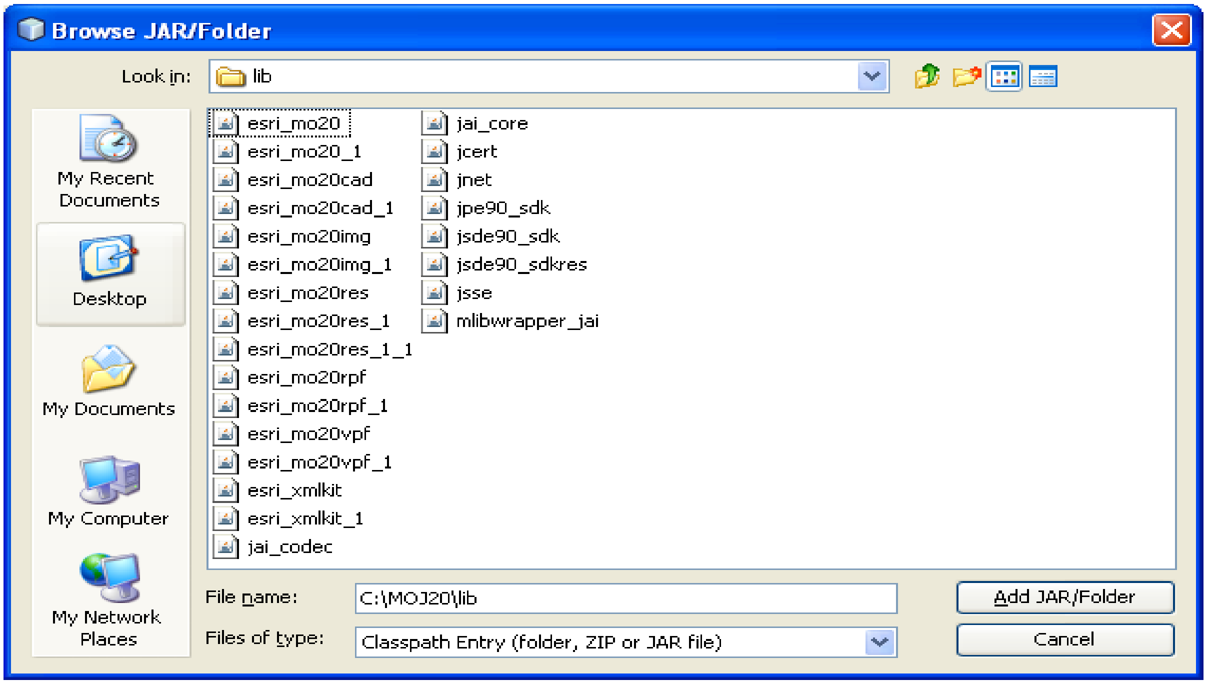
Library Classpath: C:\Program Files\NetBeans 6.7.1\java2\modules\ext\Abs

Figure 6.1. Library manager.

Open NetBeans IDE / Go to Tools / Select Libraries / Library Manager. Here we can add MOJO23 libraries as follows (Figure 6.2):

1. Select Add JAR/ Folder option in Library Manager Window
2. Browse to the location where you have all the MOJO libraries
3. Select all the libraries and add them

This will add all the MOJO libraries to NetBeans IDE that are required to integrate MapObjects into NetBeans which is mandatory for my project to compile and run.



Look in: lib

File name: C:\MOJ20\lib

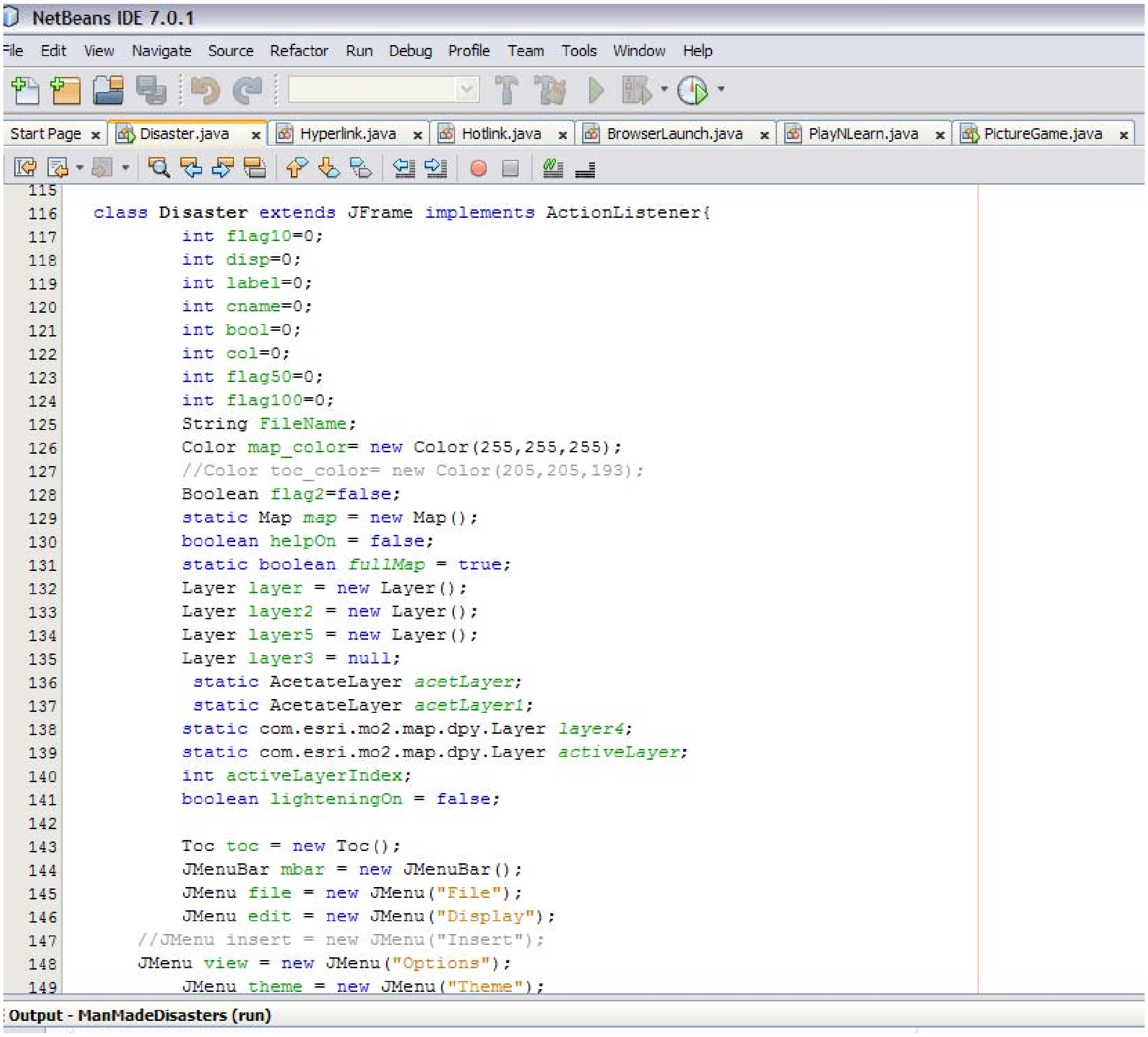
Files of type: Classpath Entry (folder, ZIP or JAR file)

Figure 6.2. Adding MOJO libraries to NetBeans.

At this point we can start editing our program in the NetBeans IDE. As we have already installed all the required libraries the application should easily be complied and run without any errors. Figure 6.3 shows the NetBeans IDE.

Follow the following steps to install the executable JAR file to any computer:

- Make a directory called “ManMadeDisasters” and copy the executable JAR file along with the lib folder in the same directory.
- Copy the MOJ20 folder in the C:
- Run the following command on command prompt to run the executable (see Figure 6.4): java –jar “ManMadeDisasters.jar” or java –jar “..path where the folder is\ManMadeDisasters.jar”.

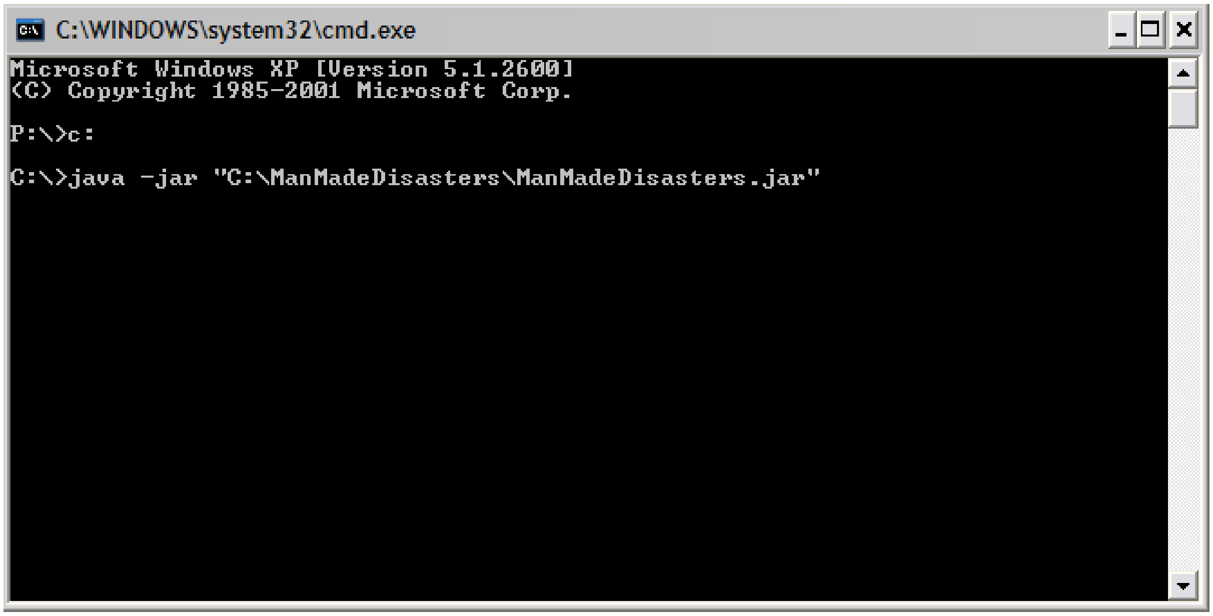


```

class Disaster extends JFrame implements ActionListener{
        int flag10=0;
        int disp=0;
        int label=0;
        int cname=0;
        int bool=0;
        int col=0;
        int flag50=0;
        int flag100=0;
        String FileName;
        Color map_color= new Color(255,255,255);
        //Color toc_color= new Color(205,205,193);
        Boolean flag2=false;
        static Map map = new Map();
        boolean helpOn = false;
        static boolean fullMap = true;
        Layer layer = new Layer();
        Layer layer2 = new Layer();
        Layer layer5 = new Layer();
        Layer layer3 = null;
         static AcetateLayer acetLayer;
         static AcetateLayer acetLayer1;
        static com.esri.mo2.map.dpy.Layer layer4;
        static com.esri.mo2.map.dpy.Layer activeLayer;
        int activeLayerIndex;
        boolean lighteningOn = false;

        Toc toc = new Toc();
        JMenuBar mbar = new JMenuBar();
        JMenu file = new JMenu("File");
        JMenu edit = new JMenu("Display");
    //JMenu insert = new JMenu("Insert");
    JMenu view = new JMenu("Options");
        JMenu theme = new JMenu("Theme");
```

Figure 6.3. NetBeans development environment.



```
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

P:\>c:

C:\>java -jar "C:\ManMadeDisasters\ManMadeDisasters.jar"
```

Figure 6.4. Command prompt showing jar file execution.

CHAPTER 7

MAPOBJECTS TOOLBARS

MapObjects Java Edition provides multiple beans which can be used to add basic capabilities to the tool. Toolbars are one of these beans which can provide commonly used functions such as zoom in, zoom out easily. This chapter discusses how these toolbars (Table 7.1 [6]) have been integrated into the GIS tool. We have used code to show how this can be achieved. The Toolbar is shown in Figure 7.1.

Table 7.1. Legend of MapObjects Toolbars

Number	Toolbar Name	Class Name
1	Zoom Pan Tool Bar	com.esri.mo2.ui.tb.ZoomPanToolBar
2	Selection Tool Bar	com.esri.mo2.ui.tb.SelectionToolBar
3	Project Tool Bar	com.esri.mo2.ui.tb.ProjecToolBar

Source: Deepak Kundra. Natural disasters GIS teaching aid. Master's thesis, San Diego State University, San Diego, CA, 2008.

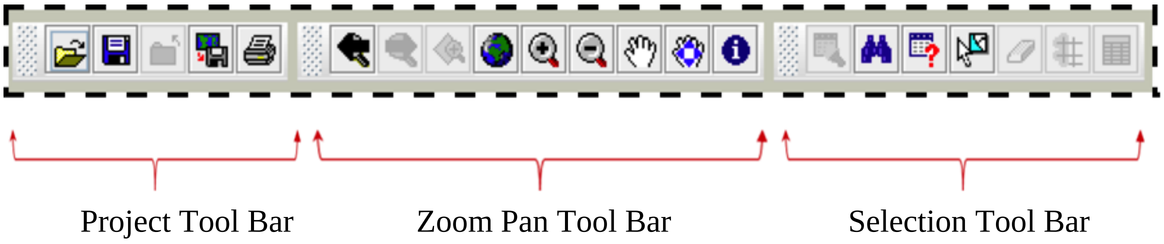


Figure 7.1. MapObjects toolbars.

7.1 com.esri.mo2.ui.tb.ZoomPanToolBar

The ZoomPanToolBar uses functions provided by ZoomPanToolBarActions class. It allows an end-user to change the map extent in a variety of ways. As the name suggest it is used for zooming and panning a layer. The actions supported by the Toolbar include:

- Zoom In and Zoom Out – Zoom In tool zooms the map down to certain level. Also Zoom out tool is used to zoom the map out to larger size.
- ZoomToFull Extent – When clicked on, this tool returns the map to the original shape and full view. It doesn't care about the size of the window; it resizes the map and shows a complete view of the map.

- Pan - Provides a tool for dragging the map to a new location without altering the zoom level.
- PanOneDirection - Pans the map in one of four directions, north, south, east, or west.
- Identify - Performs an Identify on the specified "selected" layers.

setMap() function must be called before using any of these actions. The code to integrate the toolbar with the GIS tool is:

```
static com.esri.mo2.ui.bean.Map map = new com.esri.mo2.ui.bean.Map();
ZoomPanToolBar zptb = new ZoomPanToolBar();
zptb.setMap(map);
getContentPane().add(zptb, BorderLayout.NORTH);
```

7.2 COM.ESRI.MO2.UI.TB.SELECTIONTOOLBAR

This toolbar provides functions that perform feature selection based upon attribute or spatial queries. The actions supported by this Toolbar include:

- Find - Opens a dialog for locating features whose attributes contain an end-user provided string.
- Search - Opens a dialog for locating features based on a predefined "stored query".
- Query - Opens a dialog for locating features based on a query that an end-user constructs.
- Select - Provides a tool for selecting features by rubber banding a shape in the map.
- Buffer - Opens a dialog for constructing a buffer polygon around the currently selected features.
- Attributes - Displays attributes of the currently selected features.

setMap() function must be called before using any of these actions. For GIS tool we are only using the Find function. The code to integrate the toolbar with the GIS tool is:

```
static com.esri.mo2.ui.bean.Map map = new com.esri.mo2.ui.bean.Map();
SelectionToolBar stb = new SelectionToolBar();
stb.setMap(map);
getContentPane().add(stb, BorderLayout.NORTH);
```

7.3 COM.ESRI.MO2.UI.TB.PROJECTTOOLBAR

This toolbar provides actions that allow an end-user to open, close, save a map project and print a map image to file the actions supported by this Toolbar include [9]:

- OpenProject - Open a previously saved project file.
- SaveProject - Save the current map project to a file.
- CloseProject - Close current map project.

- SaveMapImageToFile - Save current map to an image file.
- PrintLayer - Print selected layer(s) in the TOC.

The setMap() function must be called before using any of these actions. The code to integrate the toolbar with the GIS tool is:

```
static com.esri.mo2.ui.bean.Map map = new com.esri.mo2.ui.bean.Map();
ProjectToolBar ptb = new ProjectToolBar();
ptb.setMap(map);
getContentPane().add(ptb, BorderLayout.NORTH);
```

CHAPTER 8

PROJECT LAYER

In GIS a layer is a slice of the geographic data in a certain area and it is equivalent to a legend item on a paper map. The features layers that are shown in the tool are implemented using com.esri.mo2.map.dpy.BaseFeatureLayer class and com.esri.mo2.ui.bean.Layer class.

8.1 COM.ESRI.MO2.UI.BEAN.LAYER

The com.esri.mo2.ui.bean.Layer class from MapObjects Java Edition is used in the default screen when the tool is launched to show the geographic data. This class uses a shape file as the data source for showing the features and calls a method to add layers to the map. The following code [9] shows how to use this class:

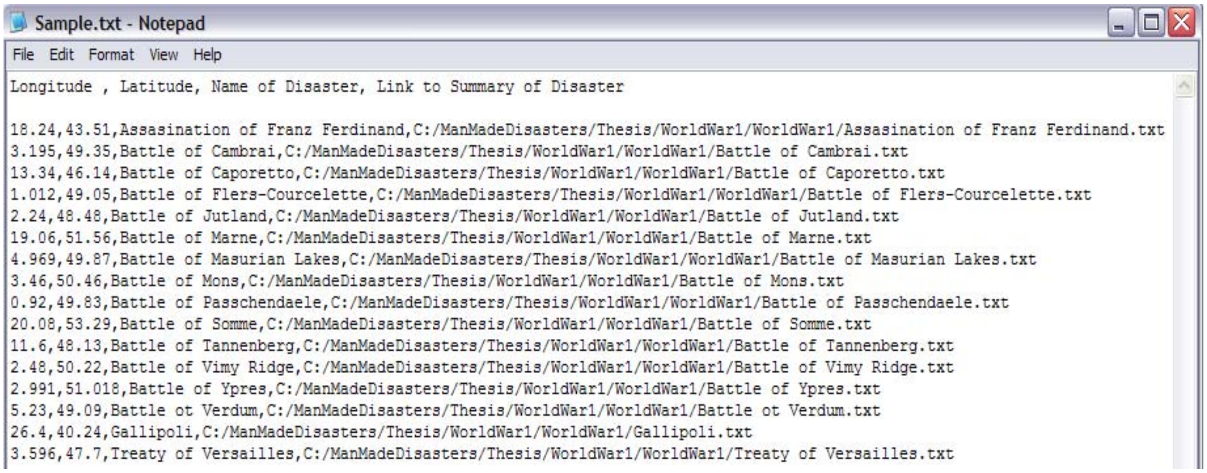
```
static com.esri.mo2.ui.bean.Map map = new com.esri.mo2.ui.bean.Map();
Layer layer1 = new Layer();
Layer layer2 = new Layer();
String s1,s2;
Properties configFile = new Properties();
configFile.load(new FileInputStream("config.properties"));
config =configFile.getProperty("config");
s1=config =configFile.getProperty("s1");
s2=config =configFile.getProperty("s2");
addShapefileToMap(layer1,s1); //Add a shapefile to the map
addShapefileToMap(layer2,s2);
……
……
private void addShapefileToMap(Layer layer, String s) {
String datapath = s;//C:/ESRI/MOJ20/Samples/Data/USA/states.shp
layer.setDataset("0;"+datapath);
map.add(layer);}
```

The details on the shape files can be found at [10]. The shape files which are used by the com.esri.mo2.ui.bean.Layer class were created or acquired using the following ways.

The first way is: there are a lot of sources which create the geographic data as shape files and distribute these files for free. The shape file showing the states of USA and countries of the world as a world map was procured from the ESRI website.

8.2 CONVERTING CSV OR TEXT FILE TO SHAPE FILE

The second way is to create a CSV or text file with geographic data (Figure 8.1) and then use the steps mentioned below to convert it into a shape file. Comma Separated Values or CSV files are used as data container files. They contain all the information that the project needs to plot the region where the movements took place. The CSV files contains the information such as coordinates in the form of latitudes and longitudes, the path of the image or the html file or the details of the action that need to be taken when the point is clicked on the map. It stores all the description about that active layer. Thus all information is fetched in the program and stored in the string variables and accordingly actions are taken. The information stored in the CSV file is displayed in the web browser. Hence, CSV files have been used in this project for the same. It can be saved either with .csv or .txt extension [11].



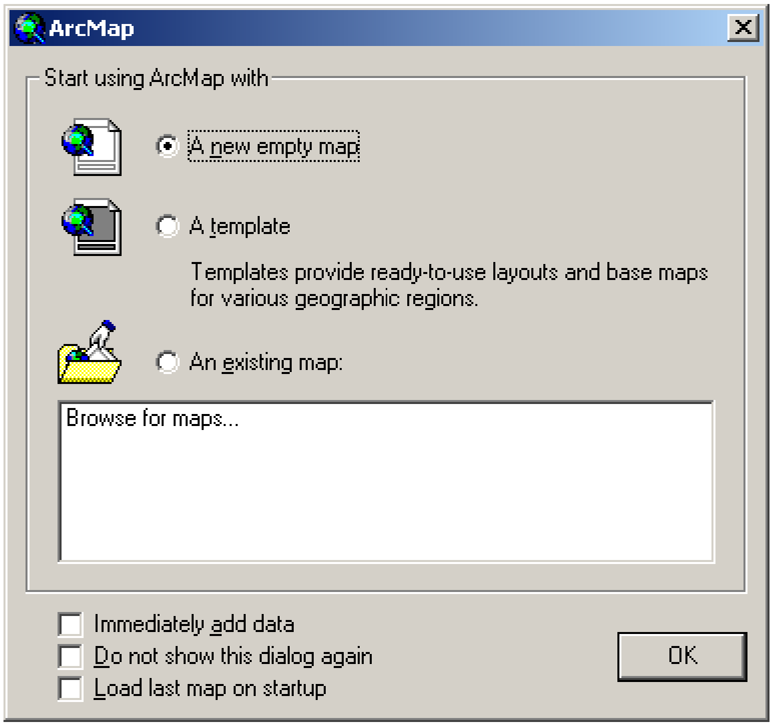
```
Longitude , Latitude, Name of Disaster, Link to Summary of Disaster

18.24,43.51,Assasination of Franz Ferdinand,C:/ManMadeDisasters/Thesis/WorldWar1/WorldWar1/Assasination of Franz Ferdinand.txt
3.195,49.35,Battle of Cambrai,C:/ManMadeDisasters/Thesis/WorldWar1/WorldWar1/Battle of Cambrai.txt
13.34,46.14,Battle of Caporetto,C:/ManMadeDisasters/Thesis/WorldWar1/WorldWar1/Battle of Caporetto.txt
1.012,49.05,Battle of Flers-Courcelette,C:/ManMadeDisasters/Thesis/WorldWar1/WorldWar1/Battle of Flers-Courcelette.txt
2.24,48.48,Battle of Jutland,C:/ManMadeDisasters/Thesis/WorldWar1/WorldWar1/Battle of Jutland.txt
19.06,51.56,Battle of Marne,C:/ManMadeDisasters/Thesis/WorldWar1/WorldWar1/Battle of Marne.txt
4.969,49.87,Battle of Masurian Lakes,C:/ManMadeDisasters/Thesis/WorldWar1/WorldWar1/Battle of Masurian Lakes.txt
3.46,50.46,Battle of Mons,C:/ManMadeDisasters/Thesis/WorldWar1/WorldWar1/Battle of Mons.txt
0.92,49.83,Battle of Passchendaele,C:/ManMadeDisasters/Thesis/WorldWar1/WorldWar1/Battle of Passchendaele.txt
20.08,53.29,Battle of Somme,C:/ManMadeDisasters/Thesis/WorldWar1/WorldWar1/Battle of Somme.txt
11.6,48.13,Battle of Tannenberg,C:/ManMadeDisasters/Thesis/WorldWar1/WorldWar1/Battle of Tannenberg.txt
2.48,50.22,Battle of Vimy Ridge,C:/ManMadeDisasters/Thesis/WorldWar1/WorldWar1/Battle of Vimy Ridge.txt
2.991,51.018,Battle of Ypres,C:/ManMadeDisasters/Thesis/WorldWar1/WorldWar1/Battle of Ypres.txt
5.23,49.09,Battle ot Verdum,C:/ManMadeDisasters/Thesis/WorldWar1/WorldWar1/Battle ot Verdum.txt
26.4,40.24,Gallipoli,C:/ManMadeDisasters/Thesis/WorldWar1/WorldWar1/Gallipoli.txt
3.596,47.7,Treaty of Versailles,C:/ManMadeDisasters/Thesis/WorldWar1/WorldWar1/Treaty of Versailles.txt
```

Figure 8.1. Example of sample.txt.

Install ArcGIS 9. Contact Geography Department at SDSU for the installation CD.

- Create a text file or CSV file with the data needed: Longitude, Latitude, Name of Disaster, Link to Summary of Disaster. Sample in Figure 8.1.
- Save the file as sample.txt or sample.csv.
- Go to the ArcGIS installation directory and launch ArcMap. Click Start with a new map. See Figure 8.2.
- Press the add button and select states.shp file for reference view. Press Add. See Figure 8.3.
- Press the add button again and select sample.txt file. Press Add. See Figure 8.4.
- Right click on sample.txt and select Display XY Data…See Figure 8.5.
- Make sure the X,Y have been correctly identified. Press OK. See Figure 8.6.



ArcMap

Start using ArcMap with

● A new empty map

○ A template

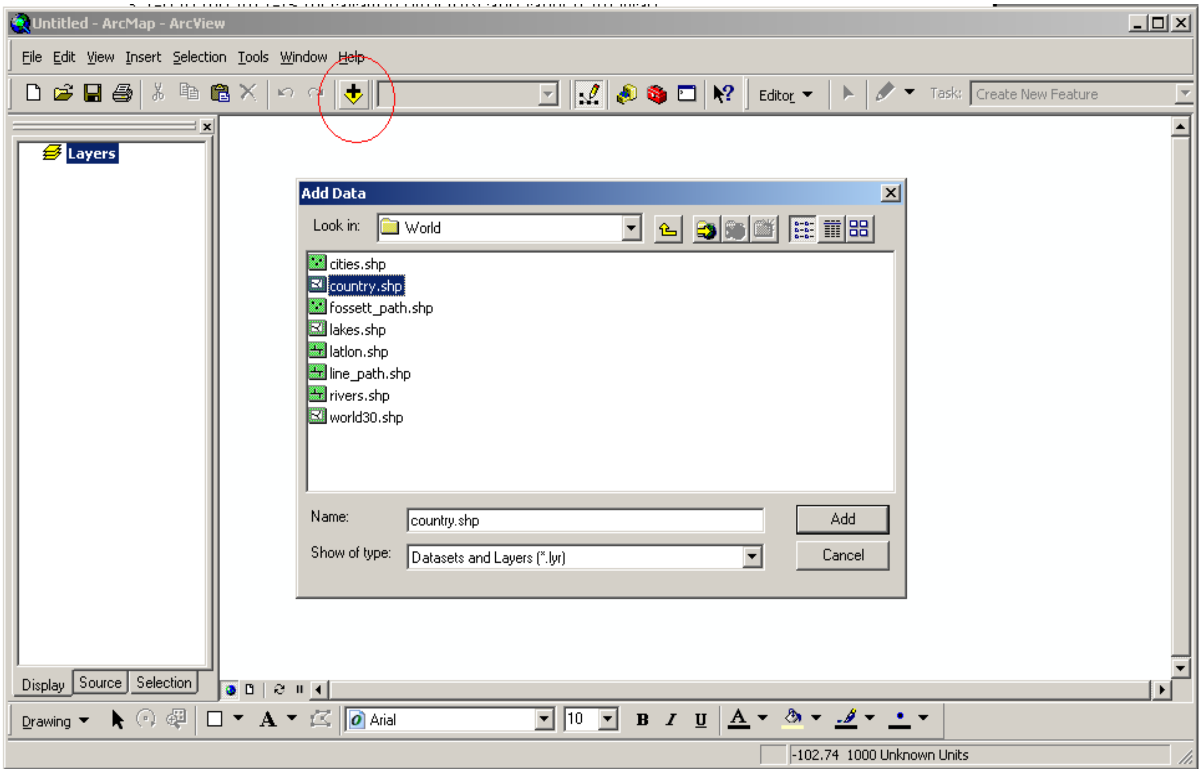
Templates provide ready-to-use layouts and base maps for various geographic regions.

○ An existing map:

Browse for maps...

□ Immediately add data
□ Do not show this dialog again
□ Load last map on startup

Figure 8.2. Starting ArcMap.



Untitled - ArcMap - ArcView

Add Data

Look in: World

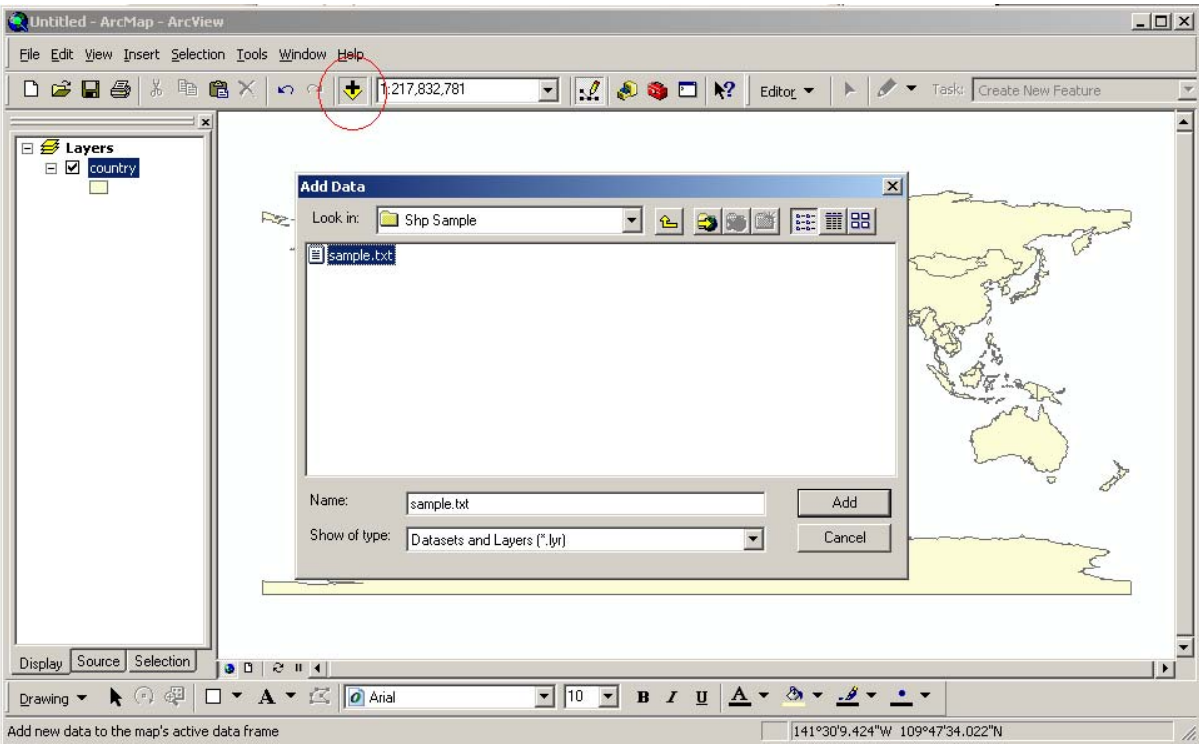
cities.shp
country.shp
fossett_path.shp
lakes.shp
latlon.shp
line_path.shp
rivers.shp
world30.shp

Name: country.shp

Show of type: Datasets and Layers (*.lyr)

-102.74 1000 Unknown Units

Figure 8.3. Adding a reference layer.


Untitled - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
Editor
Task:
Layers
country
Display Source Selection
Drawing
B I U

Scale: 1:217,832,781

Task: Create New Feature

Add Data

Look in: Shp Sample

sample.txt

Name: sample.txt

Show of type: Datasets and Layers (*.lyr)

Add

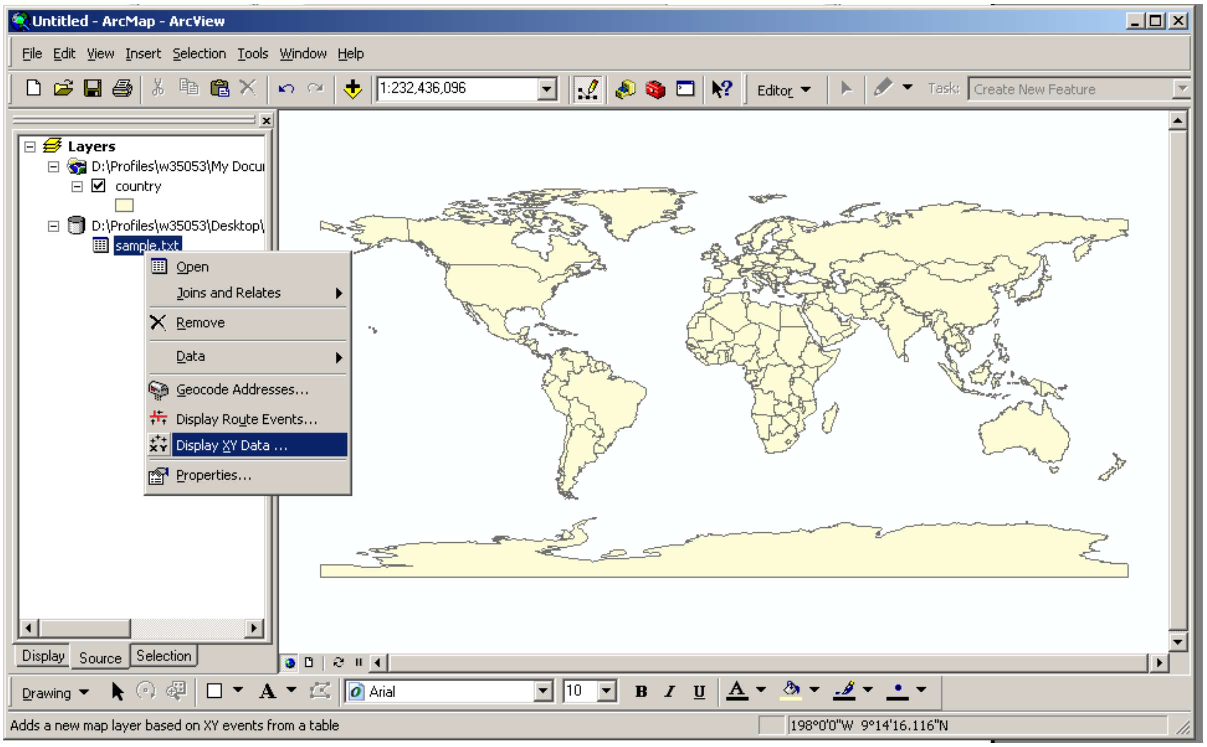
Cancel

Font: Arial, 10

Add new data to the map's active data frame

141°30'9.424"W 109°47'34.022"N

Figure 8.4. Adding text file as data source.


Untitled - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
Editor
Task:
Layers
Display Source Selection
Drawing
B I U

Scale: 1:232,436,096

Task: Create New Feature

Layers
- D:\Profiles\w35053\My Docu
  - country
- D:\Profiles\w35053\Desktop\
  - sample.txt

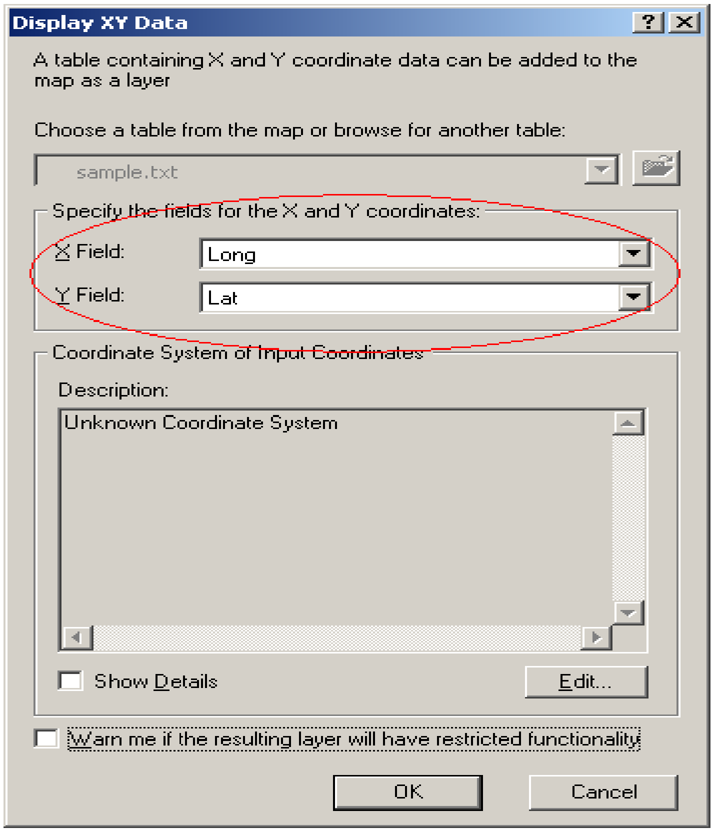
Open
Joins and Relates
Remove
Data
Geocode Addresses...
Display Route Events...
Display XY Data ...
Properties...

Font: Arial, 10

Adds a new map layer based on XY events from a table

198°0'0"W 9°14'16.116"N

Figure 8.5. Displaying XY data.



A table containing X and Y coordinate data can be added to the map as a layer

Choose a table from the map or browse for another table:

sample.txt

Specify the fields for the X and Y coordinates:

X Field: Long

Y Field: Lat

Coordinate System of Input Coordinates

Description:

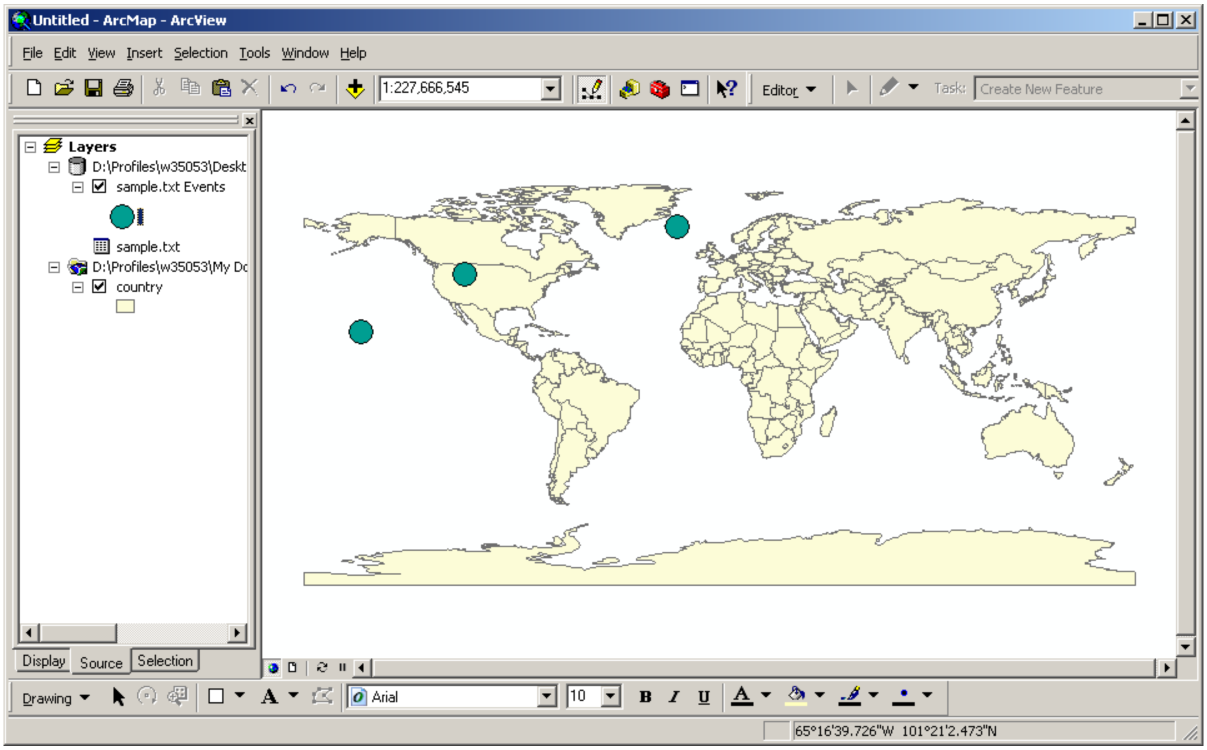
Unknown Coordinate System

□ Show Details

□ Warn me if the resulting layer will have restricted functionality

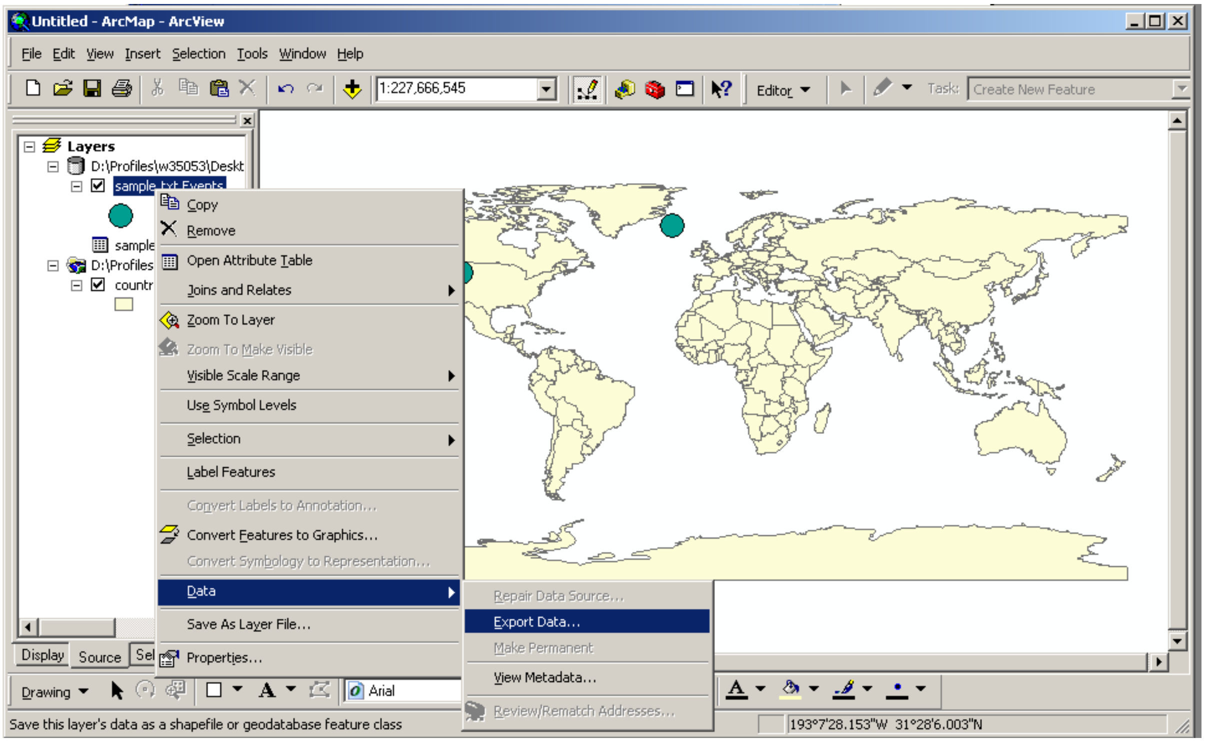
Figure 8.6. Identifying the XY data.

- Check that the data added is shown in the map on the right correctly. See Figure 8.7.
- Right click on the sample.txt. Select Events and select Data->Export Data…See Figure 8.8.
- Save the file as SHP file. Press OK. See Figure 8.9.
- You now have a shape file which can be used with MapObjects com.esri.mo2.ui.bean.Layer class.



65°16'39.726"W 101°21'2.473"N

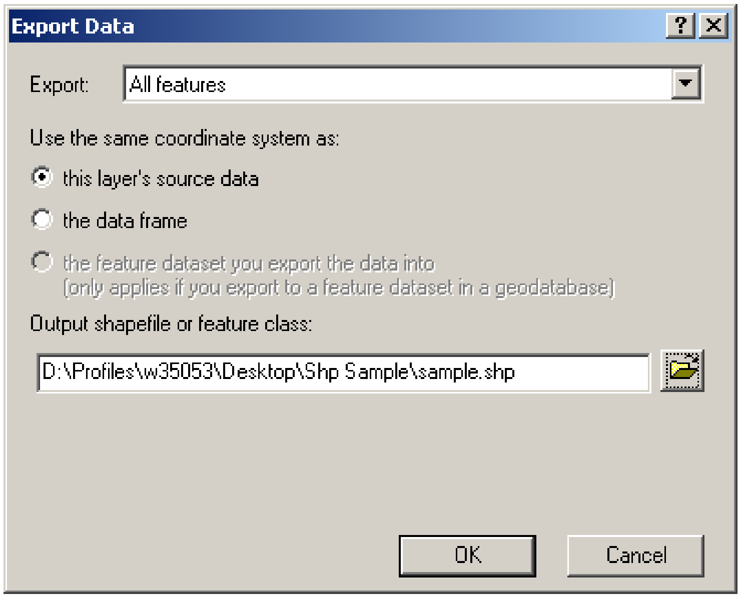
Figure 8.7. Displaying the XY data.



Save this layer's data as a shapefile or geodatabase feature class

193°7'28.153"W 31°28'6.003"N

Figure 8.8. Exporting the XY data.



Export: All features

Use the same coordinate system as:

● this layer's source data

○ the data frame

○ the feature dataset you export the data into
(only applies if you export to a feature dataset in a geodatabase)

Output shapefile or feature class:

D:\Profiles\w35053\Desktop\Shp Sample\sample.shp

Figure 8.9. Saving the exported XY data.

CHAPTER 9

FUTURE ENHANCEMENT

This project has a huge scope. But it was impossible to cover everything in the first version of the software. This project has a huge degree for further development. This chapter focuses on these ideas for future development of the project. The framework is designed in such a way that it can be expanded to support more features and use cases. As we have used object oriented JAVA as the programming language it’s easy to write code for adding extra features in the tool.

Some of the future enhancements proposed are:

- Only a few Man Made Disasters have been included in this tool. It can be extended to add a lot more.
- Videos related to the disasters can be included to make it more interactive and entertaining.
- The scope of the project as of now is to deploy it on the student computers for them to learn about the Man Made Disasters in more detail. But in future it can be used as a Web Based application where a student can access this application through the internet at his own convenience without having to install this application on his or her computer.
- We can a add time for solving the quizzes and allotting the points based on how quick the question is solved.
- More interactive games and puzzles can be added to make learning more enjoyable and animated.
- Currently we only have Wikipedia links to each disaster. We can add more data information to the project. This includes links to different web pages on the internet providing more information on a disaster to the student.

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