# HOW IS GIS USED IN A COMMUNITY COLLEGE SETTING FOR ARCHITECTURAL IDENTIFICATION

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**CERTIFICATE OF APPROVAL**

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## Abstract

This case study analyzes how students use an Architectural Identification GIS Application in a community college setting.

## Acknowledgements

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# Table of Contents

Abstract ..... iii

Acknowledgements ..... iv

List of Figures ..... vii

**SECTION 1: ENTRY VIGNETTE** ..... 8

**SECTION 2: INTRODUCTION** ..... 11

Literature Review ..... 12

Journal Article Summaries ..... 12

Problem Questions ..... 19

The Case Study ..... 19

Data Collection ..... 20

Analysis of Data ..... 22

Outcomes/Development of Themes ..... 23

*Visualization* ..... 23

*Analysis* ..... 24

*Interaction* ..... 24

*Education* ..... 25

**SECTION 3: DESCRIPTION OF THE CASE AND ITS CONTEXT** ..... 26

**SECTION 4: DESCRIPTION OF THE THEORY** ..... 31

Human-Centered Design ..... 32

Wayfinding ..... 36

**SECTION 5: ASSERTIONS** ..... 38

Architectural Identification GIS System ........................................................... 38

Technical Requirements ........................................................................... 38

Spatial Limitations ................................................................................. 38

Steep Learning Curve ............................................................................. 38

Quality of Learning ................................................................................ 39

Limitations ........................................................................................... 40

Further Research ................................................................................... 41

**SECTION 6: CLOSING VIGNETTE** ........................................................... 41

**APPENDIX A: GLOSSARY** ........................................................................ 42

**APPENDIX B: ETHICS PERMISSION FORM** ................................................. 45

**APPENDIX C: INTERVIEW FORM** ............................................................... 46

**REFERENCES** ........................................................................................ 47

## List of Figures

**Figure 1 – The Paper Manuscript** 9

**Figure 2 – Architectural Identification GIS Application** 11

**Figure 3 – Data Collection Matrix** 20

**Figure 4 – The Database** 29

**Figure 5 – The Digital Picture Hotlink** 29

**Figure 6 – The Description Hotlink** 30

**Figure 7 – The Identify Tool** 31

**Figure 8 – The Customized Toolbar** 31

**Figure 9 – Example of Coherence** 33

**Figure 10 – Example of Malleability and Ownership** 34

**Figure 11 – The Query Dialog Box** 35

**Figure 12 – The Find Tool** 35

**Figure 13 – Distorted Map View** 37

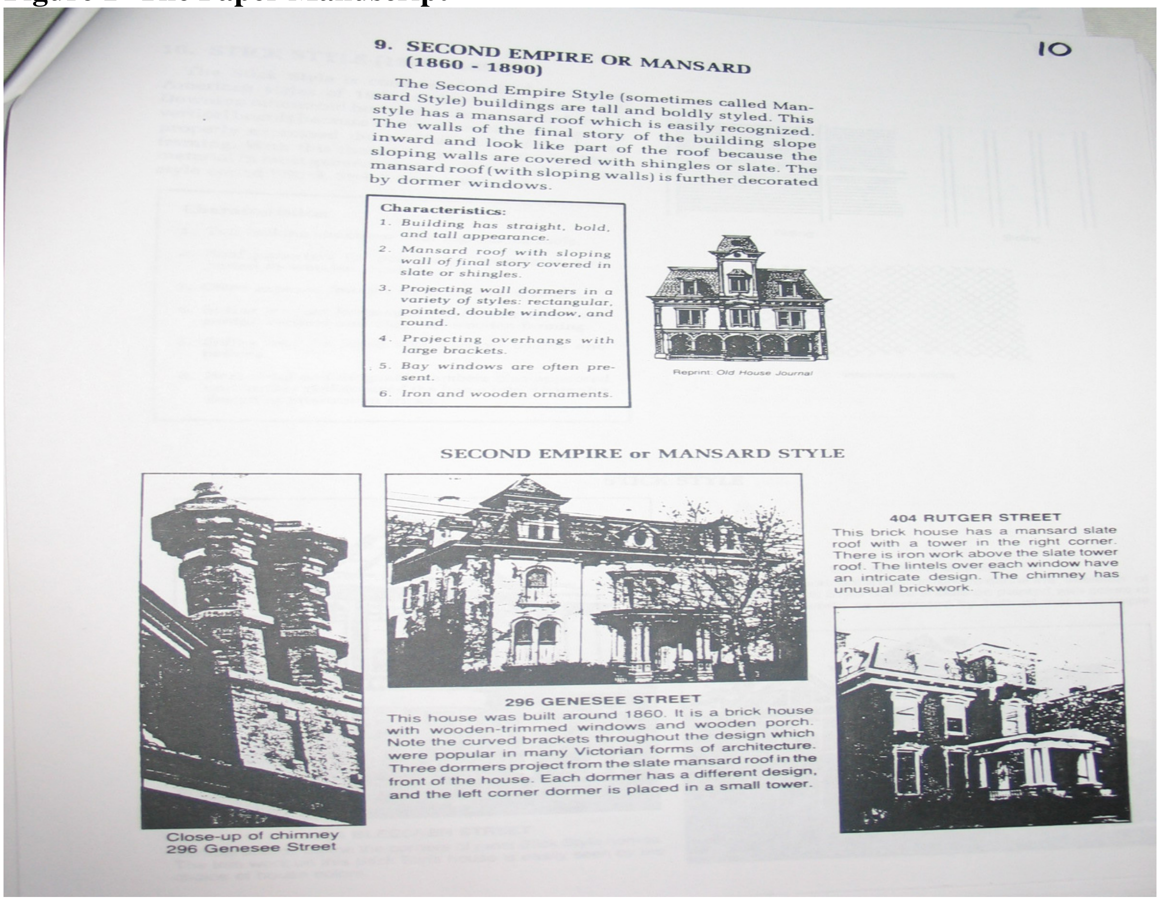
## Section 1: Entry Vignette

It was going to be an exciting day for Mr. S he has two classes to teach today, both classes will be experiencing his GIS application that he developed. One is a mechanical technology class, Architectural Civil Drafting, MT 112. The other is a civil engineering technology class, Computer Applications, CT 131. Both classes are under the Engineering Technologies and The Trades department at Mohawk Valley Community College.

Before Mr. S hands out the Architectural Identification manuscript, written by Frank Przybycien P.E. department head for ETT, he asks a question. *"Does anyone know how many different styles of architecture exist in the City of Utica?"* Students randomly guess, but no one is close. Mr. S replies, *"There are almost 30 different styles of architecture."* Mr. S asks, *"Can anyone name a building in Utica, which illustrates a particular style of architecture?"* A moment of silence occurs as students brainstorm. Student 1 raises his hand and says, *"I believe the Savings Bank of Utica is a particular style."* Mr. S. replies, *"Yes you are correct, do you know what style the bank is?"* Student 1 replies, *"No, I don't know, but it looks unique enough to be a particular style of architecture."* Mr. S replies, *"The Bank of Utica is Beaux Arts, it comes from the school of architecture in Paris. It uses Greek and Roman designs."* Mr. S continues, *"Can anyone tell me what year the architecture is from?"* Student 2 raises his hand and says, *"Is it from the 1800's?"* Mr. S replies, *"Close, it is from the late 19$^{th}$ century, from 1890 to 1920."*

Mr. S then proceeds to hand out the paper manuscript on Architectural Identification.

**Figure 1- The Paper Manuscript**



10

**9. SECOND EMPIRE OR MANSARD (1860 - 1890)**

The Second Empire Style (sometimes called Mansard Style) buildings are tall and boldly styled. This style has a mansard roof which is easily recognized. The walls of the final story of the building slope inward and look like part of the roof because the sloping walls are covered with shingles or slate. The mansard roof (with sloping walls) is further decorated by dormer windows.

**Characteristics:**

1. *Building has straight, bold, and tall appearance.*
2. *Mansard roof with sloping wall of final story covered in slate or shingles.*
3. *Projecting wall dormers in a variety of styles: rectangular, pointed, double window, and round.*
4. *Projecting overhangs with large brackets.*
5. *Bay windows are often present.*
6. *Iron and wooden ornaments.*

Reprint: *Old House Journal*

**SECOND EMPIRE or MANSARD STYLE**

Close-up of chimney
296 Genesee Street

**296 GENESEE STREET**
This house was built around 1860. It is a brick house with wooden-trimmed windows and wooden porch. Note the curved brackets throughout the design which were popular in many Victorian forms of architecture. Three dormers project from the slate mansard roof in the front of the house. Each dormer has a different design, and the left corner dormer is placed in a small tower.

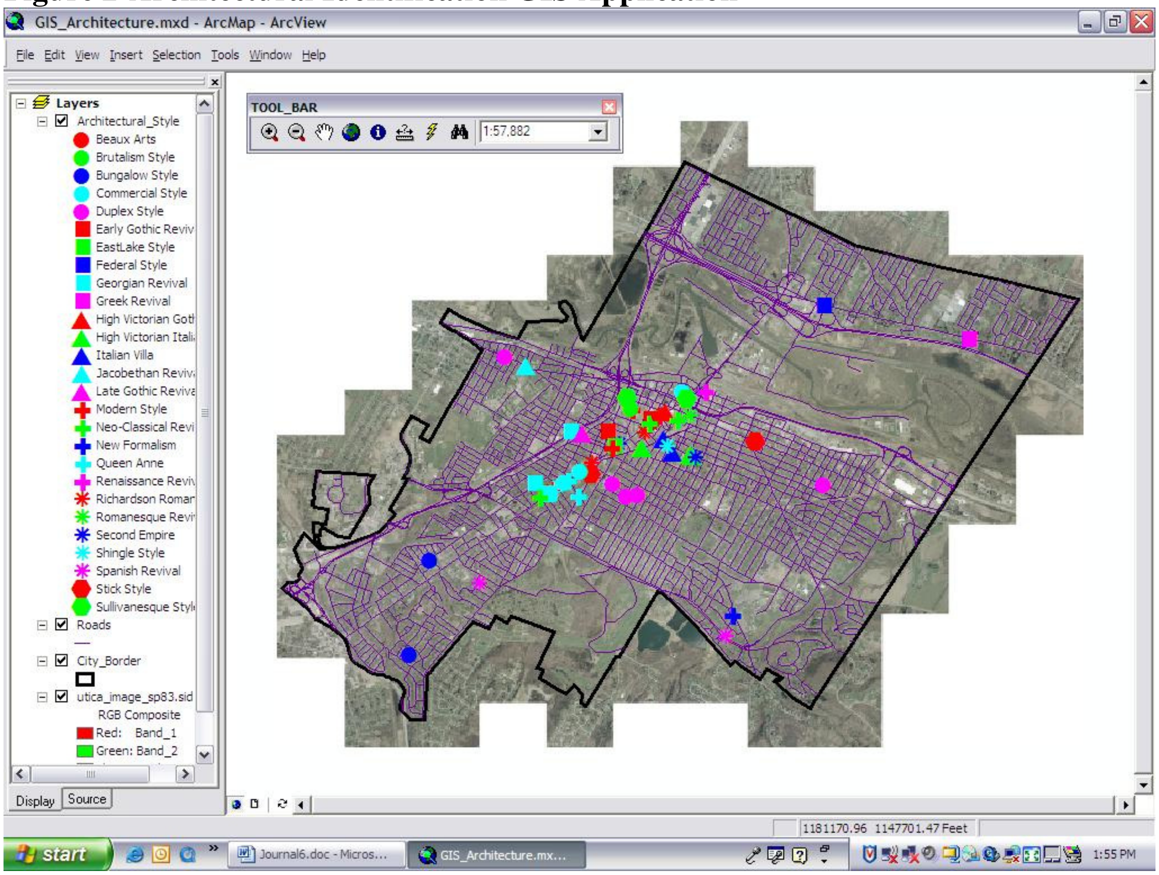
**404 RUTGER STREET**
This brick house has a mansard slate roof with a tower in the right corner. There is iron work above the slate tower roof. The lintels over each window have an intricate design. The chimney has unusual brickwork.

*The former based paper system illustrating Second Empire architecture*

Mr. S asks his class, *"I would like for each of you to closely examine the 27 different styles of architecture and note if any of you live in one or live nearby a particular style, for the examples given in the manuscript."* Student 3 raises his hand and says, *"I grew up in duplex style architecture."* Student 4 says, *"How are we supposed to know if we live near one of these styles if there is no map?"* This appears to be one obvious feature that the paper manuscript doesn't provide. The paper manuscript also lacks interactivity, for instance, it has no search capabilities. Mr. S then asks another question, *"Can anyone tell me how many styles of architecture exist on Rutger Street, in East Utica?"* Student 4 replies, *"That too would be a much easier question to answer if we had a map to look at."* Mr. S, says, *"Let's go into the computer lab and take a look at the Architectural Identification GIS application."*

Later that afternoon Mr. S proceeds to his CT 131 class. Mr. S asks the class, *"Can anyone tell me what GIS stands for?"* The students are puzzled, and silent. They are in a deep thought. Mr. S then says, *"It stands for Geographic Information Systems."* Mr. S asks the class, *"Can anyone tell me what GIS is or what it does?"* Student 1 says, *"It sounds like some type of computer information system."* Mr. S replies, *"Yes, it's a powerful, computer mapping information system."* Mr. S then explains, *"Everyone here is familiar with CADD, Computer-Aided-Drafting and Design. Well think of GIS as creating points, lines, and polygons just like you do in CADD, but now you populate those entities with data."* Mr. S continues, *"Think of this as using a point as a location of a house, but in GIS you can add data about the house, such as the type of architecture, year it was built, number of rooms, type of heating, as well as linking in a digital picture of the house. In essence you are taking a CADD design and populating those entities with data. In return you end up with a database. The attribute/database information can then be queried to answer questions like, how many houses were built before 1900?"* Student 2 raises his hand and asks, "*So you get to ask questions to the system*?" Mr. S replies, "*Yes you do*" Student 3 asks, "*Are you going show us how to use a GIS System?*" Mr. S says, "*Yes I am, but first I want to show you the Architectural Identification GIS System that I developed.*"

**Figure 2-Architectural Identification GIS Application**



*The Architectural Identification GIS Application in ArcMap, illustrating several layers.*

## Section 2: Introduction

This case study involves examining how students at MVCC are using an Architectural Identification GIS application. In order to study these effects, the author created the application based on information from an Architectural Identification manuscript. The manuscript is a paper-based format that includes a description, time period, and address of the particular architectural style in the City of Utica. The change from the paper-based manuscript to GIS allowed for an interactive, visual, and dynamic application. In conjunction with the development application change, qualitative research and a holistic analysis were done, applying theory to explain the value of the GIS application.

GIS is the acronym for Geographic Information Systems. GIS is defined as powerful computer mapping system that stores, edits and queries spatial information. GIS system uses points, lines, and polygons, to represent spatial data. This data is then or can be populated with attributes, such as tying the data to a database. This data can then be queried and represented in different ways. Computer maps can then be displayed by graduated color or graduated symbol style, using one or many variables. Layers of other various types of data can also be added. This allows for visible layers to create a hierarchy of different data types. For example the first layer may be an aerial photograph. The second may be a municipal boundary line. The third layer may be points that represent locations of significance. GIS users can see simultaneously different layers with each one representing something different.

## *Literature Review*

Several scholarly journals and articles regarding the use of GIS applications in a community college setting were reviewed. It is important to understand the difference between learning about using GIS, and learning to create a GIS application. This study focuses on students using a GIS system.

### Journal Article Summaries

“GIS in the Classroom,” written by Barbara Parmenteer, & Mary Burns, explains that the use of GIS technology is growing in America’s schools, noting “GIS use has grown and so too has demand for professionals who have GIS skills" (10). They note that many educators are enthusiastic about purchasing the most "cutting edge" technologies for their classrooms.

The article then goes into the challenges of GIS in K-12 education. The authors note that, "GIS is quite complex, and the learning curve is steep" (11). The authors mention, "We are not trying to discourage educators from using GIS in their classrooms, but to prompt reflection" (12). This they say, is mainly because of the training that is involved and the challenges of using local data. The authors suggest, "The decision to purchase a GIS is a considerable one" (12). The authors advise, "schools should start with some "proxy" GIS applications, such as freeware, Internet map servers, and manual GIS activities" (12).

"An Approach to Teaching Applied GIS: Implementation for Local Organizations," by John Benhart Jr explains how Indiana University is using a GIS Project Life Cycle for upper level GIS coursework. The author notes that, "The challenge of teaching underlying concepts of GIS functionality, the details of computer operation and software interfaces, as well as the contexts of various applications can be a difficult one" (245). This GIS Project Life Cycle, "Allows students to work with real clients, make the connection between data development, analysis, and applications development; provide expertise and needed data to local organizations; and see the utility and impact of their work" (245). This article illustrates how students responded to this type of method of teaching using GIS. The author also notes, "In relation to instructional focus, the debate centers on whether to educate students about GIS (emphasizing theory and concepts) or to train them in the specifics of using particular hardware and software"

(245). Benhart points out, “In relation to course content, the debate revolves around the issue of technical know-how versus application—should GIS instruction focus on technical details such as hardware, software, and spatial data or focus on information relating to the application of GIS to specific knowledge areas” (245).

“Data Tools for Real-World Learning” by Beverly Hunter & Yichun Xie illustrates how GIS can be used in a classroom to study real-world problems. The authors note that, “Through GIS students learn to connect social and natural phenomena to the geographical space in which they live” (18). The author explains that, “bringing students, teachers and local, state, and national government in a community together and using GIS, a blended understanding is occurring such as sharing information as an example of their local watershed” (18).

The authors note, “The central reason for using GIS tools for real-world problems is our capability to analyze and visualize the interaction of natural, social, and built environments” (20). The authors also note, “GIS tools enable students to share the results of their investigations with diverse audiences. These visually appealing products share and build data, information, and ideas among people of different backgrounds and knowledge” (20).

“GIS: More Than Just A Map” by Sami Lais is an interview with Nancy Tosta, who has over 25 years experience implementing GIS in government and private sectors. Tosta notes, “In the next five years we’re more likely to see collection of geospatial or georeferenced data at the point of transaction” (60). Collecting attributes and displaying them in a map, will no longer be a secondary process. She also notes, “We won’t use the data to create base maps but to monitor streams of environmental or business events.

Because we'll be doing it in real time and space, we'll be monitoring reality, rather than a cartographer's interpretation of reality, which is what a paper map is" (60). The way we think of how we represent data is changing. The author points out that, "The richness of the description of how different kinds of spatial and nonspatial data are related is going to continue to grow more complex. But that complexity will be as invisible to users as it is with any other kind of data" (60). Tosta also points out that, "In some ways GIS has gone mainstream. It's increasingly integrated in the IT community, and the public doesn't know that it's using something like GIS when it uses an Internet site to delineate a route. In other ways, the technology has been its own worst enemy. The culture has tended to be "those in the know" (60).

In another article titled, "Geography is Everywhere: Connecting Schools and Communities with GIS" by Marsha Alibrandi. The author of this article uses five K-12 schools as examples of GIS implementation. The author notes, "Geography is everywhere, and so is GIS. GIS is everywhere in local, regional, national and international planning; from emergency services to utilities, transportation and distribution networks to communications satellites and global positioning systems (GPS)" (32). GIS can be used with various industries such as census bureau, crime and health statistics, zip code marketing, and real estate brokerages. The author feels that, "GIS has become ubiquitous" (32). The author suggests, "To prepare students for workplaces of the 21st century, the inclusion of GIS in courses of study is critical" (32).

"Electronic Mapping in Education: The Use of Geographic Information Systems" by Raymond Sanders, Lawrence T. Kajs & Caroline M. Crawford contends that GIS is a powerful education tool. The author notes, "Electronic mapping can serve as a powerful education tool in the instruction of classroom students and in the administration of campuses and school districts. Electronic mapping can be applied to history classes, geography, social studies and even science classrooms" (121). The author also notes, "In a recent assessment of research pertaining to geographic education, different technologies, including GIS and CAD systems for visualizing geographic space, have been proposed. Such visualization lets the learner view geographic space in three dimensions rather than the traditional two and lets instructors give students the opportunity to create their own informed, knowledgeable geographic perceptions of the world" (121). The authors conclude, "Electronic mapping is a perfect complement to the student-centered, cognitive-constructivist teaching model. Such a model emphasizes the student as learner, in control of the learning situation and creatively developing an understandable, knowledgeable view of the information processed" (121). The authors also suggest, "The old adage –"Tell me and I'll forget. Show me, and I may not remember. Involve me, and I'll understand."—is supported by abundant research" (122).

According to the authors, "Students not only learn by hearing and seeing, they also have the ability and opportunity to personally apply the knowledge using higher order skills such as problem-solving and synthesis. GIS brings together into an integrated toolbox the hardware, software, and data to permit students to observe, explore, analyze, and question spatial information that runs on a typical classroom computer"(122). Students, they believe, can learn to think both independently and critically using GIS. According to the authors, "They can also develop skills of thinking, questioning, finding information, expressing ideas, and listening to others and valuing their contributions, as well as a disposition to learn" (123). Finally the authors point out, “Therefore the research findings suggest that GIS is a powerful tool to enhance the educational experiences of learners while further developing higher-order thinking skills” (123).

“Integrating GIS into the Undergraduate Learning Environment” by William J. Lloyd, the author examines some of the key issues of integrating GIS into an undergraduate learning environment. The author notes, “Despite the promise of GIS, substantial barriers have prevented its widespread use in geographic education. Among key factors are technical impediments stemming from software complexity, pedagogic issues related to lack of experienced faculty and the shortage of curriculum materials, and systemic issues associated with faculty motivation” (158). The author also notes, “Even faculty who are comfortable teaching courses in GIS often fail to incorporate the technology into their systematic and regional geography courses. Instead they tend to view GIS as a complex, advanced geographic technique to be taught to upper division and graduate students with a serious career interest in GIS. This technology is to complex too be put into the hands of untrained students” (158). The author suggests, “This leads to a dichotomy between “how to teach about GIS and how to teach with GIS” (158). The author then discusses how California State University integrated GIS into a freshmen level geography class. The University customized the interface, this way students were not stuck with the big learning curve of technical barriers in GIS software. The article explains that the University developed mini-applications of GIS. Some of the tools used were, zoom/in/out, pan, identify, scale changes, database queries. The author notes, “This ability of technology to redefine the social context of learning by acting as a stimulus for student discussion was one of the expected bonuses arising from the use of the mini-applications" (161).

California State University overcame the barriers by new funding sources, series of mini-applications and accompanying learning activities, and working with junior faculty and graduate teaching assistants. The students response from the mini-applications was generally favorable.

"Using GIS and GPS Technology as an Instructional Tool" by Ryan E. Baxter, illustrates how GIS and GPS can be used as an instructional tool in education. The author notes, "GIS technology permits the user to analyze and manipulate different data "layers." These layers could be roads, streams, pollution sites, population, vegetation and so forth. By manipulating the layers, a student could examine, for example, the relationship between soil quality and pollution sites. By doing so, students can visualize complex spatial relationships" (49). The author also suggests that, "Visualization has been shown to be a powerful way to understand problems, identify solutions, and discover the unexpected" (49). Students can also ask GIS application questions, such as: Show me all the countries that are land locked? or How many cities have a population greater than 2 million? The author suggests, "The ability to create visualizations and spatial queries makes GIS a powerful tool for students, both in solving problems and engaging their minds" (49). The author feels that, "Unfortunately, many students graduate thinking geography is the memorization of states and capitals and is useful only for reading a road map. By using geographic technology available today, students are able to go beyond textbook maps and build their own representations of the world in spatial terms. By using GIS data, students can dramatically see the effects of both human and physical systems on the earth, and more specifically, their own communities" (51).

## ***Problem Questions***

This study is geared toward answering a main research question while answers to three subquestions will help formulate a more thorough and specific response to the main question.

### Main Research Question

- *How is GIS used in a community college setting for Architectural Identification?*

**Issue Subquestions**

- How is the GIS application developed?
- What tools are used in a GIS application?
- What requirements are needed for implementing a GIS application?
- How does the GIS application relate to each human-centered design characteristic?

## ***The Case Study***

A case study was the most appropriate tradition of qualitative research to utilize since the topic must be studied in great depth. According to John Creswell (20), qualitative research involves examining "the qualitative data working inductively from particulars to more general perspectives." Since a specific GIS application is being studied, general perspectives would be developed by first studying the specifics of this tool and drawing preliminary conclusions. The case study is a bounded system, bounded by the application of GIS for Architectural Identification. The study is also bounded by Mohawk Valley Community College, and the spring 2005 semester, in which all aspects of the research took place. The study is also bounded by ArcGIS software which was used for the application. As an active researcher in this case study and the author, I studied the application extensively and discovered four important themes relating to the issues, these will be explained in detail later.

## ***Data Collection***

Data was in the form of interviews, observations, documents and websites collected. A data collection matrix illustrating these types of information gathered and their sources is presented in Figure 2.

**Figure 3 - Data Collection Matrix**

| ***Information/Information Source*** | ***Interviews*** | ***Observations*** | ***Documents*** |
|---|---|---|---|
| Department Head | 1 | | |
| Faculty | 2 | 2 | |
| Students (GIS Users) | 10 | 10 | |
| Architectural Identification Manuscript | | | 1 |
| Other Websites | | | X |
| Other Studies | | X | 1 |
| Scholarly Journal Articles | | | 8 |
| GIS Reference Book | | X | 1 |

*Data in the forms of interviews, observations and documents were collected from multiple sources of information*

The author first met with the department head, for the Engineering Technology and Trades department at Mohawk Valley Community College, Frank Przybycien in the fall of 2004 semester to discuss his manuscript. The manuscript is an excerpt from his book titled, *Utica: A City Worth Saving*. The manuscript in hard copy form illustrates the time period, description and a black and white picture of various styles of architecture that exist within the City of Utica. They both agreed that the manuscript was a prime candidate for a GIS application, because the information of the manuscript as well as the locations of the houses could be tied directly to a geographical database. This would allow for a "point and click" application to illustrate a color picture of the house as well as the description and time period. The GIS application would allow for interactivity. The manuscript was examined closely because the GIS application needed to provide the same information as the manuscript, but as a different design using technology. The GIS application was completed in the spring 2005 semester and a qualitative study needed to take place.

Prior to each interview, subjects were asked to sign and date an ethics permission form, (Appendix B). The questions asked can be found on the interview form in Appendix C. A formal interview was given to two faculty members as well as the department head. Ten students were also given interviews. These participants were from the Engineering Technologies and Trades Department, mostly drafters and civil technology majors. Each participant was interviewed in a natural setting, which was the ETT computer lab. The participants were asked to compare the GIS system to traditional paper-based manuscripts. The interviews also rendered observations. Documentation included a GIS reference book, the architectural identification manuscript, and eight scholarly journal articles. Websites offered data for understanding both technical and non-technical aspects of GIS applications.

## *Analysis of Data*

Data from each of the interviews was analyzed. Overall participants seemed to agree with their answers to the questions. Each question with a summary of the key responses given is listed and will be discussed here.

**1. Describe a session on using a GIS System?**

All respondents would open the software (ArcGIS), and open the Architectural Identification application. Respondents would then turn on and off files or layers. Respondents would also change the symbology or style of files. Some respondents would make some files transparent. This would allow them to see through the first layer, and see the second layer. Respondents would also rearrange the order of files, so other layers are on top of others, and some are beneath other layers.

**2. What tools do you use on the GIS System?**

All respondents use the *info* tool. This tool when clicked on a point, line, or polygon will display its attribute information. This would tell the respondent the particular date of specific style of architecture. Respondents also used the *pan* tool. This allows the user to move the map. Respondents also used the *zoom* tool. This allows the user to change the scale of the map by zooming in and out. Respondents also used the *measure* tool. This tool allows the user to measure from one location to another.

**3. What other aspects of the system do you use?**

All respondents used the *hotlink* tool. This allows the user to view a scanned document or picture. Some respondents used the *find* tool. This tool allows a user to search the attribute table. Other respondents used the *query* tool. This allows the user to create logical statements, in which the system searches for results. Most respondents also used the *layou*t tool. This tool assists in plotting a map and printing it.

**4. How did you feel about using the paper system?**

The majority of the respondents felt that the paper system was easily reproduced. The respondents felt that they could easily re-copy and distribute the paper system as well as take it home with them. Respondents also felt that the paper system lacked color, as well as visualization and analysis, but the paper system didn't require a computer or software. All of the respondents felt that the GIS application allowed for visualization and analysis as well as the ability to see spatial relationships. Often respondents referred to the paper system as adequate but inefficient compared to the GIS system. Respondents also felt that the paper system lacked layering capabilities.

## *Outcomes/Development of Themes*

As the data from the interviews and observations were analyzed, four main themes repeatedly appeared with regards to the GIS application. These four themes, *visualization*, *analysis*, *interaction*, and *education*, are described in this section.

### Visualization

Visualization is one of the four major themes that arose from the data analysis and literature review. Users are able to break out of the linear two dimensional spaces, and visualize an actual depth to various data contexts. For instance, "such visualization lets the learner view geographic space in three dimensions rather than the traditional two and lets instructors give students the opportunity to create their own informed, knowledgeable geographic perceptions of the world" (Sanders, Kajs, & Crawford 121). Another instance is, “visualization has been shown to be a powerful way to understand problems, identify solutions, and discover the unexpected” (Baxter 49). The aerial photo in the Architectural Identification GIS application was found to be very appealing to the respondents. They found interest in this particular type of visualization, which gave the opportunity as a background layer, to see landmarks and landscape topography.

### Analysis

Analysis is the ability to analyze patterns or spatial relationships. According to the literature, “GIS brings together into an integrated toolbox the hardware, software, and data to permit students to observe, explore, analyze, and question spatial information that runs on a typical classroom computer” (Sanders, Kajs, & Crawford 122). Querying is a type of analysis in which users can ask a GIS system questions. According to Baxter, “The ability to create visualizations and spatial queries makes GIS a powerful tool for students, both in solving problems and engaging their minds” (49). Users have the opportunity to draw conclusions from their analysis as well. Respondents for the Architectural Identification GIS application found themselves rendering such queries as: How many styles of architecture where built before 1900? A GIS system can be seen as both an input/output system. The input is the data and the output is the analysis.

### Interaction

Users of a GIS system consistently noted that they also have the ability to interact with the data. For instance “GIS technology permits the user to analyze and manipulate different data “layers.” These layers could be roads, streams, pollution sites, population, vegetation and so forth. By manipulating the layers, students could examine the relationship between soil quality and pollution sites." (Baxter 49). Interaction, it was found, was independent for user. Some users prefer red, a particular color or style, such as triangles, while other users preferred an entirely different color or style. Users turned on and off particular layers or made them transparent, and they changed the hierarchy of the layers. Respondents to the Architectural Identification GIS application favored the interaction of being able to change a particular symbol or line weight.

## Education

"GIS is quite complex, and the learning curve is steep," according to Parmenteer and Burns (11). This is apparent in this study when a teacher integrated GIS into a classroom. Benhart notes (245) "The challenge of teaching underlying concepts of GIS functionality, the details of computer operation and software interfaces, as well as the contexts of various applications can be a difficult one." There is an acknowledgeable difference in teaching about GIS, as referred to its theories and concepts, hardware and software or teaching to learn from GIS. As one teacher interviewed noted, "GIS is a two fold process, it branches into technical as well as academia." For instance "In relation to course content, the debate revolves around the issue of technical know-how versus application—should GIS instruction focus on technical details such as hardware, software, and spatial data or focus on information relating to the application of GIS to specific knowledge areas" (Benhart 245). Lais points out, "In some ways GIS has gone mainstream. It's increasingly integrated in the IT community, and the public doesn't know that it's using something like GIS when it uses an Internet site to delineate a route. In other ways, the technology has been it's own worst enemy. The culture has tended to be "those in the know" (60). In observing classes for this study, one way of overcoming the steep learning curve was by customizing the graphic user interface (GUI). For instance in one class that was observed, students felt without the customization there were too many tools that were irrelevant for the task that they were doing. Customization of the toolbars allowed students to avoid being with the steep learning curve of technical barriers in GIS software. This approach was taken for the Architectural Identification GIS application. In conclusion, "to prepare students for workplaces of the 21$^{st}$ century, the inclusion of GIS in courses of study is critical" (Alibrandi 32).

## Section 3: Description of the Case and Its Context

*The City of Utica, New York and the surrounding area are rich in varieties of American architecture. In fact, Utica is said to have the most concentrated location of all major forms of American architecture of any city in this country. There are two major reasons for this abundance of architectural examples. First, this area was initially developed prior to the Revolutionary War and has experienced growth during all periods of American architecture. Secondly, many cities, unlike Utica, have undergone large scale urban renewal projects which have destroyed all old buildings.*

*The existing buildings of various architectural forms in Utica illustrate the continuous developable of this nation. Truly, these famous buildings are a part of our great American heritage.*

*Only through active government involvement to protect the existence of buildings, financial commitments by bankers, interest by realtors, and by use of these buildings or re-use for area people, the future is up to us. These famous examples in Utica will either continue to give this area the reputation of being the best site of architectural identification, or these buildings will be destroyed with only pictures left behind to* *remind us of this part of our American heritage. By Frank Przybycien, Department Head for ETT department at MVCC, and author of* ***Utica: A City Worth Saving****.*

Mr. Przybycien created a manuscript from his book that illustrates 27 different styles of architecture within the City of Utica. This paper based manuscript illustrates the style of architecture, a description of the characteristics of the architectural style, the time period of the particular style of architecture, and a picture of the style of architecture. This manuscript has been used in the past for MT 112, an Architectural-Civil Drafting class, which is offered in the spring at MVCC. The opportunity to teach the class in the spring of 2004 was the beginning for the study. In using the manuscript in the class, students were always overwhelmed by the diversity of architecture that is located within Utica. The manuscript offered examples and descriptions of the different styles of architecture within the City of Utica.

Mapping the locations of the different styles of architecture offers a 'big picture' as far as the relation of the time periods and the proximity of each style. Being able to see the location and spatial relationship of the various styles of architecture was something that the manuscript did not offer. Being able to add several layers to the Architectural Identification GIS system gives flexibility to the user in being able to look at other spatial relationships. The ability to turn off and turn on layers gives the user the ability to see different layers at different times. Users have the opportunity to draw relationships and conclusions about the data by their own instinct and curiosity.

The first step in creating the Architectural Identification GIS application was deciding what attributes to included in the database. This part of the setup is critical because it determines how the database can be queried. Other parts of creating the application were the data collection. Global Positioning Systems is the most accurate way of collecting an actual spatial location. GPS is a method of data collection that involves using a receiver to collect signals from satellites in space to get a fixed X,Y,Z location/spatial location. However this type of data collection can be very time consuming, it requires the user to visit every location and record its coordinate position.

The other method of data collection is geo-coding. This type of data collection is automated. However it also can be very erroneous too. Users create a table with their address and the addresses are matched according to street centerline data. One way of explaining this is to imagine a line segment, where one address starts at one end and another address ends at another end. The algorithm then tries to match the correct location based upon a line segment of address locations.

Other decisions for the application included which type of various data layers that should be incorporated. This can also be addressed as data relevance. Other issues that needed to be addressed were the coordinate system, map datum, scale, and legend style. All in all many hurdles are confronted when building a GIS application. It has been distinctly noticed that there is a major difference between using a GIS System and developing a GIS application. Before a GIS System can be used it must first be developed. This qualitative study will examine the Architectural GIS System used by students at MVCC.

The Architectural Identification GIS application was developed in the spring 2005 semester. ArcGIS 8.2 software developed by Environmental Science Research Institute (ESRI) was used for analysis. Addresses for the 27 styles of architecture were created in an Excel table and then geo-coded from street centerline data. The locations of the houses were then double-checked by site visits. The layers that were included in the application are City of Utica boundary, street centerline, and a .60 centimeter true color aerial photo mosaic. The attributes that were added to the architectural styles are: year started, year ended, time period, type of style, and address. Figure 4 illustrates the database.

**Figure - 4 The Database**

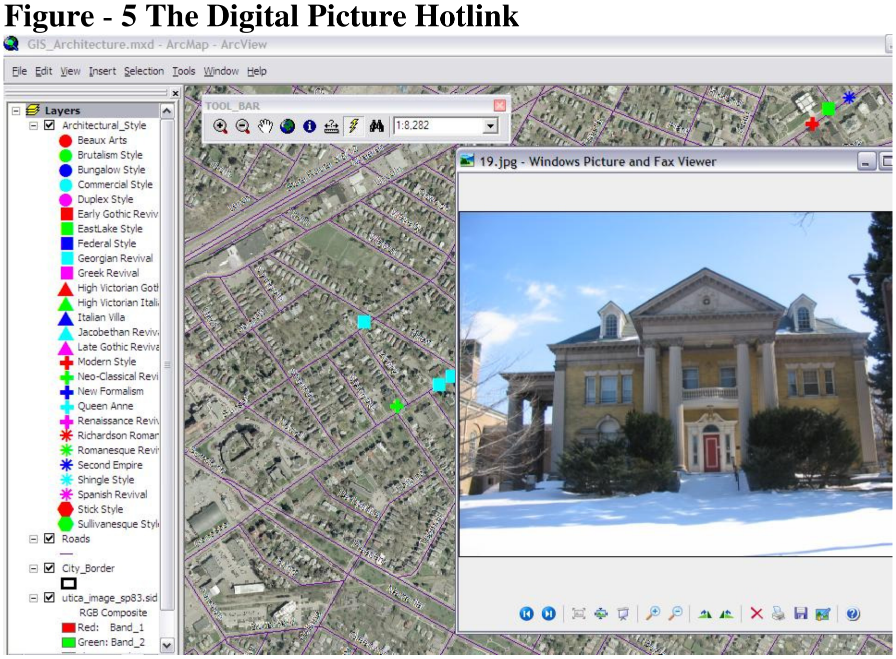
Attributes of Architectural_Style

| YEAR_STARTED | YEAR_ENDED | TIME_PERIOD | ADDRESS | TYPE | HOTLINK |
|---|---|---|---|---|---|
| 1820 | 1860 | 1820-1860 | 1323 Herkimer Road | Greek Revival | C:\GIS_ARCH_UTICA\Description\2.jpg |
| 1830 | 1860 | 1830-1860 | 1108 State Street | Early Gothic Revival | C:\GIS_ARCH_UTICA\Description\3.jpg |
| 1830 | 1860 | 1830-1860 | 714 Washington Street | Early Gothic Revival | C:\GIS_ARCH_UTICA\Description\3.jpg |
| 1845 | 1870 | 1845-1870 | 500 John Street | Romanesque Revival | C:\GIS_ARCH_UTICA\Description\4.jpg |
| 1850 | 1930 | 1850-1930 | 321 Main Street | Renaissance Revival | C:\GIS_ARCH_UTICA\Description\5.jpg |
| 1850 | 1880 | 1850-1880 | 1 Rutger Park | Italian Villa | C:\GIS_ARCH_UTICA\Description\6.jpg |

*The database for the Architectural Identification dataset*

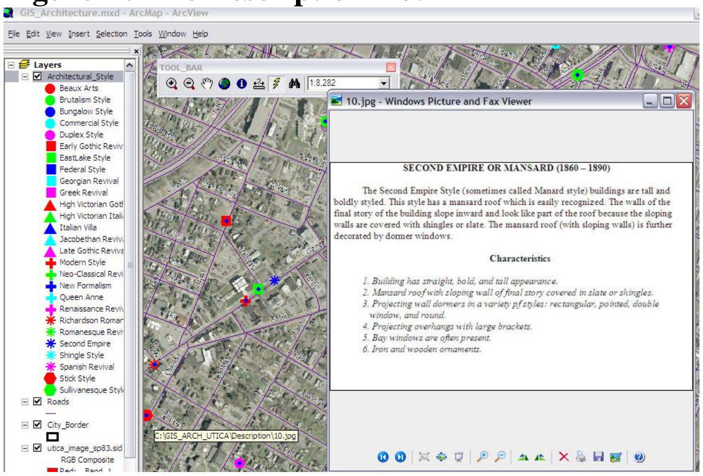
Two hotlinks were created for the architectural identification layer. Figures 5 & 6 illustrate the two hotlinks.

**Figure - 5 The Digital Picture Hotlink**




*A digital picture appears, for a particular style of architecture, when using the hotlink tool.*

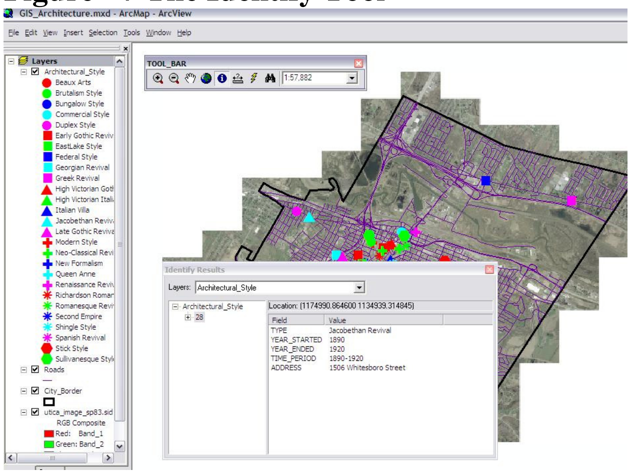
**Figure - 6 The Description Hotlink**




*The description of a particular style of architecture appears when using the hotlink tool also.*

These hotlinks included the description from the manuscript, and the second is a digital photo of the particular style of architecture. The legend for the architectural styles was using geometric shapes: circle, triangle, square, asterisks, crosses, and hexagons. Each symbol was used five times with several different colors: red, green blue, light blue and purple. GIS can be seen as a steep learning curve. The user interface of the software was then customized to overcome the learning curve. Nine tools are available for use. These tools included: *pan, zoom in, zoom out, zoom full extent, hotlink, measure, map scale, find,* and *identify*. The pan tool allows the user to pan the map. The *zoom in* tool allows the user to zoom in to a particular area of interest. The *zoom out* tool allows the user to zoom out of a particular area of interest. The *zoom full extent* tool allows the user to zoom to the full extent of the map. The *hotlink* tool allows the user to view linked documents such as digital pictures or scanned documents. The *measure* tool allows the user to measure distances from one location to another. The *map scale* tool informs the user the correct scale that they are viewing the map at. The *find* tool allows a user to search for a particular address or style of architecture.  The *identify* tool displays the attributes of the selected layer.  Figure 7 illustrates the identify tool.

**Figure - 7 The Identify Tool**




*The address, time period, and style appear when using the identify tool.*

Users also have the ability to turn off and on particular layers as well as road labels and other text labels.  Figure 8 illustrates the customized toolbar.

**Figure 8 - The Customized Toolbar**


*The tools: zoom in, zoom out, pan, zoom extent, identify, measure, hotlink, find, map scale*

## Section 4: Description of the Theory

Two main information design theories were carefully applied during the GIS application.  Each of the nine human-centered design characteristics and wayfinding were theories that evolved from the study.

### ***Human-Centered Design***

In "Information Design," Mike Cooley (65) tells us that Human-Centered Systems "A dialectical interaction is necessary between the subjective and the objective, challenging the appropriateness of the narrow technocentric and cognitive-engineering approaches to systems design and emphasizing new forms of "emancipatory technology" with new mechanisms for user involvement" Cooley also suggests, "HCS provides a powerful alternative philosophy for systems design and broader educational and societal development" (64). Lastly Cooley points out, "It (HCS) regards the social and cultural shaping of technology as central to the design and development of future technological systems and society as a whole" (65).

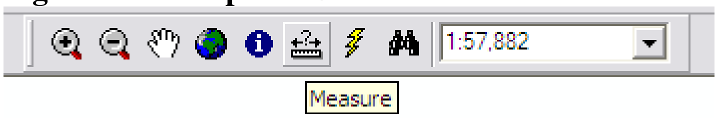
According to Cooley, Human-Centered Systems display the following nine characteristics: coherence, inclusiveness, malleability, engagement, ownership, responsiveness, purpose, panoramic, and transcendence. Cooley also suggests

These characteristics are said to add interactivity to an application, thus making it more attractive to users. When creating the Architectural Identification GIS application, special thought was put into incorporating these traits into the design in an effort to make the system human-centered. Described here are some of the ways this was accomplished.

**Coherence**

Coherence refers to letting the user know what is going on and what is possible. (Cooley 68) The Architectural Identification GIS application includes rollovers for the customized toolbar. As a user hovers over a particular tool, a text appears to inform the user what specific function the tool executes. This is shown in Figure 9.

**Figure 9 - Example of Coherence**




*As a user hovers over a specific tool, a text box informs them of the function of the tool*

**Inclusiveness and Engagement**

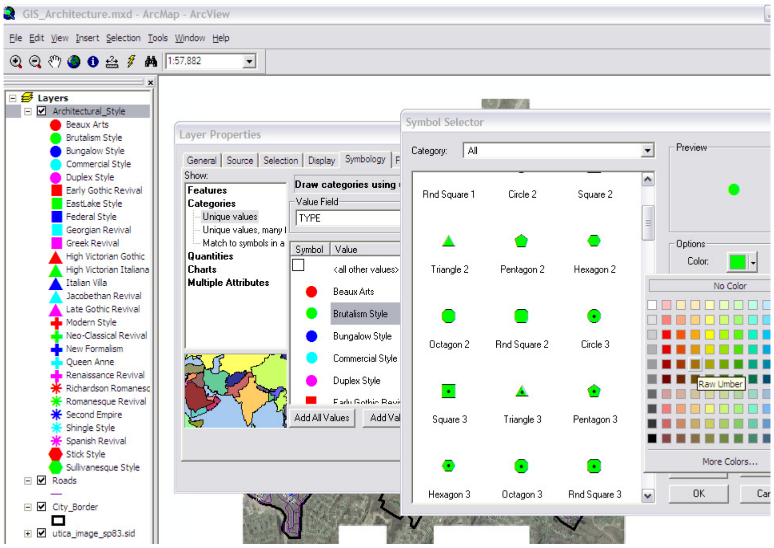
*Inclusiveness* and *Engagement* involve inviting the user to participate in the system. *Inclusiveness* refers to making the user feel part of the community of activities and engagement is geared toward creating a feeling of empathy. (Cooley 68) The customized toolbar offers the users to feel engaged in a GIS application. Many users can feel intimidated by using new software and being unfamiliar with many toolbars and menus. Since the application only has nine tools, users feel invited to participate without having to overcome the steep learning curve.

**Malleability and Ownership**

*Malleability* refers to the ability to mold the system to suit specific needs of the individual and Ownership involves making users feel as if they own part of the system. (Cooley 68) These two characteristics are related in that they involve allowing the user to make personal decisions and choices in the application. The application then responds based on the user's specifications.

In this regard, every architectural style in the legend has the ability to change in size, shape and color. Thus, the symbology in the legend can be molded to the users preferences. This capability also creates a feeling of ownership over the application since users are changing the appearance of the legend. Figure 10 illustrates this.

**Figure 10 - Example of Malleability and Ownership**

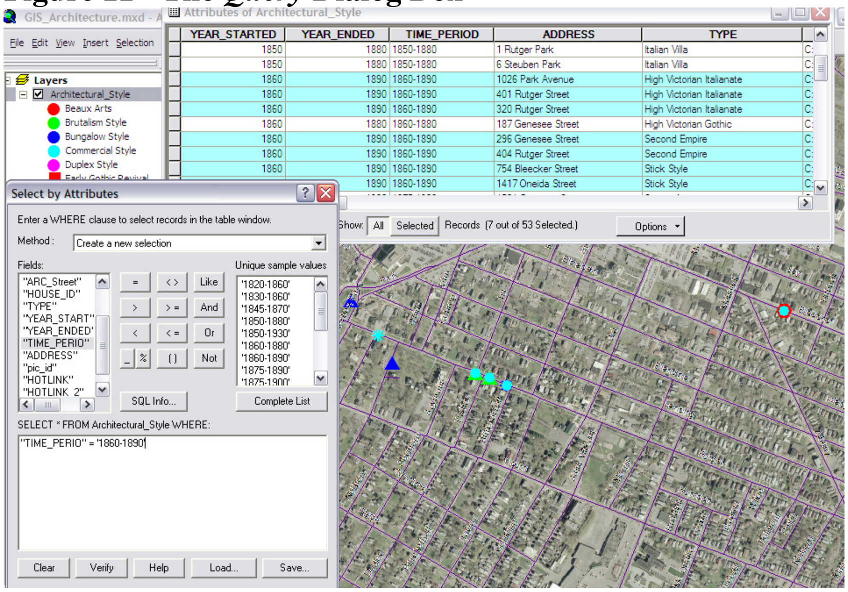



*Users are able to change the size, color and shape for entities in the legend*

## Responsiveness and Purpose

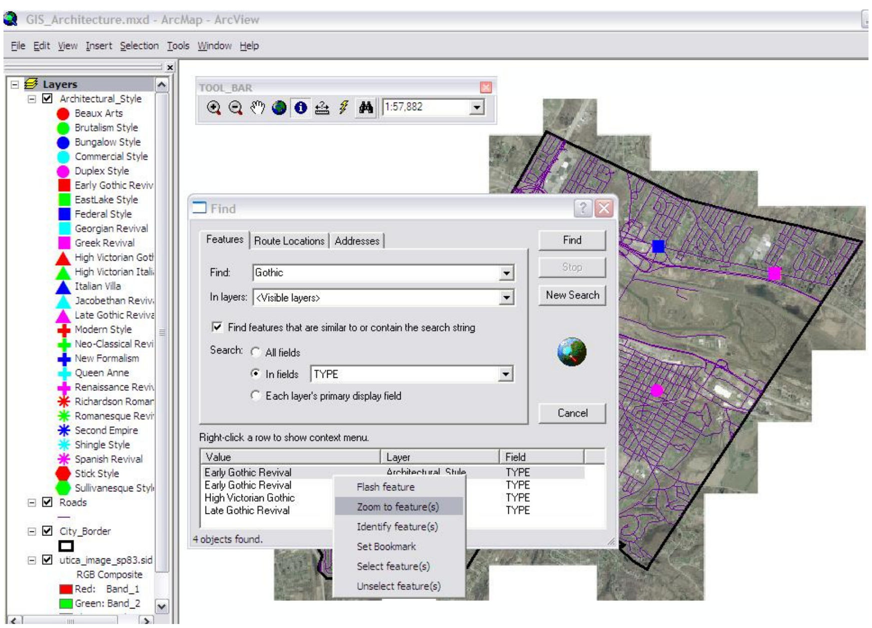
*Responsiveness* and *Purpose* both deal with the ability of a system to respond to a user's individual requests. (Cooley 68-70) The paper system lacked the ability for users to search or query the data associated with architectural identities, such as time period, year started and year ended. The query dialog now offers the opportunity for users to search the associated database for the architectural identities. This selects the particular items in the map view as well as in the table too. The find tool also allows the user to find a particular address or style of architecture. Both of these new features help to respond to the purpose that users have in mind when using the Architectural Identification GIS application. Figures 11, illustrates the query dialog box. Figure 12 illustrates the find tool.

## Figure 11 - The *Query* Dialog Box




*Users can query different variables from the database*

## Figure 12 - The *Find* Tool




*Users can search for a particular style of architecture or address.*

**Panorama and Transcendence**

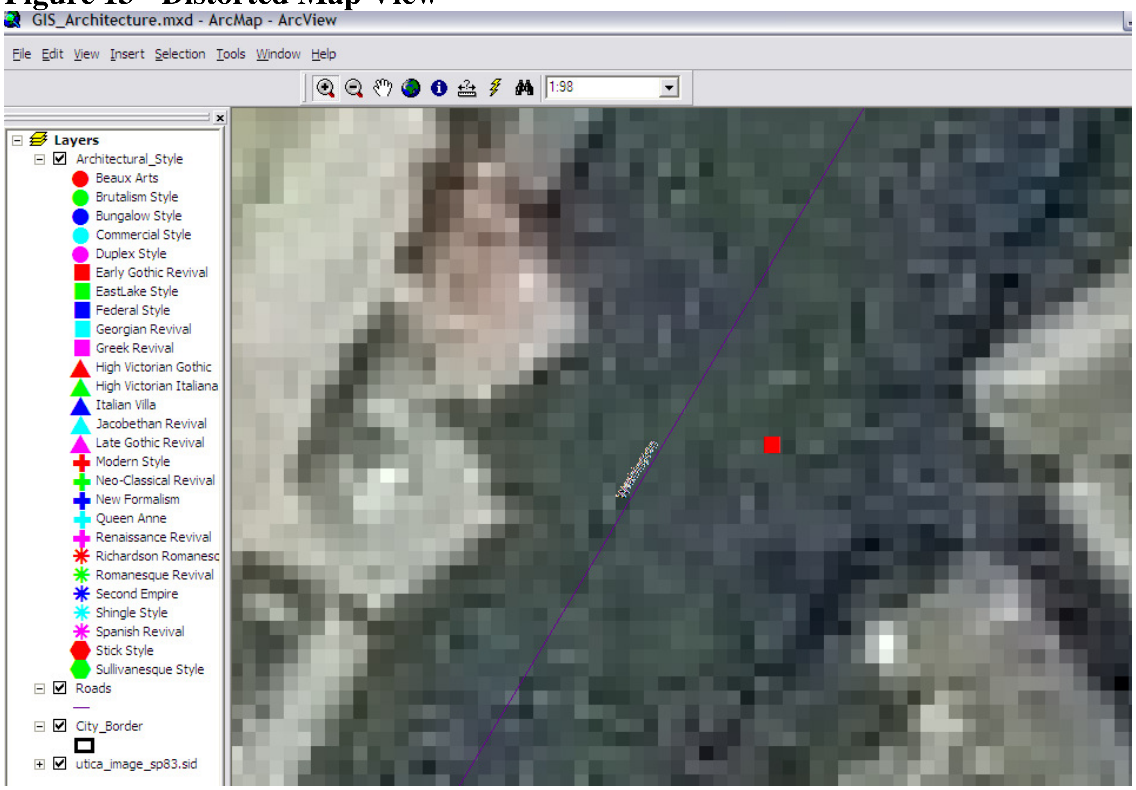
Transcendence is the characteristic of provoking the user to go beyond the immediate task. In order to do this, boundary knowledge must be self-evident. Panoramic means that the system provides windows through which the user can take on a panoramic view to acquire boundary knowledge. (Cooley 70) The Architectural Identification GIS application includes a .60cm true color aerial photo mosaic of the entire City of Utica. This high-resolution raster dataset allows to users to go beyond just that of architectural locations. The aerial photo offers an up close bird's eye view of the City of Utica. Landscape, landmarks and topography are extremely visible as well as other physical features. The application also has zoom in and zoom out capabilities. This allows the user to see the relationship of the styles of architecture at different scales/resolution.

***Wayfinding***

According to Passini, "Wayfinding is distinguished from other types of problem solving by operating in an architectural, urban, or geographic space" (88). This theory illustrates a representation noted as cognitive mapping, this is all part of information processing. Passini notes, "People need information to make and execute decisions" (89). In designing the Architectural Identification GIS application several tools were incorporated to assist in wayfinding. The first tool designed to incorporate wayfinding is the *find* tool. This tool allows the user to search for a particular address of style of architecture. After a selection is made using the find tool the user can select several options to find the particular item that they are looking for. The user can choose from several options in finding an item. This includes flashing the particular item, or zooming to it, or identifying its attributes.  This tool allows the user to find the immediate task at hand.  Figure 7 as discussed earlier illustrates an example of this.

Three other *zoom* tools also contributed to the wayfinding theory.  The *zoom in*, *zoom out*, and *zoom extent* tools assisted users in finding a particular map scale. Respondents often found themselves lost by being too zoomed in.  The map view would be represented by pixels.  Respondents would then use the zoom extent tool or the map scale tool to go to an actual legible map view.  Figure 13 illustrates a distorted map view.

**Figure 13 - Distorted Map View**



*Respondents would use the map scale tool, or zoom tools to overcome being too zoomed in.*

Passini also points out, "Information is also needed when people make and execute decisions at specific points along their way to a destination" (91).  Respondents felt that the color legend along with the *find* tool assisted them in finding a specific style of architecture.  Respondents also felt that the *zoom in* and *zoom out* tool assisted them in navigating to specific styles of architecture. The *zoom extent* tool and the *map scale* tool, assisted the respondents as a tool to overcome being too zoomed in or a distorted map view.

## Section 5: Assertions

### *Architectural Identification GIS System*

After careful research and observation regarding the use of the Architectural Identification GIS System some generalizations can be made.

### *Technical Requirements*

A GIS System is computer dependent; this dependency has a drawback of having a tendency of the computer software to crash. During the research and observations there was at least a half-dozen of times that the software crashed. It's crucial to have a back-up on disk to overcome losing any information.

### *Spatial Limitations*

It should be also noted that the application was a stand alone operation. One drawback was that many students asked," Can I do this from home?" The application was limited to the stand alone software. The software is expensive. Even though ESRI, www.esri.com gives tremendous educational discounts, without the discount the stand alone software can cost about $2,500 for one single license.

### *Steep Learning Curve*

There are many parameters that are involved in developing a GIS application. Issues like coordinate systems, map datums, database development, data relevance and data quality are just a few to name. Customizing the toolbar eliminated the steep learning curve in using a GIS System. By limiting the number of tools in the graphic user interface, kept the users from being distracted or wondering off, and not being able to use irrelevant tools. Overall the GIS application with a customized toolbar is a point and click application that can have much more of a sophisticated analysis if needed be. The GIS Application also allows for students to ask questions and further their thinking development. It's essential to point out that even though no statistical analysis was completed I strongly feel students learned more using the GIS application compared to the paper manuscript. Comments like, "There is only 150 feet separating three different styles of architecture" or "The time period from 1860-1890 is represented by three different types of architecture and all three are located on Rutger Street."

### *Quality of Learning*

Before students were exposed to GIS, the paper manuscript was a one-way method of learning architectural identification. The GIS application opened doors for the students to learn about the architectural identification in many other ways. These ways include using the query tool, using the measure tool, as well as other tools and also observing spatial relationships among the particular styles of architecture.

In using the GIS application students liked the overall spatial map. One student mentioned, "It appears that there is a strong concentration of architectural styles along located on Genesse Street. Students were also able to draw conclusions about spatial patterns and queries. Students enjoyed the fact that they could ask questions to the system and selected records would return. One particular student mentioned, "Not only can I change the legend but I can also find how many styles of architecture were created before 1900, this is cool". Students also liked the fact that the application could be molded to their specific needs. One student enjoyed the ability to make one particular architectural style "pink diamonds" for the legend. The high resolution aerial photograph would bring the students attention beyond the immediate task. One particular student mentioned, "It appears that there are two baseball fields that are less than a half a mile away from this particular Georgian Revival style of architecture". Finally Frank Przybycien says, "GIS is the latest technological buzzword around, it's essential for students to learn its discipline to prepare for the industry world".

A GIS application is never complete. Data needs to be updated, more hotlinks can be created, and the actual platform can become even more user friendly. A web-mapping application would allow users from anywhere to use the Architectural Identification GIS Application. New software releases may also include new features and tools to do a variety of different things, from analysis to visualization. Lastly, would to explore other GIS software industry vendors, which could render positive results, such as cheaper cost, easier graphic user interface, and other mapping capabilities.

### *Limitations*

Due to monetary constraints, further development of the Architectural Identification GIS Application is limited. Developing a web mapping application would cost a quite a bit amount of money. The software alone which is called ArcIMS, from ESRI, is close to $10,000, and would also require a server to store the data on.

### *Further Research*

The case study was bounded in several ways. In order to make assertions that could apply to a larger population of GIS Applications, some boundaries would need to be taken away. Studies regarding other community college GIS applications could be done or all GIS applications could be examined. Another development would be to study the Architectural Identification GIS Application over a longer term. Statistical measures such as test scores and quizzes could be studied to determine if students do learn more from using a GIS application.

## Section 6: Closing Vignette

Student 1 comments, "I never knew that these many bodies of water exist within the City of Utica". Student 2 mentions, "I can see my swimming pool in the aerial photo, and the next closest architectural style is 300 feet from my house". Student 1 says, "There is such a strong concentration of architecture on Genesee Street". Mr. S replies, *"I am so thrilled that everyone seems to be learning so much more than just the immediate task at hand"*. Student 2 says, "Mr. S will we be using the Architectural Identification in our next class too"? Mr. S replies, "Yes we will". Student 2 says, "Great, I like using the GIS application, it's really neat and it's so high-tech. The point and click of the GIS application is so easy. Information about the styles of architecture is only a click away." Student 3 mentions," I like the querying ability of the GIS application, who would ever think that you could ask the system questions and get results, this is high-tech." Mr. S smiles and dismisses his class, he's very proud of the positive response that the students have for his Architectural Identification GIS Application.

# APPENDIX A: GLOSSARY

**Analysis of Themes-** "following description the researcher then analyzes the data for specific themes, aggregating information into large clusters of ideas and providing details that support the themes" (Creswell, 1998); themes that emerged from the results of the data collection were analyzed in this section of the thesis

**ArcGIS-** GIS software developed by ESRI, Environmental Science Research Institute.

**ArcMap**- one of three software packages in ArcGIS. ArcMap is a off-the-shelf software that displays and edits spatial data.

**Assertions-** "this is the last step in the analysis where the researcher makes sense of the data" (Creswell, 1998);

**Bounded System-** "the case selected for study has boundaries, often bounded by time and place." (Creswell, 1998); this case study is bounded by the school involved, MVCC, and the time period of three months (Spring 2005 semester) in which the entire study took place.

**Case-** "the 'bounded system' or 'object' of study" (Creswell, 1998); the case in this study is an Architectural Identification GIS System at MVCC.

**Case Study-** "in qualitative research, this is the study of a 'bounded system' with the focus being either the case or an issue that is illustrated by the case." (Creswell, 1998); in this case, it is an in-depth study of a GIS System in a community college setting, based on a diverse array of data collection materials.

**Coherence-** one of the nine Human-Centered Design characteristics as described by Cooley (2002); refers to letting the user know what is going on and what is possible

**Engagement-** one of the nine Human-Centered Design characteristics as described by Cooley (2002); the quality of inviting the user to participate in the system

**ETT-** Engineering Technologies and Trades, is the department at MVCC, in which the GIS System was studied.

**GIS-** stands for Geographic Information Systems, is a computer system used to capture, store, edit, analyze, visualize and plot, spatially referenced data.

**Holistic Analysis-** "in this approach to data analysis, the researcher examines the entire case and presents descriptions, themes, and interpretations or assertions related to the whole case" (Creswell, 1998);

**Hotlink-** the process and ability of linking an external digital file to a spatial attribute in ArcMap.

**Inclusiveness**- one of the nine Human-Centered Design characteristics as described by Cooley (2002); the characteristic of including the users in the system and inviting them to feel part of a community of activities

**Issue Subquestions**- "subquestions in a qualitative study that follow the central underlying question… written to address the major concerns and perplexities to be resolved, the 'issue' of a study" (Creswell, 1998); this study involves four issue subquestions that follow the main research question

**Malleability-** one of the nine Human-Centered Design characteristics as described by Cooley (2002); the possibility to shape the system to suit specific needs of the individual

**MVCC-** stands for Mohawk Valley Community College, is located in Utica, N.Y.

**Ownership-** one of the nine Human-Centered Design characteristics as described by Cooley (2002); refers to the feeling that the users own part of the system, which gives them a sense of belonging

**Panoramic-** one of the nine Human-Centered Design characteristics as described by Cooley (2002); the quality of providing windows through which the user can take on a more panoramic view of the system to acquire boundary knowledge

**Purpose-** one of the nine Human-Centered Design characteristics as described by Cooley (2002); the ability of a system to respond to the purpose a user has in mind and encourage the user to go beyond it

**Qualitative Research-** "an inquiry process of understanding on a distinct methodological tradition of inquiry that explores a social or human problem." (Creswell, 1998)

**Query**- the ability to ask a system database questions and have records returned

**Responsiveness**- one of the nine Human-Centered Design characteristics as described by Cooley (2002); the ability of a system to respond to each user's requirements and individual needs

**Theme**- concept that has emerged from the interviews, observations, and other data collection methods

**Transcendence**- one of the nine Human-Centered Design characteristics as described by Cooley (2002); the quality of provoking the user to go beyond the immediate task

# APPENDIX B: ETHICS PERMISSION FORM

**Ethics Protocol for Case Study Research**
**[Brian C Judycki]**

This authorization is being requested in part to fulfill requirements of the State University of NY Institute of Technology's Human Subjects Research Review Board as well as state and federal regulations regarding the use of human subjects in research. The project involves a case study that may be used in my master's research at the SUNYIT Information Design and Technology Master's program. Excerpts or rewritten versions may also be submitted to professional journals for publication. The case study involves [The effects of using GIS as an Information Design tool] The work involves participant and non-participant observations, one-on-one and group interviews, and scheduled visits.

I can be reached at *[315.792.5313, which is at Mohawk Valley Community College, where I am a full-time faculty member]*. I would be happy to answer any questions about the project.

I would like to reassure you that as a participant in this project you have several, rights.

- Your participation in these studies is entirely voluntary.
- You are free to decline to answer any question at any time,
- You are free to withdraw from the study at any time.

My notes from meetings, interviews, and observations will be kept strictly confidential. Excerpts from these notes may be made part of the final thesis. Copies of the final publications will be supplied whenever possible and as requested.

I would be grateful if you would sign this form to show that you have read its contents.

________________________________________ signed
________________________________________ printed
________________________________________ dated

# APPENDIX C: INTERVIEW FORM

Interview Protocol
Project: GIS Systems

Time of Interview:
Date:
Place:
Interviewer:
Interviewee:
Position of interviewee:

{I am studying the effects of using GIS Systems.}

Questions:

1. Describe a session on using a GIS System?

2. What tools do you use on the GIS System?

3. What other aspects of the system do you use?

4. How did you feel about using the Paper System?

5. To whom should I talk to find out more about GIS Systems?

## REFERENCES


Alibrandi, Marsha. *Geography is Everywhere: Connecting Schools and Communities with GIS.* Learning and Leading with Technology, 29 no7 April 2002.

Baxter, Ryan. *Using GIS and GPS as an Instructional Tool.* The Clearing House 76 no1 2002.

Benhart, John. *An Approach to Teaching Applied GIS: Implementation for Local Orginizations.* Journal of Geography 99 no6 2000

Hunter, Beverly & Xie, Yichun. *Data Tools for Real-World Learning.* Learning and Leading with Technology 28 no7 April 2001.

Lais, Sami. *GIS: More Than Just A Map.* Computerworld no26 Jan 2001

Lloyd, William. *Integrating GIS into the Undergraduate Learning Environment.* Journal of Geography. 100 no5 2001.

Parmenteer, Barbara. & Burns, Mary. *GIS in the Classroom.* Learning and Leading with Technology. April 2001.

Sanders, Raymond. & Kajs, Lawrence. & Crawford, Caroline. *Electronic Mapping in Education: The Use of Geographic Information Systems.* Journal of Research on Technology in Education. Winter 2001/2002.

Title: How is GIS used in a Community College Setting for Architectural Identification

Keywords: GIS, architecture, computer mapping, community college, human-centered design

# BRIAN JUDYCKI

## OBJECTIVE

Seeking a community college teaching position to utilize my existing experience and applications of GIS and Computer Aided Design, as well as teaching new applications and design.

## EDUCATION

♦ Bachelor of Arts in Geography, University at Albany, May 2000
♦ Geographic Information Systems/Spatial Analysis Undergraduate Certificate, University at Albany, May 2000
♦ Currently enrolled in SUNYIT Master of Science in Information Design and Technology, to be completed in Spring 2005.

**Continuing Education:** Certified 40 Hour Hazardous Materials and Site Investigation; Certificate in Microstation Fundamentals Training (5 day course), Certificate in AutoCAD 2000 Fundamentals Training (3 day course), ESRI Virtual Campus Courses include: Migrating from ArcView 3.2 to 8.2. Introduction to ArcCatalog, Introduction to ArcToolbox, Advanced Fundamentals of ArcMap, Advanced Methodologies of Spatial Analyst and 3D Analyst.

**Professional Affiliations:** Urban and Regional Information Systems Association (URISA); Member of the Advisory Board of Mohawk Valley Community College, American Association of Geographers (AAG), American Society for Photogrammetry and Remote Sensing (ASPRS).

## SUMMARY OF QUALIFICATIONS

Four years of experience in a worldwide consulting firm. Projects included CAD drafting and design for civil and architectural site layout. Mechanical drafting and design for HVAC systems. Highly experienced in mapping various applications in a Geographic Information System environment. Thoroughly experienced in performing three-dimensional and spatial analysis as well as performing image analysis/classification of satellite imagery and aerial photos, and global positioning data collection and database organization. CAD creation, design and conversion of both 2D and 3D drawings into a GIS system. Created custom data sets for various client requirements, some of which allow the visualization of environmental modeling, municipal planning and GIS-related efforts. CAD experience includes extensive architectural, mechanical and civil

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drafting design.

Highly experienced with ESRI software, ArcGis 8.3, and Extensions ArcView3.2 and Extensions, (Spatial Analysis, 3-D, Image Analysis, Network Analyst), ArcInfo, ArcSde, ArcIms, ArcExplorer ArcPad, Avenue Programming, CATS, HPAC, AutoCAD 2004, Microstation 8, Idrisi, Erdas, Mapinfo, Pathfinder 2.0. Corel Draw 7. Microsoft Office.

## WORK EXPERIENCE

Jan2004-Present MVCC

*Instructor*

Courses included Mt 242 (Advanced Microstation), Introduced students to the fundamentals of 3D modeling tools and commands within Microstation. Students designed various mechanical parts in 3D during lab time. Mt 222 (Tool Design), Covered various issues regarding the design of jigs, and fixtures. Lab time included mechanical jigs and fixtures being drafted in AutoCAD. Mt 171 (Computer Apps), Introduced students to the Microsoft Office suite of software. Labs and lectures included Word, Excel, PowerPoint, Computing Fundamentals (Hardware), also AutoCAD, Microstation and ArcView 3.2. Mt 112 (Architectural/Civil Drafting) Introduced students to the concepts of Architectural drafting and design as well as the fundamentals of building various components in a industrial/commercial or private setting. Lab time consisted of drafting various sections of houses/buildings in AutoCAD.

Played a key-role in the development of a GIS Curriculum for the Technology and Trades Department, that is currently in the process of being finalized.

Oct2003-Jan2004 Shumaker Consulting Engineering

*GIS Analyst/CAD designer*

Currently working on a part-time basis. Current project is the City of Utica Sewer. This includes GIS mapping, along with the creation and population of the database as well as CAD conversion of the existing sewer drawing to a GIS format. Also training the engineers in the Sewer Department to use ArcGIS querying and analysis capabilities. Mechanical, Civil and Architectural drafting for a facility expansion for Upstate Homes for Children and Adults. Designs included HVAC, plumbing and fire protection, along with sanitary and storm sewer, utility relocation, site improvements, and drainage/landscaping. Other drafting and design projects include: Presbyterian Homes: HVAC, plumbing. Electric Boat: mechanical system design for various mechanical parts and machines. Preswick Glen: site layout, parking and landscape design.

Oct2001-Oct2003 Montgomery Watson Harza

*GIS Analyst/CAD designer*

Duties included creation and conversion of AutoCAD and Microstation datasets to be incorporated into a GIS system. Configuration of geo-databases for geo-datasets. Clients include Town of Marcy, conversion of AutoCAD 2000 mapping drawings into a complete GIS Database for Town wide mapping. Incorporated existing mapping from Chas Sells to current mapping. Compiled Aerial photos, tax mapping, wetland boundaries, Agricultural districts, Flood zones, and Zoning districts and Digital Soil data. GE Schenectady Environmental Health and Safety Dept, created a customized geo-database for air emission points, fire extinguishers, eye wash stations, oil tank locations, and emergency shower locations. Provided an inventory and analysis of safety product locations to determine efficient new locations. Water distribution and modeling using H2o Map for the Village of Ilion, created in CAD, converted to a GIS database to monitor water usage and allocation demand. 3D modeling of geologic layers and hazardous waste plume contamination, using EVS for NYSEG. Determined plume concentrations and quantities for excavation. Performed flood mapping for various dam break analyses for an inundation study of Prison Reservoir.

Sept2002-Dec2002 MVCC

*Adjunct Teacher*

Taught two different sessions of CT 131, Introduction to Computer Applications. Introduced students to the components of software and computer hardware. Class was mixed with non-computer users and advanced users. Software learning included Microsoft office (Word, Excel, and PowerPoint). Also introduction of technical software and use of AutoCAD 2000, Microstation J, and ArcView 3.2. A lab was assigned for all software class lessons. Also taught Mt 251 (Advanced AutoCAD) Introduced students to the fundamentals of 3D solid modeling. Lab exercises included drafting various mechanical parts in 3D.

Oct2000 – Oct2001 Harza Engineering Company

*GIS Specialist / CAD Technician*

Duties included Microstation and AutoCad design files being extracted and converted to shapefiles to be implemented into a GIS environment. Three-dimensional models for various projects to show years of topographic evolution. Obtained and performed image analysis of historic aerial and satellite photos in determining stained soil, property boundaries and vegetation types. Modeled hazardous waste sites using ArcView in both State Plane and UTM projected coordinate systems from survey CAD drawings. Sampled and purged monitoring wells, the results of the samples were linked to the GPS location of the wells and displayed in EVS using ArcView. Paper maps to digital format. Scanned and geo-referenced aerial photos. Used GPS for various projects: 40 miles of ski trails, fire hydrants, manholes, using a Trimble GPS TSC1 Asset Surveyor using ArcPad on a Compaq Ipaq with hot-linked pictures. Performed image analysis of false color aerial photograph to determine geologic fault lines, to assist in determining drilling for acquiring wells. Also provided base maps for coworkers, and did various Microstation/AutoCad design work.

June1999-Sept2000 (eight months) Air Force Research Laboratory

*GIS Internship*

Researched weather applications for several projects. Worked on-line with Dr. Scott Shipley, expert in GIS Meteorology. Applications included: surface plots of metar data with temperature and wind direction extracted, radar displayed on satellite imagery (AVHRR) for hurricanes, spatial analysis of wind profiles, 3-D terrain modeling with imagery draped over. Also image analysis of DOQQ photos: registration, enhancement, supervised and un-supervised classification. Using CATS and HPAC demonstrated applications of strategic warfare scenario's of terrorists attacks for a spatial analysis of critical assessments of plume concentrations risks.

October1999-May2000 (eight months) New York State Dept. of Environmental Conservation

*GIS Internship*

Plotted coordinates using different methodologies (gps, geo-code, imagery) for major chemical and bulk storage facilities. Updated the existing database as well as creating a new database for missing tanks, for quality assurance and quality control. Also conversion of coordinates for the NYUTM extended zone 18 standard. Printed maps for the various regional offices using ArcPress in reference to un-inspected sites and use of obtaining coordinates for missing storage facilities.

## REFERENCES

Captain Bob Duncomb, Staff Meteorologist, Air Force Research Laboratory. (315) 330-3185.

Angela Chieco PE, Environmental Engineer, New York State Department of Environmental Conservation, Division of Remediation, Bureau of Spill Prevention and Response. (518) 457-3854.

Nick Kolak PE, Research Scientist, New York State Department of Environmental Conservation, Division of Remediation, Bureau of Spill Prevention and Response. (518) 457-3891.

Denny Mowers PLS, Chief Land Surveyor, D.L. Mowers Land Surveyors & Associates. (315) 866-6069

Paul Romano PE, Managing Engineer, Shumaker Consulting Engineering & Land Surveying. (315) 724-0100