

Trail Search

By

Tim Nugent

Submitted to
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the Degree of Bachelor of Science
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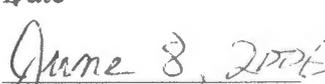
Tim Nugent



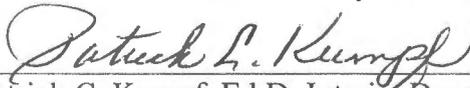
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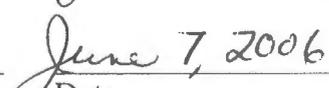
Prof. Bob Schlemmer, Faculty Advisor



Date



Patrick C. Kumpf, Ed.D. Interim Department Head



Date

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Table of Contents

Section	Page
Acknowledgements	iii
Table of Contents	iv
List of Figures	v
Abstract	vi
1. Statement of the Problem	1
2. Description of the Solution	1
2.1 User Profile	2
2.2 Design Protocols	3
2.3 Use Case Diagram	4
3. Deliverables	5
4. Design and Development	6
4.1 Timeline	6
4.2 Budget	6
5. Proof of Design	7
5.1 News	7
5.2 Trail Search	8
5.3 Parks	9
5.4 Submit Trails	11
5.5 Help	12
6. Testing Procedures	13
7. Conclusions and Recommendations	14
7.1 Conclusions	14
7.2 Recommendations	14
References	17

List of Figures

Figure Number	Page
Figure 1. Use Case Diagram	5
Figure 2. Timeline	6
Figure 3. Budget	7
Figure 4. News	8
Figure 5. Trail Search	9
Figure 6. State Selection	10
Figure 7. Region Selection	11
Figure 8. Park Selection	11
Figure 9. Submit Trail	12
Figure 10. Help	13

Abstract

Trailsearch.org is a hiking trail resource Web site that allows the user to search for trails multiple different ways. This Web site was created because of the lack of good hiking trail Web sites on the internet. Trailsearch.org lists detailed information about hiking trails, important information about the park or location in which they are located, and maps of trails when available. With this Web site, the hiker can search by trail length, trail name, park name, trail difficulty, hiking time, trail loops, state, and distance from major city. Hikers can also search for parks by clicking on a state and then the regional area. Hikers are able to read and make comments on every park page, and may also submit their own trail information and maps.

Trail Search

1. Statement of the Problem

There is a lack of easy-to-use and informative hiking trail resource Web sites on the Internet. A hiking trail resource Web site should have multiple ways of searching for hiking trails. One of the ways should be a graphical navigation by clicking on the state, then region, then park name to get to the park's trails. Another way to search for trails should be by advanced search features. These features include trail name, park name, state, length, distance from a major city, whether a trail is a loop, length of time a trail to hike, and the difficulty of a trail. The list of trails that the search returns for use will have a link the park page in which the trail is located. This park page should have the park address, driving directions, contact information, link to the official Web site of the park, maps, rules and regulations of the park, features of the park, a list of all the trails and detailed information about each trail, and a comment section to post comments about the park or each trail specifically. Each page of the Web site needs to have a disclaimer statement so the owner of the Web site is not held liable for any information obtained through the Web site. The Web site also needs a form to submit trail or park information which is stored in a separate database and needs to be reviewed before being submitted to the live database. It must have the ability for the user to send a map, and have the submission limited by file size and amount of files. The creation of this Web site needs to be completed by May, 2006. The input of data will continue throughout the life of the Web site.

2. Description of the Solution

TrailSearch is the solution to the void of hiking trail resource Web sites on the internet. None of the Web sites I have found have had more than two or three of the needed features of such a Web site. My solution is to create a Web site that includes all of these features. These features that my Web site will include are

- Multiple ways to search for trails, geographical and an advanced search
- Capacity for advanced searching by trail name, park name, state, length, time it takes to hike, distance from a major city, whether a trail is a loop, and the difficulty of a trail
- Maps of as many parks as possible
- Detailed information about each trail
- Ability for users to submit their own information and maps
- A comment section on each park page

Trail Search will cost no money for users to access all information, and there is no need to sign up for a username. The Web site will contain neither ads nor banners for other Web sites or products. Some of the key concerns of this Web site are the following:

- Security: I am worried about the security of my server if I allow users to upload files. I will have to make sure I have done everything possible to make the server as secure as possible.
- Copyrighted material being posted on the Web site: While I will review each map that users submit to the Web site, I cannot always know if a map the user submits is copyrighted or not.
- Accidents related to information available on the Web site: People sue others over the most trivial of issues, and I want to make my disclaimer as all-encompassing as possible.

2.1 User Profile

There is only one user profile for Trail Search: Hikers. Hikers can have varying degrees of knowledge of computers. Because the knowledge of my users is unknown, the Web site must have a very straightforward and easy-to-use interface. The interface must be intuitive, and not cluttered.

2.2 Design Protocols

The default webpage of Trail Search will be the news page. This will advise hikers of updates, provide hikers with a running tally of how many trails the database contains, and ask for more information from the hikers on certain parks or trails. At the top of the screen, beneath the banner, will be tab-like buttons that the hiker will use to navigate the Web site. The hiker will have a choice of news, advanced searching, geographically searching for parks, submitting information, and help.

If hikers select the Trail Search option, it will bring them to a Web page containing text boxes, drop down list boxes, and check boxes where they can enter their search criteria. This will then bring up the trail data into a data set table beneath their search options. This table will include all of the searchable information about the trail, and a link to the Web page where the information about the trail is located. By clicking on this link, users are directed to the park that the trail they searched for is in.

If hikers select the Parks option, then they will be taken to a Web page with a picture of the United States broken down by state. The hikers will be able to refine their list of parks by clicking on a state. Once they click on their state of choice, a new Web page will open up with the state they selected taking up the screen and subdivided into

regions. Hikers will then further refine their search by clicking on a region. By clicking on a region, the hikers will be taken to a Web page that lists every park within the region. The hikers can then click on the park they wish to view more information about and they will be directed to the park Web page.

If hikers select the Submit Info option, they will be taken to a Web Page containing a form filled with text boxes, drop down list boxes, and check boxes that hikers can use to submit trail information to the Web site. Below this is a browsing option that lets the hikers browse for a trail map on their computer to submit to the Web site.

If hikers select the Help option, then they will be taken to a help Web page with a list of frequently asked questions. These questions are numbered and appear at the top of the page. In order to see the answer to the frequently asked question, hikers will click on the question, and they will be redirected to the answer further down on the page. At the bottom of this page, there is a place for hikers to ask questions.

2.3 Use Case Diagram

The following diagram shows the use cases of the Trail Search Web site. Note that there is only one actor. This was done so that a user does not have to fill out information and create a username and password. This process takes a few minutes and would drive most people away. The diagram below details how Trail Search will be set up (See Figure 1.).

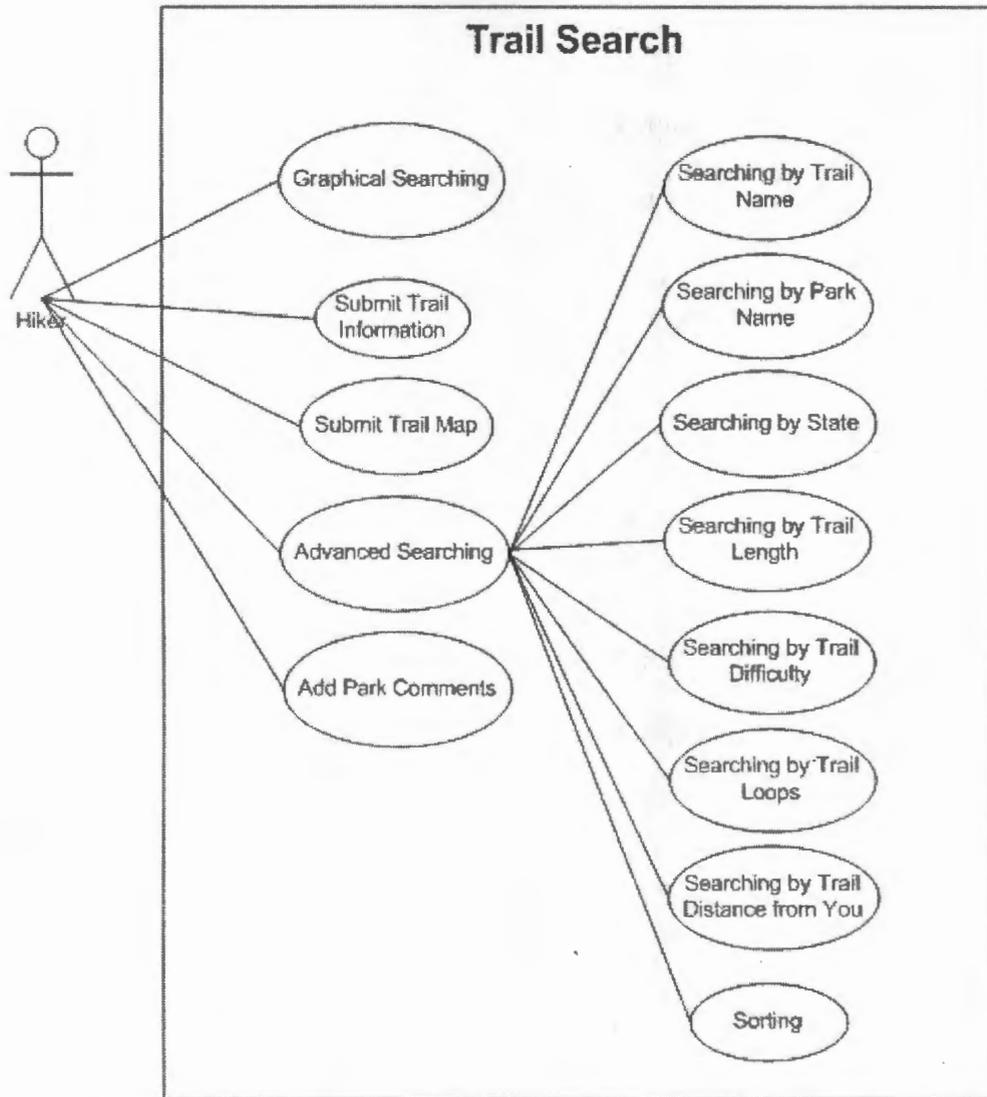


Figure 1. Use Case Diagram

3. Deliverables

In order to create an easy-to-use and informative Web site, certain items were required. During the design phase of this project, the following deliverables were defined:

1. The Web site will be written in HTML and VB.NET with ASP.NET, and will be connected to a SQL database.
2. The Web site will contain two ways of searching:
 - Searching geographically by navigation using a picture of the United States and then each state.
 - Searching with advanced options which include:
 - Searching by trail name
 - Searching by park name

- Searching by state
 - Searching by trail length
 - Searching by time the trail takes to hike
 - Searching by distance from major city
 - Searching by trail difficulty
 - Sorting the search results
3. The Web site will contain Park pages that contain:
 - Driving directions
 - Park information
 - Maps
 - Detailed trail information
 - User comments section
 4. The Web site will have the ability to upload maps
 5. The Web site will have the ability to submit trail information to a form

4. Design and Development

4.1 Timeline

A detailed Timeline showing every step that needs to be taken to complete Trail Search can be seen in Figure 2.

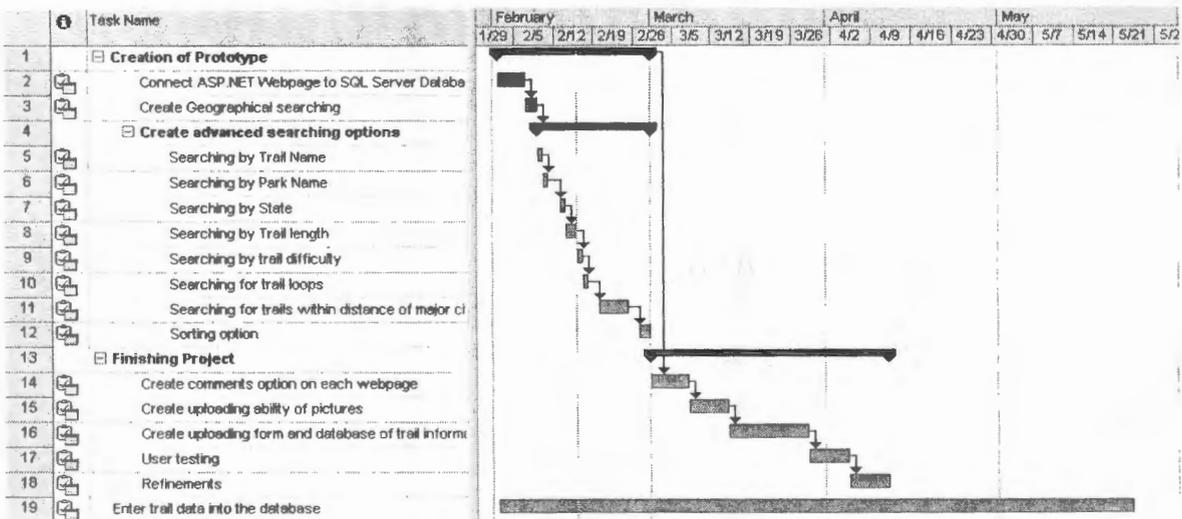


Figure 2. Timeline

4.2 Budget

A detailed Budget showing the costs of the software, hardware, and a break down of man hours needed to create Trail Search can be shown in Figure 3:

Resource Name	Cost	Work
<input type="checkbox"/> Tim Nugent	\$4,160.00	208 hrs
<i>Connect ASP.NET Webpage to SQL Server Database</i>	\$216.00	10.8 hrs
<i>Create Geographical searching</i>	\$144.00	7.2 hrs
<i>Searching by Trail Name</i>	\$72.00	3.6 hrs
<i>Searching by Park Name</i>	\$72.00	3.6 hrs
<i>Searching by State</i>	\$72.00	3.6 hrs
<i>Searching by Trail length</i>	\$144.00	7.2 hrs
<i>Searching by trail difficulty</i>	\$72.00	3.6 hrs
<i>Searching for trail loops</i>	\$72.00	3.6 hrs
<i>Searching for trails within distance of major city</i>	\$360.00	18 hrs
<i>Sorting option</i>	\$144.00	7.2 hrs
<i>Create comments option on each webpage</i>	\$360.00	18 hrs
<i>Create uploading ability of pictures</i>	\$360.00	18 hrs
<i>Create uploading form and database of trail information</i>	\$720.00	36 hrs
<i>User testing</i>	\$360.00	18 hrs
<i>Refinements</i>	\$360.00	18 hrs
<i>Enter trail data into the database</i>	\$632.00	31.6 hrs
<input type="checkbox"/> Server	\$500.00	Hardware
<input type="checkbox"/> Windows XP	\$146.95	Software
<input type="checkbox"/> SQL Server 2005 Express	\$0.00	Software
<input type="checkbox"/> Visual Studio 2003 .NET	\$984.00	Software
<input type="checkbox"/> Domain Subscription	\$20.00	
<input type="checkbox"/> Total Cost	\$5,810.95	
<input type="checkbox"/> Actual Cost	\$20.00	

Figure 3. Budget

5. Proof of Design

5.1 News

The News tab is the default Web page of the Web site. This is where I inform hikers of any changes I made to the Web site and list the number of trails each state contains. Each news post contains a day and month that the news was submitted. On the top right side of the Web page are a list of every state and how many trails that state

contains. Underneath the states, the total number of trails is listed. A sample news page is provided in Figure 4.

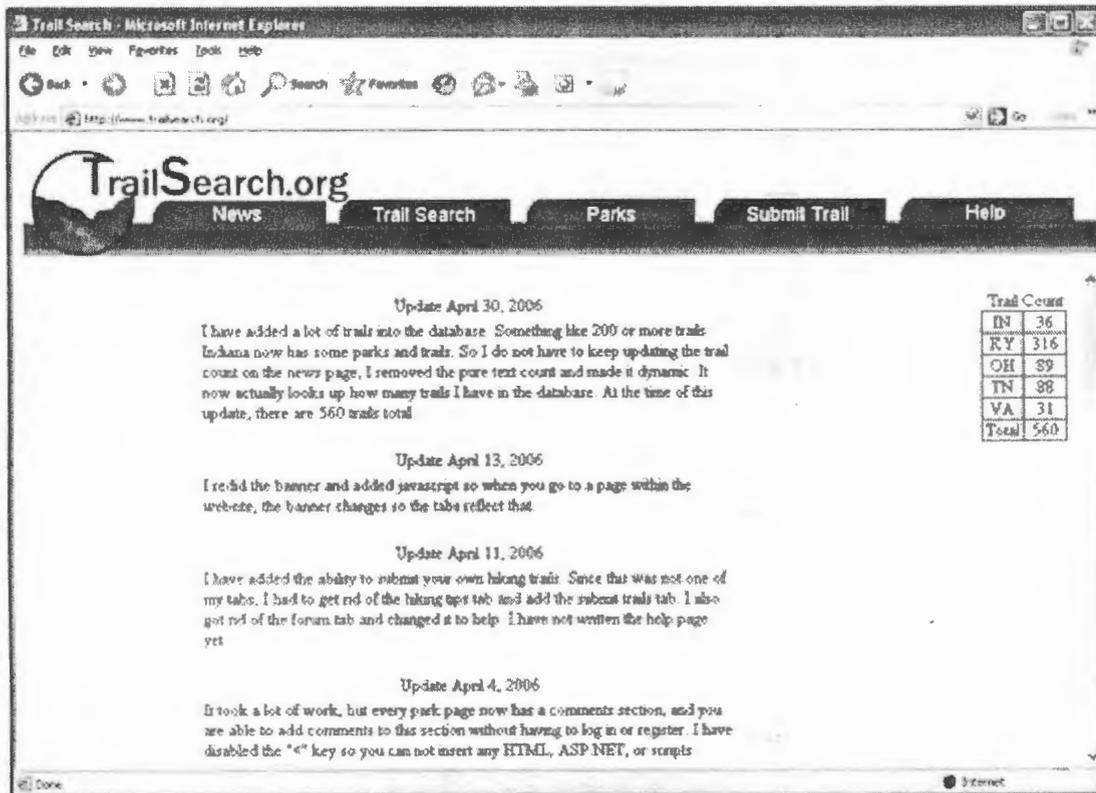


Figure 4. News

5.2 Trail Search

Using the Trail Search page allows hikers to search through trails with much more criteria than other hiking Web sites. Hikers can select many different options from a list and it returns the corresponding results. The trail name and park name searches allow partial text matches. For instance, if hikers forget the name of the park, but they remember it had the word gorge in it, they can type “gorge”, hit search, and it would return every trail that is in a park that contains “gorge” within the name. The difficulty, state, and sorting criteria are drop down list boxes. These features make the searching criteria less confusing. Hikers are able to search for trails that are specific lengths through the trail length text boxes. This feature allows hikers to search for more specific trails. If

hikers want to hike trails longer than 2 miles yet shorter than 10 miles, they now have the find those trails. Hikers can also search only for trails that are loops by checking a simple checkbox. If hikers want to search for trails within 100 miles of where they live, they have the ability to do also. They simply type “100” into the text box after “All trails within”, and then select the nearest large city from the drop down list box. Once the results of their search are returned, hikers can then click on the “Park Info” link under the more details column. This link points hikers to the park Web page that the trail is located in. An example of this page can be seen in Figure 5:

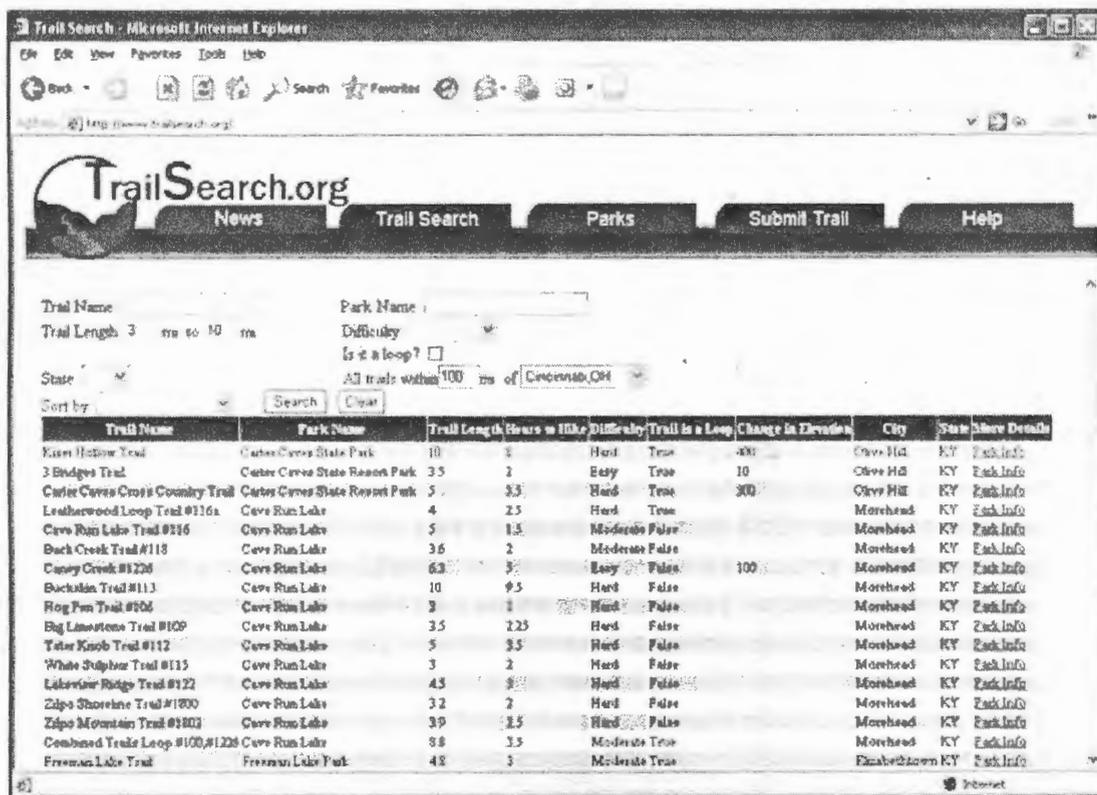


Figure 5. Advanced Searching

5.3 Parks

Through the use of a geographical searching page, hikers are able to search for parks efficiently and quickly. Hikers will not need to sift through long lists of parks, or have to search for the name of their state in a list: they can just click on their state, then

click on the region and they have a narrowed down list which is closer to their needs.

This can be seen in Figure 6, Figure 7, and Figure 8.



Figure 6. State Selection



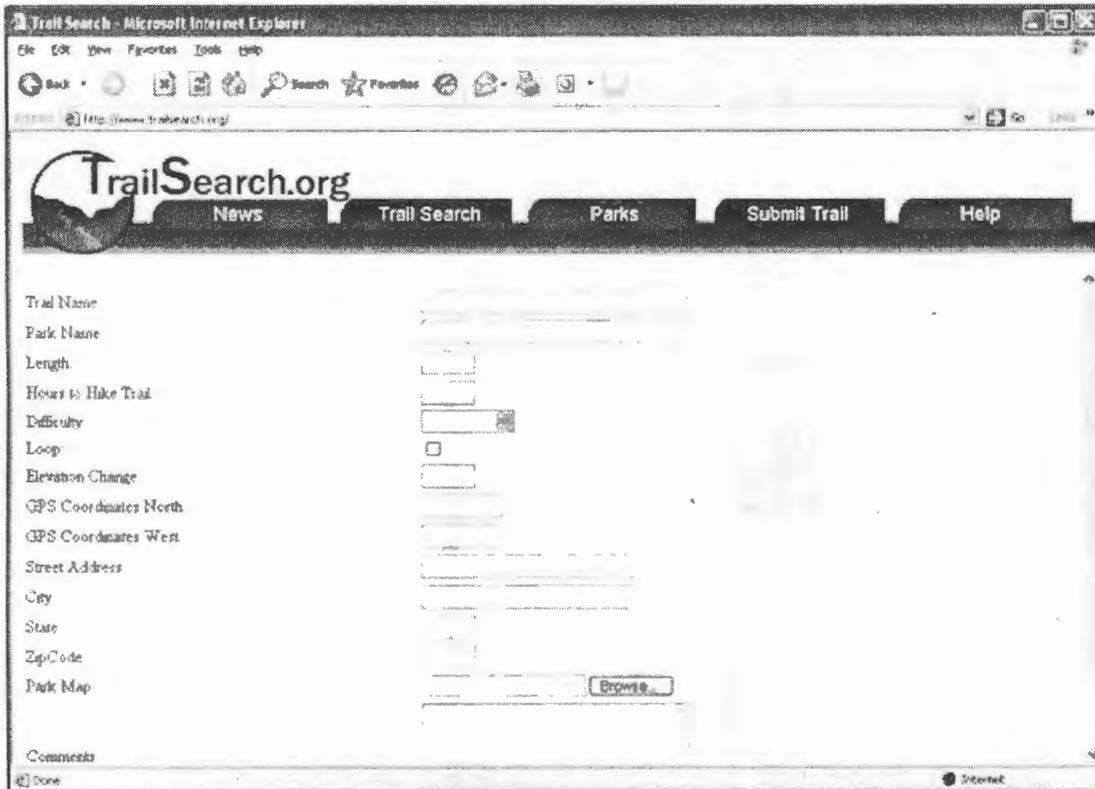
Figure 7. Region Selection



Figure 8. Park Selection

5.4 Submit Trail

The Submit Trail tab contains the form that allows hikers to submit hiking trails and maps. Hikers are able to submit the name of the trail, the park it is located in, its length, its hike time, its difficulty, whether or not it is a loop, its elevation change, its GPS coordinates, its street address, its city, its state, its zip code, any comments about the trail, and a map of the trail. Figure 9 illustrates this.



The screenshot shows a web browser window titled "Trail Search - Microsoft Internet Explorer". The address bar displays "http://www.trailsearch.org". The page features a navigation menu with tabs for "News", "Trail Search", "Parks", "Submit Trail", and "Help". The "Submit Trail" tab is active, displaying a form with the following fields:

- Trail Name
- Park Name
- Length
- Hours to Hike Trail
- Difficulty
- Loop (checkbox)
- Elevation Change
- GPS Coordinates North
- GPS Coordinates West
- Street Address
- City
- State
- Zip Code
- Park Map (with a "Browse..." button)
- Comments

The form is currently empty, and the "Submit" button is not visible.

Figure 9. Submit Trail

5.5 Help

The Help tab contains a list of frequently asked questions. These questions are listed at the top of the Web page. Hikers can find the answers to these questions by clicking on the question which links to the answers below as shown in Figure 10.

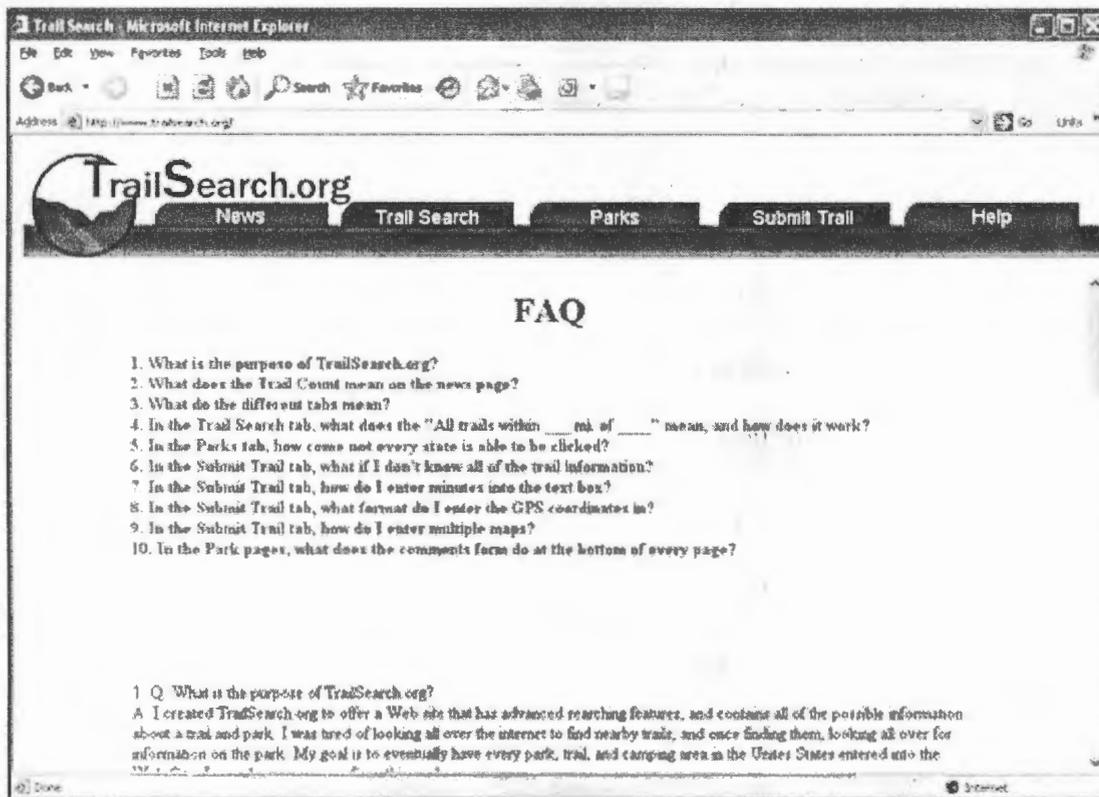


Figure 10. Help

6. Testing Procedures

The development of TrailSearch.org follows an iterative design process. I completed the project in sections. First, I connected the Web site to the database and tested the connection. Next, I filled in data to the database and created a submit button to display all data in the database. Once I had this working, I created the individual search options and tested each to make sure they worked by themselves and in conjunction with each other. Once I completed the testing myself, I asked fellow students to use the Web site and give me their observations. I also asked them to do searches for trails of certain lengths within a certain distance of a city to see if my Web site was self-explanatory. From this testing, I have realized that I needed to redesign the search form, and add a statement under the parks page notifying users to click on the state to view that state's

parks. For the rest of the use cases I tested each the same way; I did my own testing first, and then I asked a fellow student to try and break it.

7. Conclusions and Recommendations

7.1 Conclusions

This project was created in response to the lack of good hiking trail resource Web sites on the Internet. I created an easy-to-use Web site that contains detailed information about trails and the parks they are in. With Trail Search, hikers can search for these trails multiple ways, and even submit their own trails and maps. I created Trail Search in Visual Studio 2003 .NET with ASP.NET and VB.net. The database of trails, comments, and submitted trails are stored in a SQL 2005 Express database. While the creation of this Web site would have cost an estimated \$5,810.95, it really only cost the \$20 for the domain subscription. Trail Search has fulfilled all of the Design Freeze deliverables, and has been tested to make sure it works as it was intended to.

7.2 Recommendations

While working on the Trail Search Web site, I have faced many challenges. Discovering how to connect ASP.NET to a SQL database properly took a great deal of time. The first time, I was putting the connection string in the code itself whenever I wanted to connect to the database. I soon found out a better way to do this. Putting the connection string in the Web.config file is a much more efficient way. I had many hurdles in my advanced searching form. The existence of NULL values set my progress back a few weeks. I found that if a trail did not have every single column of data filled

with information, it would never show up in the list of trails. To work around this I had to create a series of if then statements.

The ability for users to submit trails into a database took a lot of research. At first I had the form directly enter data into the database when hikers hit submit. I soon found out that this is very unsecure. This allows a hacker the ability to enter a SQL command into the text box that could potentially delete my entire database. This ability is called SQL injection. I soon created stored procedures and entered data into the stored procedures using parameters. However, if hikers entered invalid data into a text box, the Web site would crash. To fix this problem, I inserted try catch statements into the code which would return an error to hikers if they entered invalid data. Hikers were still able to crash the Web page if they entered a "<". This is because ASP.NET by default protects the Web site from data entered that could alter it in an unwanted way. Hikers would be able to submit ASP.NET code to the server inside the <% %> symbols. This code could be dangerous to the Web site. In order to fix this, I had the code convert every "<" into a ".". However, this still did not fix the problem. I found that I had to edit the web.config file to disable the feature mentioned above. Removing this feature fixed the previous errors, but hikers could still crash the Web page if they typed more characters into a text box than the parameter allowed. This was easy to fix, I just limited the amount of characters each text box was allowed to contain.

Submitting files to the Web server was another deliverable that was harder than it looked. First, I had hikers submitting the file to a table in the database. This worked fine, but I found that SQL stores file as binary data which you can not access without writing a program to. This is not how I wanted the use case to work, so I edited the code to submit

the file to a folder on the Web server's hard drive. After figuring out the permissions issues, this finally worked.

The comments deliverable was perhaps the hardest to solve. At the time when I created the comments use case, around 60 park pages already existed. I wanted a comments section on each of these park pages, and future park pages as well. I did not want to have to create a page inside Visual Studio 2003 .NET for every park in the Web site. I asked many people for ways to solve this problem. In the end, I found a way to solve this on my own. To work around this, I added the forms to the bottom of each park page, and pointed every park page to the same code behind page. This way it was a simple job of copying and pasting into each park Web page.

Testing was a very important part of designing Trail Search. If I tried to test everything myself, there would be many ways to crash the Web site, and it would be very confusing. Asking fellow students to test the Web site found the errors in my coding quickly, and effectively.

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