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1. USER FUNCTIONALITY

We have two different users for “CoreAccess”. Main users are PDA users who run application from a PDA connected to GPS and internet. However, some PDA users may not have GPS receivers. For this reason, we have added extra positioning methods which are explained in detail in the following part. Second group of users are internet users. Since our server application will serve the information via web services, this will not bring us any additional load. All we have to is designing a web page which calls our web services, then internet users can also benefit from our GIS application. The only difference is, internet user does not have GPS receiver. There is not any other difference between the functionalities of PDA user and internet user. The functionalities of users are explained in detail in the following sections.

- **Select Positioning Method:** This is the first step of our application. Before making any queries, we have to know the position of the user. User has four choices for determining his/her position. First one is determining user’s global position “via GPS receiver”, second one is “via entering address keyword”, third one is “via browsing on map” and the last one is “via manually entering global position”. We serve any kind of possibilities for positioning, because main purpose of our application depends on global position of user. In some cases user may not have GPS receiver, so other alternatives are important also.



Figure 1: Select Positioning Method

The details of these methods are:

- **Via GPS Receiver:** This is the first option. If user has a GPS receiver connected to PDA, then this option is enabled. GPS serves the most accurate positioning information among our other positioning methods. The only thing that user has to do is selecting this option. Then NMEA 01803 strings will be read from the serial port, \$GPRMC sentences, which are the “recommended minimum” sentences that contain longitude, latitude and altitude information (detailed information can be found in our GPS research report), will be interpreted by our GPS string interpreter class. Once this option is selected, user’s position will be updated automatically in specific time intervals like 10 seconds. Additionally, this is the only option that web users are unable to select.
- **Via Address Keyword:** This option is added by the advice of our instructors and we believe it is very crucial. When user does not have a GPS receiver, (s)he can enter some keywords which may be consisting of streets, avenues, towns, etc. Then search query is sent to server and vector map of that place is shown to user. For example, user may enter “100.yıl Pazarı” or “Necatibey Caddesi”, then a map with its center having the found place is returned to user. User can now easily determine his/her exact position by browsing on the map, navigating, zooming in and out. All properties of map menu are available to user at that time. This is the best option for web users also.
- **Via Browsing on Map:** In fact, this option is similar to the previous one. The only difference is, now user does not specify any address keyword. When this option is selected, city map of Ankara for example is displayed to user. Then the user is able to determine his/her exact position by browsing on the map, navigating, zooming in and out. Again, all properties of map menu are available to user at that time. This option is also beneficial for web users. When user decides a point on the map, the latitude and longitude information of that point is determined and sent to server as the global position of user.
- **Via Manually Entering Global Position:** This is the last option and its main purpose is to meet our testing demands when we don’t have GPS receiver, in fact. However there may be some users who are sure about their latitudes and longitudes especially by the help of observing Google Earth in these days. We can not claim that this option is helpful to users in general, so maybe we will hide this property in the final release of our product. Its working mechanism is very easy, user only fills in the latitude and longitude text fields. Then this information is sent to server as global position of the user.
- **Search Activity:** User’s global position is taken, now the search menu appears to the user. The application area of our project is social activities. These activities are cinema, theatre, music and sport. There are three different search options in this menu. First one is “search by category” option, second is “search by attributes” option and the last one is “search by browsing map” option. The results of all these three options are identical, they will return a result list. This is very important for modular programming. Graphical representation of this situation can be found in our early

State Transition Diagrams. This result list will contain the major identities of found places, which will be explained in the following part.

The details of these three menus are:

- **Search by category:** If user wants to do an activity, but no matter the place, he/she can search for the appropriate places. The only necessity is to determine a category name between the cinema, theatre, music and sport categories. In fact, this option is for users who do not have any idea about what to do. For this reason, user may want to see the social activities around him. For instance, if a user in METU campus decides to go to cinema and select “cinema” category in this menu, our application will find the nearest cinemas around him. Results for this example may be first METU cinema (U3), then Bilkent and finally Tüze Armada. Moreover, he/she can view from the map.

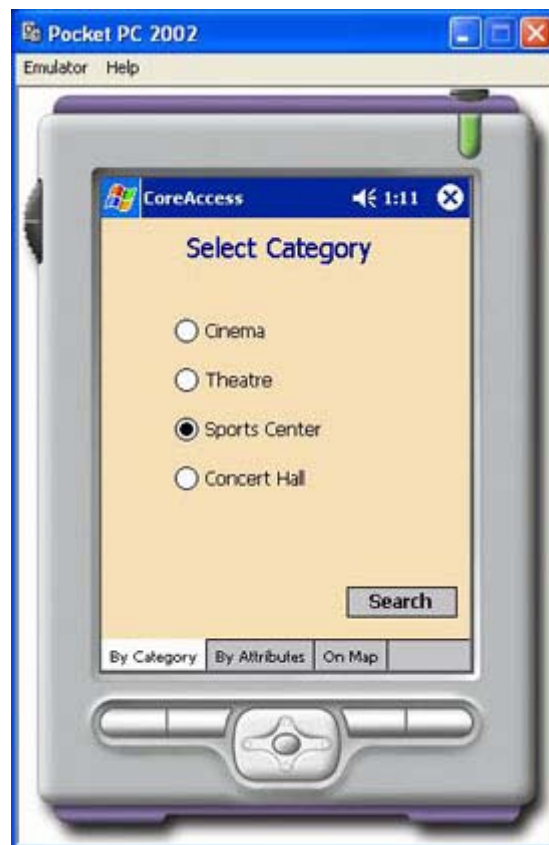


Figure 2: Search by Category

- **Search by attributes:** This option is for users who have at least some idea about what to do. User is able to enter his criterias for the activity he/she wants to do. These criterias may be;
 - Activity name,
 - Activity place,
 - Activity category,
 - Let activity date between preferred dates.

User is able to specify none, one or many of these criterias. The number of entered criterias increases the detail level of search. Then, according to entered criterias, search is successfully done and results are shown to user as a list sorted according to smallest distance value.

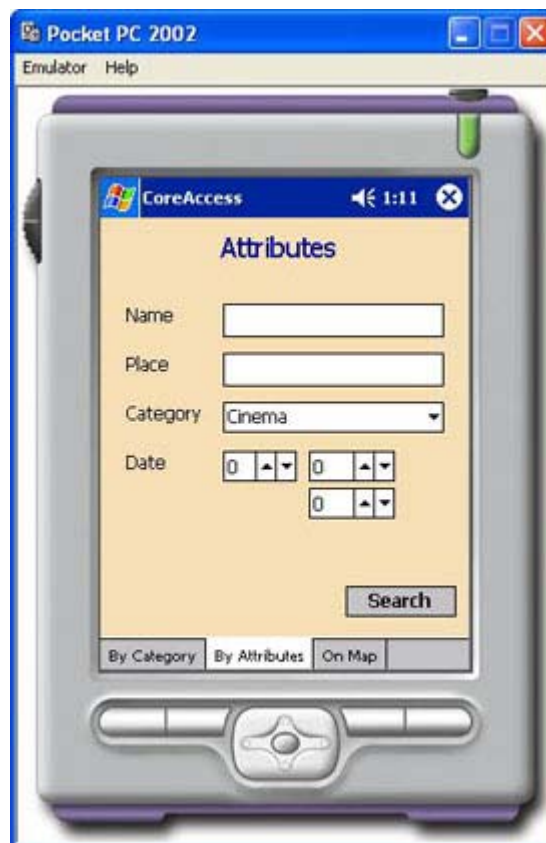


Figure 3: Search by Attributes

- **Search by browsing map:** This option is for users who do not want to use text based menus for searching. In this menu, according to users' global position, local map is shown to user. His position is signed on the map. He can browse, zoom in/out, rotate map and select the activity place. Visible activity places may vary according to zoom level of the map. After deciding on the activity place from the map, following options will be the same as previous search methods.

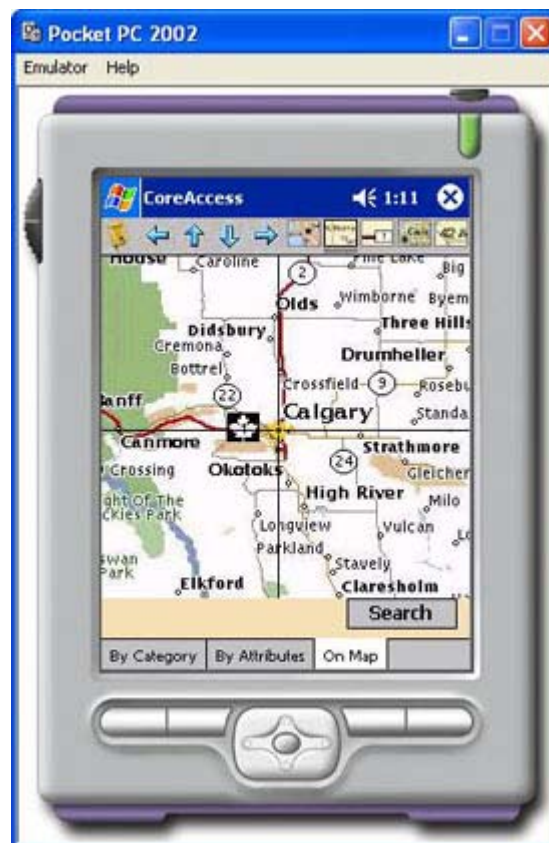


Figure 4: Search on Map

- **Select from Result List:** All three search options mentioned above come to this menu. The results are displayed to user as a list sorted from nearest to furthest. There may be more than one result, on the other side search may return empty list if even our ontology definitions fail to find a result. The activities and places are listed with their keywords in this menu. User can select one or more items from this menu. Next, he has two options on the selected items. User can either see the details of the activity and place in written form or see the places on the map. The details of these menus are explained in the following sentences.



Figure 5: Result List

- **Display Written Details:** This menu shows the details of the selected activity or place. The written details in this menu include:
 - Activity name,
 - Activity place,
 - Activity date and time,
 - Activity place's address and phone,
 - Extra properties of the place like having parking place, children playground, etc,
 - Link to transportation options.



Figure 6: Written Details

User can easily go back to returned results menu and display another item's details. Transportation options are not shown automatically because user may not want to see them. Therefore, there is a link for transportation options in this menu. If user selects it, then transportation menu will appear.

- **Transportation Menu:** This menu is a sub menu of “display written details” menu because it is an optional menu. If user selects it, the transportation options between the user's global position and activity place's global position will be shown to user. This menu has both written part and visual part which consists of the shortest path displayed on vector map. The written part includes the followings for the selected transportation option:

- Names of the vehicles (since there may be combination of vehicles as a result),
- Vehicle information (for ex: 132: ODTU – Kızılay),
- Estimated distance,
- Estimated time (for the work hours, this variable may be treated differently),
- Cost of the vehicle combination.

The transportation methods mentioned here may be “bus”, “dolmuş”, “metro”, “tramway”, “taxi” and finally “on foot”. We have the path of each transportation method in our database. There may be cases when there is more than one possible way to reach activity place, or there may not be any public transportation vehicles available at that time to desired place and taxi would be the only solution. For all cases, “taxi” is the final option in CoreAccess.

Secondly, as we have mentioned above, user is able to see the combination of vehicles on the map. This time, shortest path for the selected combination will be drawn on vector map. For finding shortest paths, we will use efficient shortest path and graph algorithms. Again, user is able to do all the functionalities of map menu like zooming in / out, navigating, etc. Moreover, the distance of the paths may be shown on the map. This is a good option for comparing the distances of the paths. With the help of this property, user can manage his time efficiently. In the same manner as previous “Display Distance” option, estimated time and cost values may be shown on the map also. This property will increase the time and cost efficiency of the user’s choice.

- **Display Items on Map:** This menu is second sub menu of “result list” menu. In this menu user is able to see his selections on the map. User may select more than one place in the previous selection menu. On the map, his global position and selected activity places will be shown with a placemark. The paths directed from his global position to activity places will also be drawn in different colors. Furthermore, user can make following operations on the map:
 - **Zoom in/out:** Map can be zoomed in / out.
 - **Rotate:** Map can be rotated either clockwise or counter clockwise.
 - **Browse Map:** User does not have to stick to the result map. He is able to browse the map by going upwards, downwards, left and right.

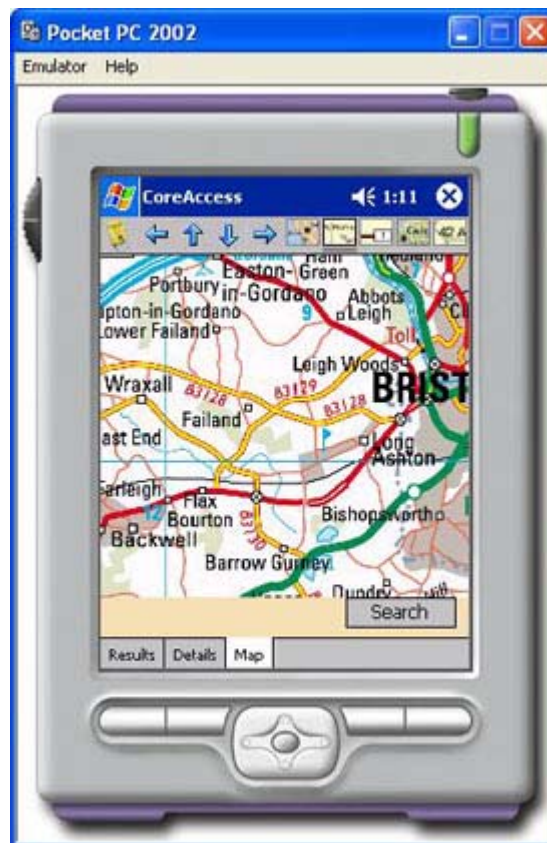


Figure 7: Display Items on Map

User can easily go back to returned results menu and display another item’s details on map.

- **Select Language:** Our user application is multilingual. This is a very easy thing to do in fact, we don't expect a locale problem.



Figure 8: Select Language

2. CONTENT MANAGER FUNCTIONALITY

The duty of content manager is to change the contents of their company's social activities. For instance, the content manager of a cinema can add the new films which are on screen. Content manager may be responsible of managing several places' activities. The followings are the capabilities of the content manager's functions:

- **Login:** A content manager has to login to the system first with his id and password. A content manager may have the ability to modify only one place's activities or a number of places' activities.
- **Add/Modify/Delete Activity:** If new activities are available, content manager has the responsibility to add new activities and move the past activities to history. There may be cases when content manager needs to delete or modify the activity. The properties of the activities need to be entered are:
 - Activity Name
 - Activity Time
 - Activity Place (hall)

- Activity Cost
- Activity Type

The screenshot shows a window titled 'Content Manager Application' with two tabs: 'Activity' and 'Company Info'. The 'Activity' tab is active, displaying a form with the following fields:

- Category:** A dropdown menu with 'Cinema' selected.
- Type:** A dropdown menu with 'Action' selected.
- Name:** A text input field.
- Date:** Three dropdown menus for day, month, and year, showing '15', '15', and '2005' respectively.
- Time:** A text input field.
- Comment:** A large text area for a detailed description.

Figure 9: Managing Activities

- **Add/Modify short description about the activity:** Content manager can add brief information about the activity. Thus, users can have some idea before attending any activity.
- **Add/Modify phone number/address/e-mail address:** Content manager can add or modify those important attributes of the activity place.

The screenshot shows the same 'Content Manager Application' window, but with the 'Company Info' tab active. The form contains the following fields:

- Activity Place Name:** A text input field.
- Address:** A text input field.
- E-Mail:** A text input field.
- Fax:** A text input field.
- Phone:** A text input field.

A 'Modify' button is located at the bottom right of the form area.

Figure 10: Managing Company Info

3. SYSTEM ADMINISTRATOR FUNCTIONALITY

System Administrator has the highest level rights. He is able to do anything that user and content manager can do. Apart from those rights, he is responsible for uploading map data, ontology information, determining the relation between instances in the ontology. Functionalities of system administrator are explained below extensively:

- **Login:** In order to accomplish main activities, system administrator has to login to the system for security. This feature enables the protection of database contents of the application. Only system administrator has the right to modify and add the contents of the ontology and map data.
- **Upload/Delete/Modify Map:** In this functionality, system administrator can upload map, delete map, modify map. Some new areas that were not in the coverage area of CoreAccess can be added to extend the coverage area. In the same manner, some areas may be discarded or modified.



Figure 11: Admin - Manage Map

- **Add/Modify/Delete Node:** Nodes are very important in CoreAccess. All maps are processed as connected nodes. Activity places are special nodes. Apart from activity places, there are lots of nodes to describe roads. Vehicles' paths are constructed by series of connected nodes. As a result, its system administrator's responsibility to manage all nodes.
- **Add/Modify/Delete Vehicle:** System administrator can add, modify or delete a vehicle. As explained in the previous part, vehicles' paths are defined by connected nodes. System administrator can change the path of the vehicle by adding new nodes

or removing existing nodes. Moreover, system administrator can manage the type (which may be one of “bus”, “dolmuş”, “metro”, “tramway” or “taxi”), time_divider and cost_multiplier of the vehicle. time_divider and cost_multiplier are vehicle specific properties. These allow the system to estimate cost and duration of a path for selected transportation method.

The screenshot shows the 'CoreAccess Admin Application' window. On the left is a sidebar menu with options: Map, Ontology, Activity Place, Vehicle (selected), Content Manager, Help, and Logs. The main area is titled 'Vehicle' and contains the following fields: 'Vehicle Type' (a dropdown menu set to 'Bus'), 'Vehicle No' (a text input field), 'Vehicle Speed' (a text input field followed by 'km/h'), 'City' (a dropdown menu set to 'Ankara'), and 'Region' (a dropdown menu set to 'Bahçeli'). To the right of these fields is a 'Determine Path' button. Below the input fields is a section labeled 'Vehicle Path:' containing a map of a coastal area with various locations marked, including Portishead, West Hill, Redcliff Bay, Weston, Clapton-in-Gordano, Portbury, Easton-G, and Shirehampton. A red line indicates a path on the map. To the right of the map is a 'Save' button.

Figure 12: Admin - Manage Vehicle

- **Define/Modify/Delete Ontology:** System administrator can define different ontologies for activities, especially for movies and plays.

CoreAccess Admin Application

Map
Ontology
Activity Place
Vehicle
Content Manager
Help
Logs

Ontology

Ontology Type

Browse...

ADD

Figure 13: Admin - Manage Ontology

- **Add/Modify/Delete Activity Places:** Content manager can manage activities but its system administrator's responsibility to manage activity places. The attributes that have to be filled are name, address, phone number, e-mail address, Global Position and Node of the activity place.

CoreAccess Admin Application

Map
Ontology
Activity Place
Vehicle
Content Manager
Help
Logs

Activity Place

Name:

Adress

Phone

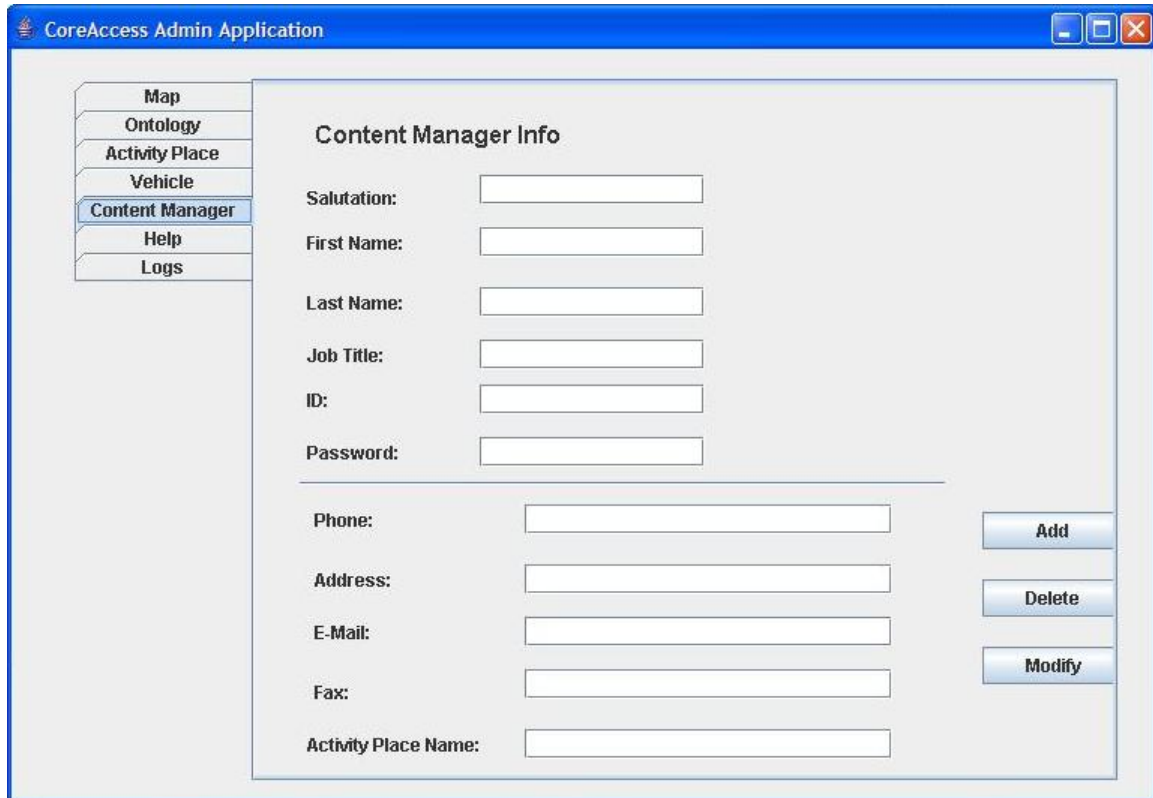
Latitude Longitude

Label

ADD MODIFY DELETE

Figure 14: Admin - Manage Activity Place

- **Manage Content Managers:** Its system administrator's responsibility to add new content managers or delete old ones. System administrator gives user id and password to content managers and defines their abilities. Therefore, content managers have limited right to access and modify the database elements.



The screenshot shows the 'CoreAccess Admin Application' window. On the left is a vertical menu with options: Map, Ontology, Activity Place, Vehicle, Content Manager (highlighted), Help, and Logs. The main area is titled 'Content Manager Info' and contains a form with the following fields: Salutation, First Name, Last Name, Job Title, ID, Password, Phone, Address, E-Mail, Fax, and Activity Place Name. To the right of the form are three buttons: 'Add', 'Delete', and 'Modify'.

Figure 15: Admin - Manage Content Managers

- **View Logs/History:** One of the most usable properties of CoreAccess is logging. CoreAccess logs all of the user activities. When user makes a search or requests details of any activity/place, CoreAccess stores this information to database. The attributes of the logs are: user ip, global position of the user, time and date, search details, requested activity's details, etc. System administrator is able to see and print these logs any time. By this way, statistical data will be taken and managers and companies will be informed about the usage statistics.

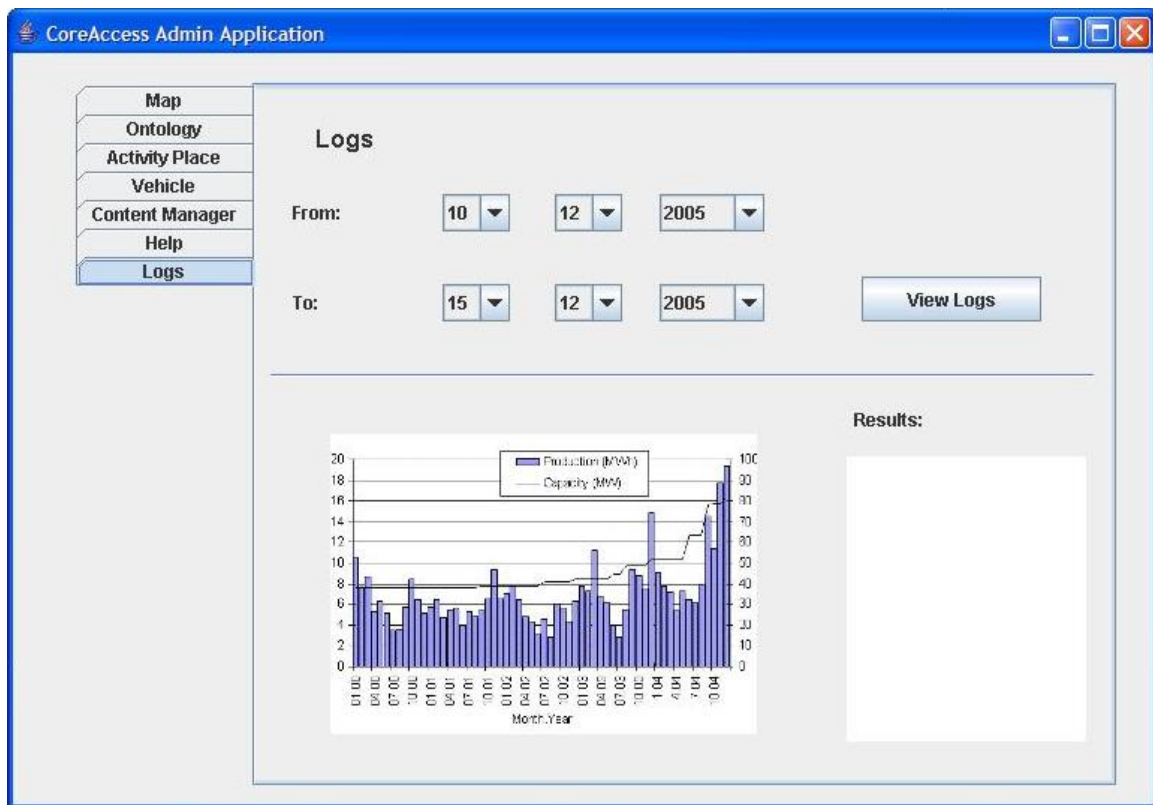


Figure 16: Admin - View Logs

- **Help Menu:** All applications should have a help menu, so this is for the administrator.

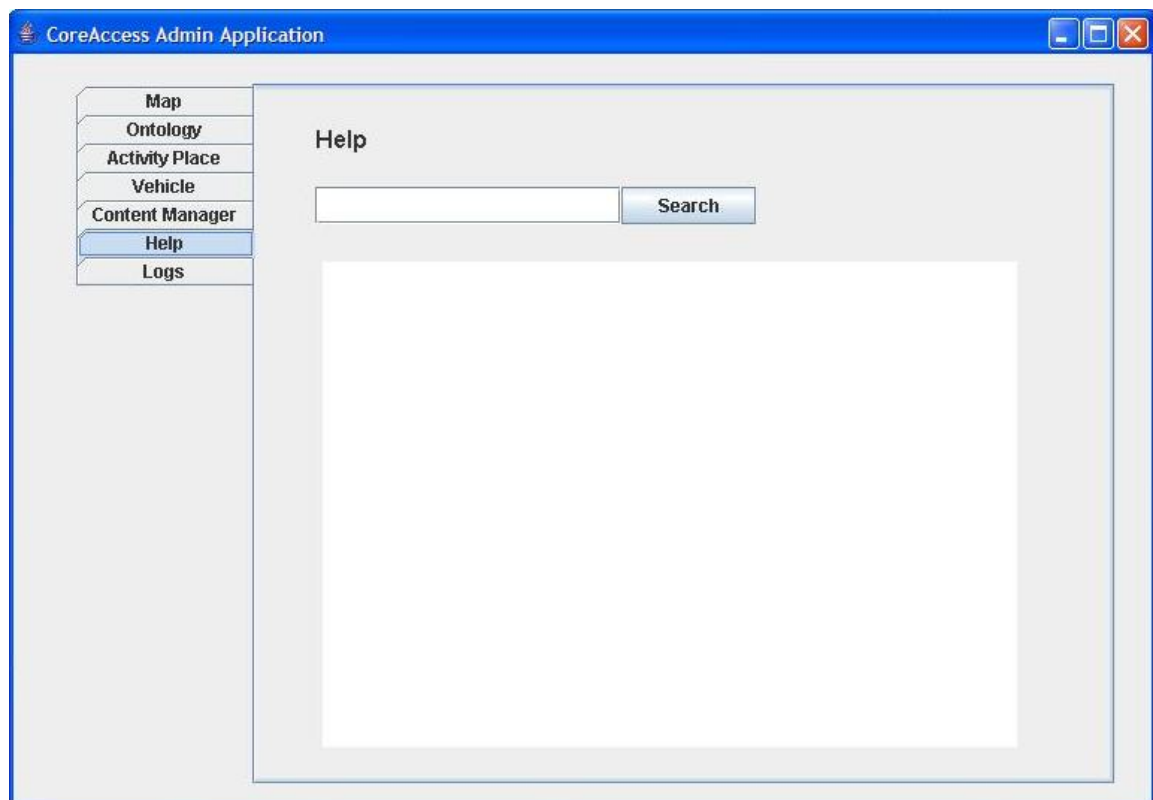


Figure 17: Admin - Help Menu