Final Report

of Miami-Dade Bicycle Route Planning Project

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Purpose of the Project:

To develop a Web-based route planning system that allows cyclists to compute and visualize a bicycle route in Miami-Dade county under consideration of travel distance, travel time and route complexity.

Proposed Tasks and Progress Report:

TASK 1: Compile and process geo-spatial data layers provided by Miami Dade County, and create a Geo-database

Completed actions:

1) Meet with the Bicycle Pedestrian Coordinator from Miami Dade MPO. Discussed Web page layout, layer content and logo.
2) Update route planner Geodatabase with most current Navteq street data, turn restriction tables, and traffic light information (2nd quarter 2010).

TASK 2: Build a Web interface in an interactive ArcGIS Server Web mapping application that publishes the data layers from the geodatabase on the Web

Completed actions:

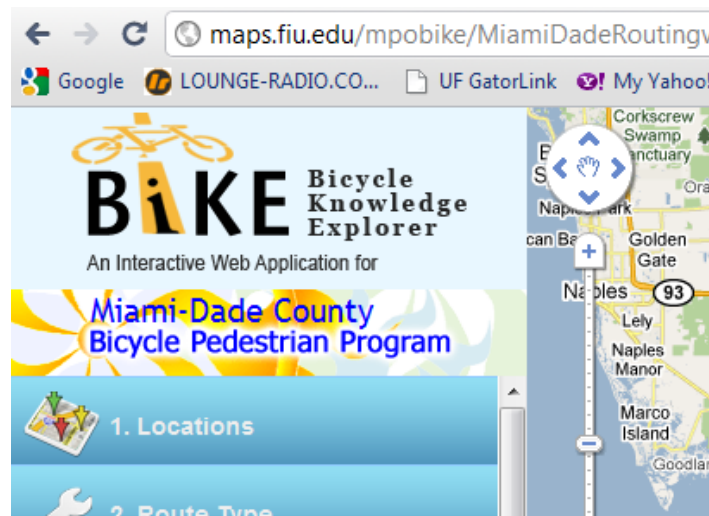1) Design a logo for Miami-Dade County bicycle route planner, integrate into Miami Dade BiKE Web page (Figure 1).

Figure 1:Bicycle route planner logo

TASK 3: Develop a customized route planning tool that provides location selector, route optimization for various search criteria, route mapping, and route directions.

Completed actions:

1) Use Google AJAX Search API to add local search capabilities in search for address locations and points of interest for setting trip origin, destination, and intermediate waypoints;
2) Implement a locator tool for selection of trip origin, trip destination, and intermediate waypoints via mouse click on the map (Figure 2);
3) Use Google Maps API to embed Google maps (streets, Aerials and Hybrid base maps) in the background of the route planner application (Figure 3);
4) Implement a guided interactive menu that allows the user to a) select trip origin and destination, b) select a route optimization criterion, c) browse the route directions, d) view the search result on the map;
5) Publish the route search algorithm as a Geoservice on the FIU GIS Center server cluster to make the routing available to Web users. The Web based route search finds shortest route, fastest route, and simplest route under inclusion of one-way and turn restrictions. Search allows defining moderate travel speed (10mph) or fast travel speed (20mph) (see Figure 4-Figure 7);
6) Provide a function that allows to download a route in a GPS readable file format (.gpx).
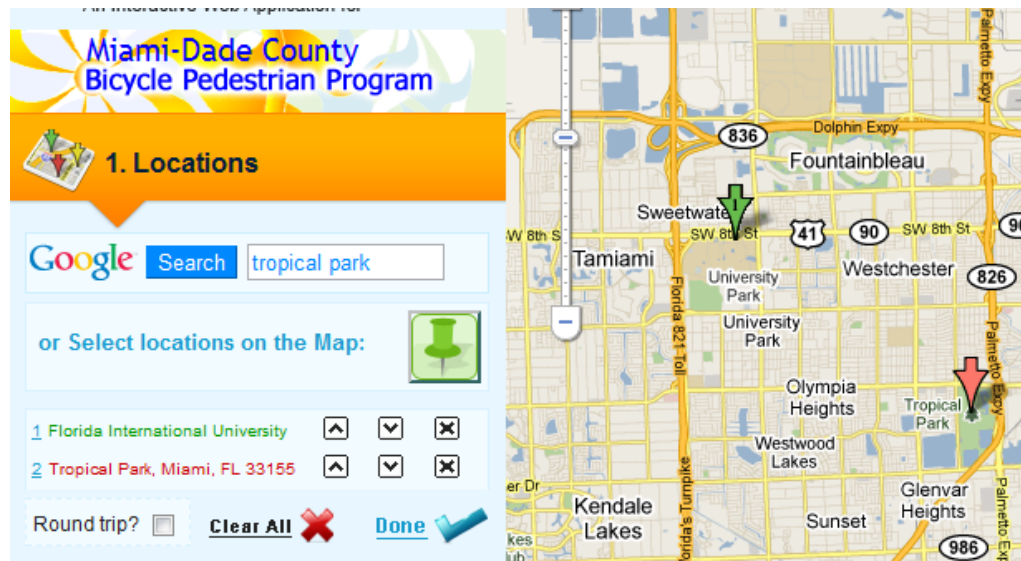
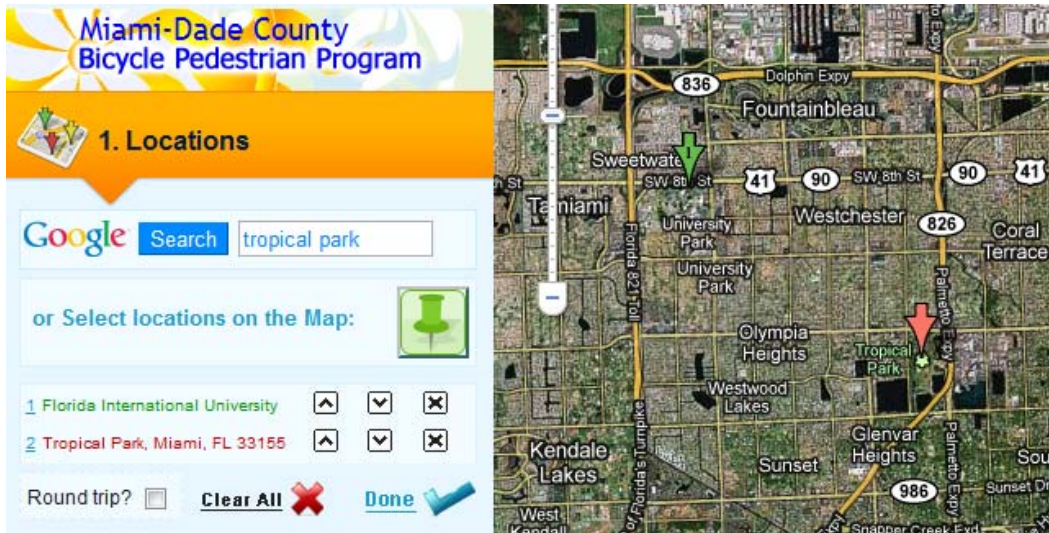**Figure 2**:Selecting trip origin and destination through address field or pin on the map

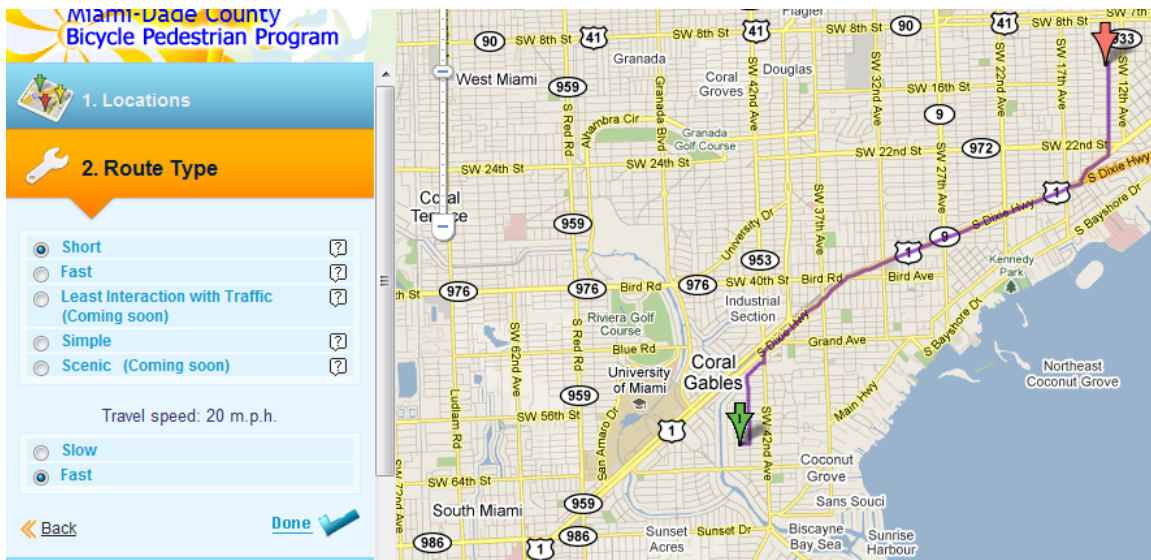**Figure 3**:Selection of different background maps; here: hybrid

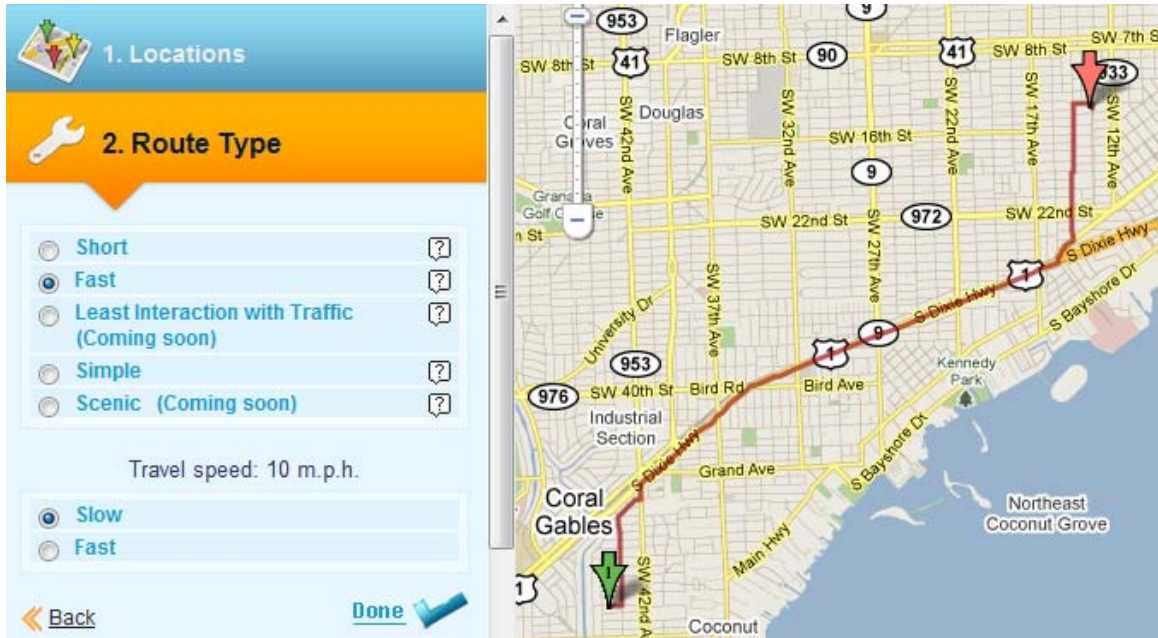**Figure 4**:Search result for shortest route

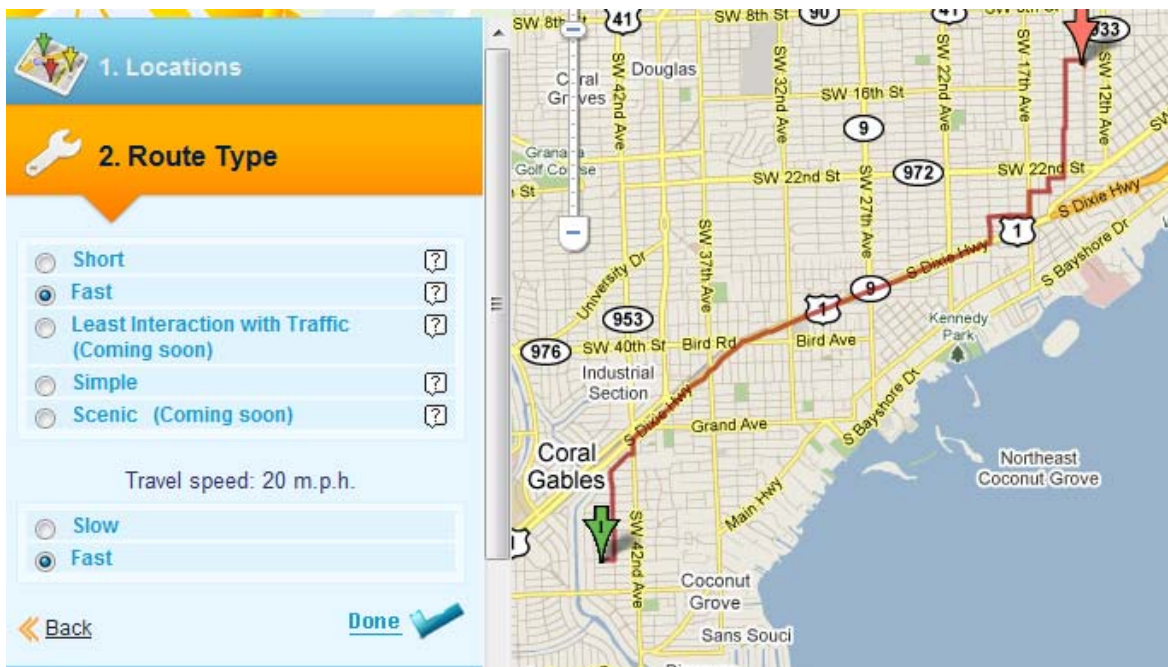**Figure 5**:Search result for fastest route with selected travel speed of 10 mph

Figure 6:Search result for fastest route with selected travel speed of 20 mph
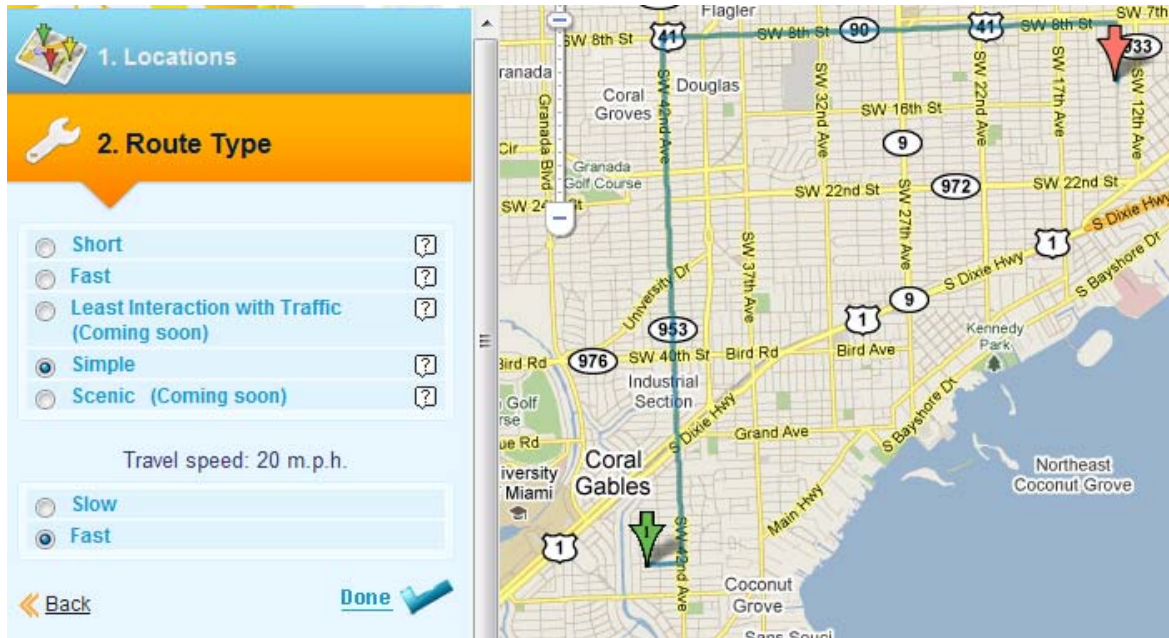
Figure 7:Search result for simplest route

Following **cost functions** have been implemented for the different route options, which are minimized during a route search:

shortest path: Cost [m]= sum of all arc lengths

simplest path: Cost [unitless] = sum of all turns + (sum of all arc lengths [m]) /4000

fastest route with 10mph speed selected:
Cost [min]= (sum of all arc lengths [m])/4.4/60 + sum of turntimes+ sum of turns *0.1

fastest route with 20mph speed selected:
Cost [min]= (sum of all arc lengths [m])/8.8/60 + sum of turntimes+ sum of turns *0.1

where turntimes are > 0 for controlled intersections with traffic light when no turn or a left turn is made.

TASK 4: Publish the development route planner and test the performance

Completed actions:
    Set up a production server at FIU GIS server cluster and publish a development route planner for further enhancement and improvement laid out in the future phases. The route planner in its testing stage is accessible through the following link:
    http://maps.fiu.edu/mpobike/MiamiDadeRoutingv2.html

Schedule, tasks and corresponding invoices

Project month (6/01/2010 – 9/30/2010)	1	2	3	4	5	6	7	8	2010
Meet with stakeholders – FIU, UF, Miami Dade GIS, MPO BPAC and bicycle groups and transportation planners						300			
Data compilation and cleaning, geometry alignment, data preparation, Geodatabase setup					$ 12,000				
Setting up Web services for BiKE mapping site; establish network platform; Web page design integration;							$ 1,200		
Launch the first phase BiKE Web mapping site that contains all MPO recommended transportation layers							$ 250		
Street data processing and preparation for routing application					$ 7,000				
Geo-data integration in SDE and ArcGIS Server							$ 1,500		
Implement route search algorithms for five optimized routes including scenic routes, one-way and turn restrictions							$ 2,500		
Launch BiKE as a functioning route planner for testing and future enhancement							$ 250		
Direct Project Total									$25,000
Indirect Cost (calculated at 10%)									$2,500
Project total									**$27,500**