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# Context-Based Customization of Routing Functions for Web GIS Applications

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# Context-Based Customization of Routing Functions for Web GIS Applications

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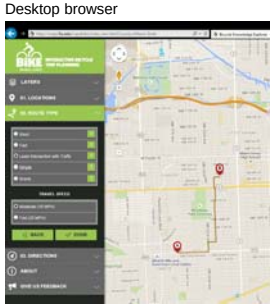
## ABSTRACT

This poster presentation features three route planning applications developed by the Florida International University GIS Center and the Geomatics program at the University of Florida, and outlines their context based differences. The first route planner has been developed for cyclists in three Florida counties, i.e. Miami Dade County, Broward County, and Palm Beach County. The second route planner computes safe pedestrian routes to schools and has been developed for Miami Dade County. The third route planner combines pre-compiled cultural/eco routes and point-to-point route planning for the City of Coral Gables. This poster highlights the differences in design (user interface) and implementation (routing options) between the three route planners as a result of a different application context and target audience.

## BICYCLE ROUTE PLANNER

Project URLs:
http://bikemiami.fiu.edu (Miami-Dade County)
http://bikebroward.fiu.edu/mpobike/ (Broward County)
http://maps.fiu.edu/BIKE_Palm/ (Palm-Beach County)


Desktop browser



Mobile device browser

**Users:**
Recreational, commuter, and sport cyclists

**Routing criteria offered:**
1) shortest, 2) fastest, 3) simplest, 4) least interaction with traffic (i.e. safest), and 5) most scenic.

**User interface:**
- Desktop browser: User input guided through accordion design in the left panel
- Mobile device browser: User input guided through icons on the bottom, with a help screen at start-up; facilitates GPS real-time routing

**Routing:**
- Least cost path with linear weight combination from linear segments and turns.
- Attributes considered in different criteria:
  (1) Distance
  (2) Cycling speed (10mph/20mph)
  (3) Number of turns
  (4) Presence of traffic signal
  (5) Presence of off-road bicycle track
  (6) Lakes, ocean, canals, parks
  (7) Bicycle Level of Service (BLOS), comprising number of lanes, traffic volume, road category, presence of on-road bicycle lanes, and posted speed limit.

**Example: Results for different optimization criteria:**

| Optimization criterion | Distance [m] | Travel time measured at 10 mph [min] | Travel time measured at 20 mph [min] | Turns |
|---|---|---|---|---|
| Shortest | 7804 | 36.7 | 21.9 | 23 |
| Fastest (at 10mph) | 8529 | 34.7 | 18.6 | 21 |
| Fastest (at 20mph) | 8572 | 34.8 | 18.6 | 20 |
| Simplest | 9790 | 42.6 | 24.0 | 4 |
| Most Scenic | 8490 | 36.4 | 20.3 | 6 |
| Least interaction with traffic | 7947 | 38.1 | 23.0 | 18 |

## SCENIC ROUTING AND ECO-CULTURAL TOURS

Project URL: http://maps.fiu.edu/cgm (City of Coral Gables)

3D-historic landmarks

Cultural fountains/pools tour

**Users:**
Pedestrians and cyclists interested in thematic tours of the city

**Routing criteria offered:**
- A selected of pre-compiled tours to (e.g. fountains, landmarks, canopies, churches) put together by local historians to be followed in 3D
- Five routing criteria from bicycle route planner for selected origin/destination

**User interface:**
- A dropdown menu shows historic landmarks that can also be chosen as waypoints, besides address/location search and map pin

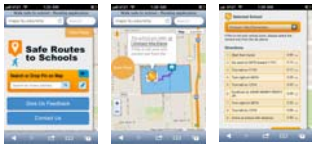
**Data preparation:**
- Create 3D models of historic landmarks
- Digitize suggested thematic routes

## SAFE ROUTES TO SCHOOLS

Project URL: http://maps.fiu.edu/srts/ (Miami-Dade County)

Desktop browser


Mobile device browser




Digitized sidewalks and crosswalks


**Users:**
Walking elementary and middle-school students and their parents

**Routing criteria offered:**
Safest route

**User interface:**
- Desktop browser: User inputs home location through left panel.
- Mobile device browser: User can hide panel to view map. Panel is subdivided into several screens; facilitates GPS real-time routing

**Routing:**
- Least cost path with linear weight combination from linear segments and turns.
- Attributes considered in different criteria:
  (1) Distance
  (2) Presence of sidewalk
  (3) Number of crosswalks per segment
  (4) Presence of traffic signal
  (5) Road category
  (6) Presence of school zone.

**Cost function:**

$$Cost\ distance = \frac{[Segment\ Length]}{1600} * 5280 * 1.3^{2-[Sidewalks]} * 1.5^{1-[OnMajor]} * 1.4^{[MaxCross]-[NumCross]} * 1.6^{1-[InSchool]}$$

**Data preparation:** Digitize sidewalks, crosswalks, school zones, school entrances

## SUMMARY

**Conclusions:**
The three web-based routing applications presented three groups of users (e.g. cyclists, school children, and recreational citizens or tourists and two modes of transportation (e.g. walking, cycling). Criteria of users and modes of transportation determine the data collection, user interface, as well as the routing algorithm.

**Future work:**
- Development of crowd-sourcing functions for users to input qualitative data for eco-cultural tours
- Creation of mobile tools to collect user feedback relating to safe routes to school
- Completion of all k-8 schools in Miami Dade County, Florida

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