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Walk to School Route Planner for Miami Dade County, Florida

Zhaohui Fu

Florida International University, Fujen@fiu.edu

Boguan Guan

Florida International University

Henry Hochmair

University of Florida

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**Safe Routes
to Schools**

Walk to School Route Planner for Miami Dade County, Florida

Zhaohui (Jennifer) Fu

Boguan (Keven) Guan

Florida International University, GIS Center

Dr. Henry Hochmair

University of Florida, Geomatics



Outline

- Project Background
 - Stakeholders and Partners
 - Purpose
- Demo
- Methodology
 - Data Preparation
 - Routing Criteria and algorithm
 - Web solutions (Google Maps API and ArcGIS Server Mesh-up)
- Future work -- validation of safe routes
 - Go Mobile
 - Validation of the network – User feedback
 - Expansion



Outline

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Project Background

- ❖ SRTS is a new federal reimbursement program with the following goals:
 - ❖ encourage children in grades K-8, including those with disabilities, to walk and cycle to school;
 - ❖ make walking and cycling to school safer and more appealing;
 - ❖ facilitate projects that will improve safety and reduce traffic, fuel consumption, and air pollution in the vicinity of schools.
- ❖ Find more information at www.srtsfl.org



Safe Routes to Schools

Project Background – Stakeholders and Partners



Advisory members



Funding agency



Project team



Safe Routes to Schools

Project Background -- Objectives

- An Interactive web application
- Students and parents can enter the location of origin
- Default destination is the designated school within the school boundary of the chosen location
- Dynamically generates the safest route



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Safe Routes to Schools

Live site: <http://maps.fiu.edu/srts/>

ArcGIS Server Data mash up

Search or Drop Pin on Map

Layers

- Basemap
- School Boundaries
- Trailways
- Streets
- Interstates
- Highways
- Water
- Green
- Public School Locations

Dynamic Route Generation

Search or Drop Pin on Map

Selected Home

Selected School

Directions

1. Start from home 0.00 mi
2. Go south on 22ND toward 61ST 0.63 mi
3. Turn left on 56TH 0.06 mi
4. Arrive at school with distance 0.69 mi

Print

The school you selected is: **Clusia Elementary**

If this is not your school and Miami Park Elementary, Broadview Elementary, Anolis Lake Elementary, King Martin I. Elementary, Liberty City Elementary, Grant L.C. Elementary, Holmes Elementary (Temporarily Closed), Drew Charles R. Elementary, Oakland Villa Elementary, The Children's Center, Delrose Elementary, South Lakes Elementary, Apollo, Maya Elementary.

Print Layout

Safe Routes to Schools

Start from home 0.00 mi

Go south on 22ND toward 61ST 0.63 mi

Turn left on 56TH 0.06 mi

Arrive at school with distance 0.69 mi

Map data ©2013 Google



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Methodology – Data Preparation

Data	Source
Street network data	NAVTEQ NAVSTREETS
School locations	Miami Dade School Board
School Boundaries	Miami Dade School Board
Speed Limit	Miami Dade County GIS
Side Walk	Digitized by FIU GIS Lab
Cross Walk	Digitized by FIU GIS Lab
Traffic Lights	Miami Dade County GIS



Methodology – Data Preparation and Processing

- ❖ Sidewalks, Crosswalks – Digitize the sidewalks and crosswalks based on Google Maps and Google Street View.
- ❖ School Entries – Digitize the school entries based on Google Street View.



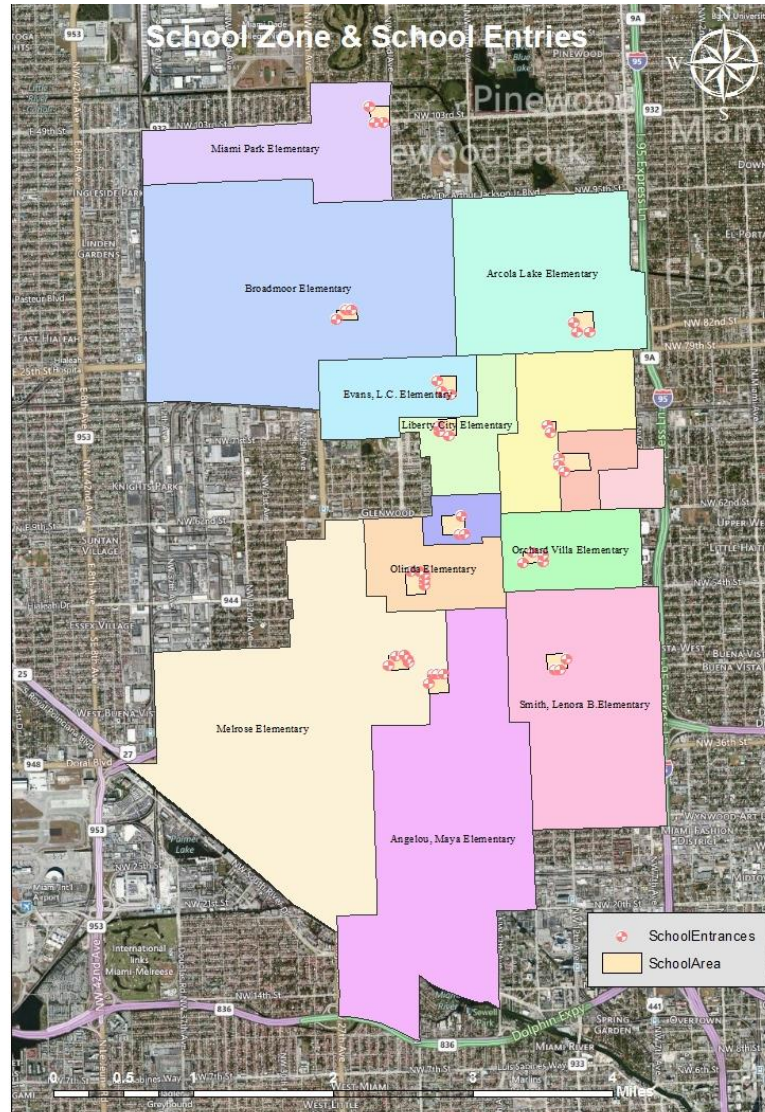
Methodology – Data Preparation and Processing

- ❖ Remove freeway segments from network layer
- ❖ Generate “Cross Point”
- ❖ Convert sidewalks information into an attribute
- ❖ Extract school zone flashing signal
- ❖ Manually adjust the location
- ❖ Remove “fake” junctions
- ❖ School Entries – Digitize the school entries



Safe Routes to Schools

Methodology – Data Preparation and Processing

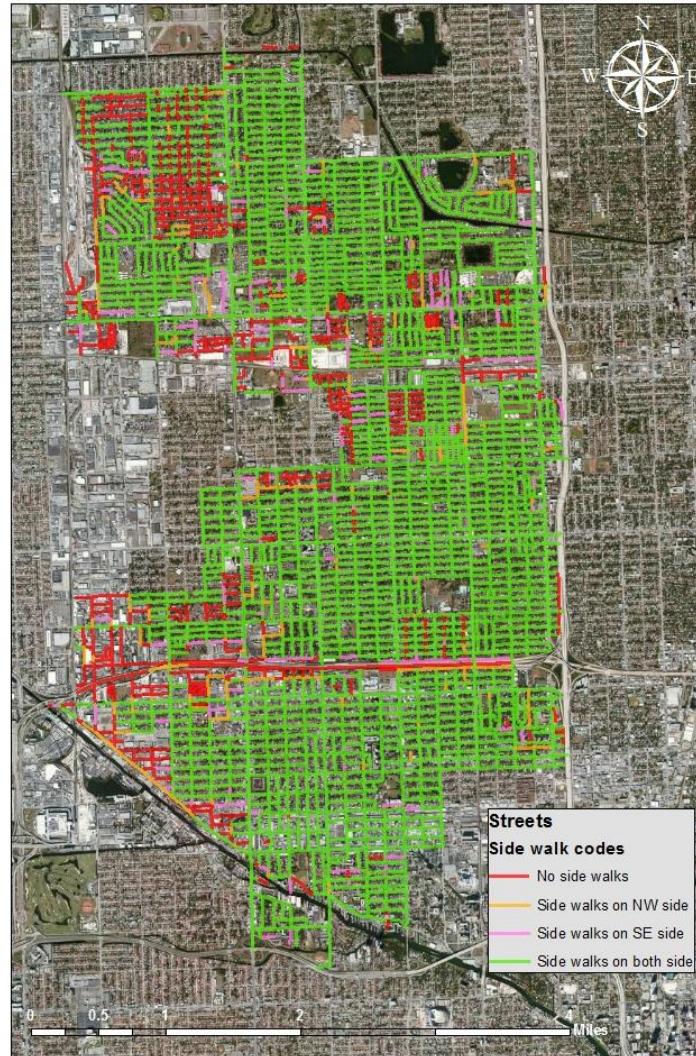




Safe Routes to Schools

Methodology – Data Preparation and Processing

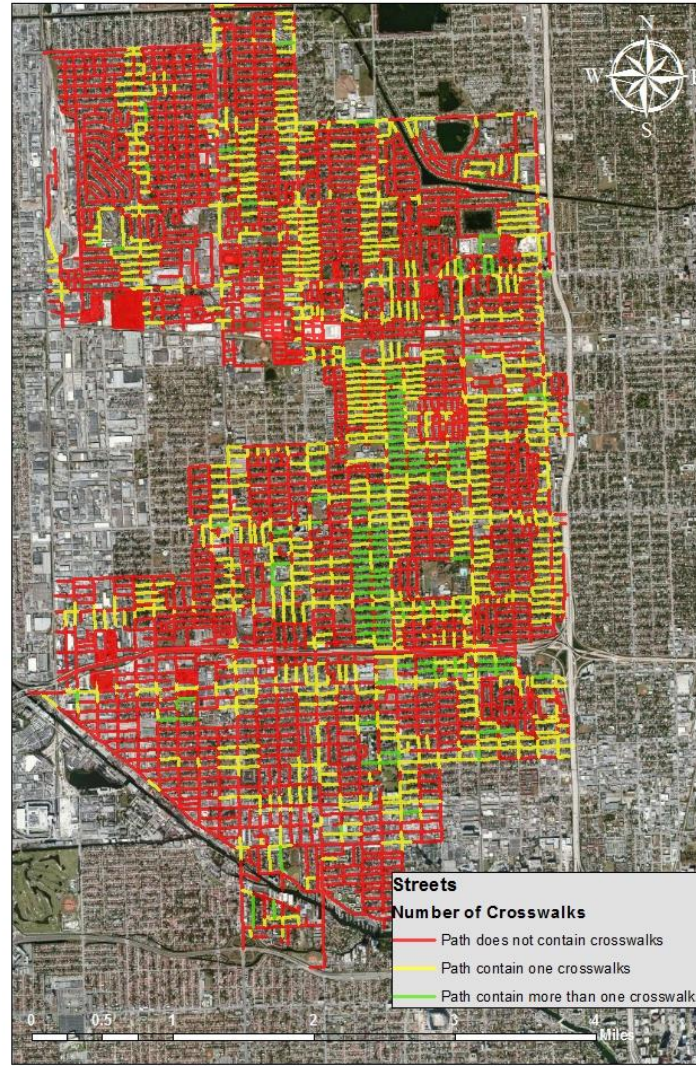
Side walks for the subject 13 school zones





Safe Routes to Schools

Methodology – Data Preparation and Processing Crosswalks for the subject 13 school zones





Methodology – Criteria and algorithm

Network contributors – Two ways to assign the impedance to a route network: Links and junctions

- ❖ **Impedance to the links** - Sidewalk, crosswalk, major street, inside the flashing school zone – the network will be computed as cost distance in feet as follows (Pedestrian travel speed is estimated as 4ft/s as suggested by the Highway Capacity Manual)

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



Safe Routes to Schools

Methodology – Criteria and algorithm

Network contributors – Two ways to assign the impedance to a route network: Links and junctions

- ❖ **Junction without traffic signal**- each junction will add one minute as cost time
- ❖ **Junction with traffic signal** – each traffic signal point adds 0.5 minutes as cost time

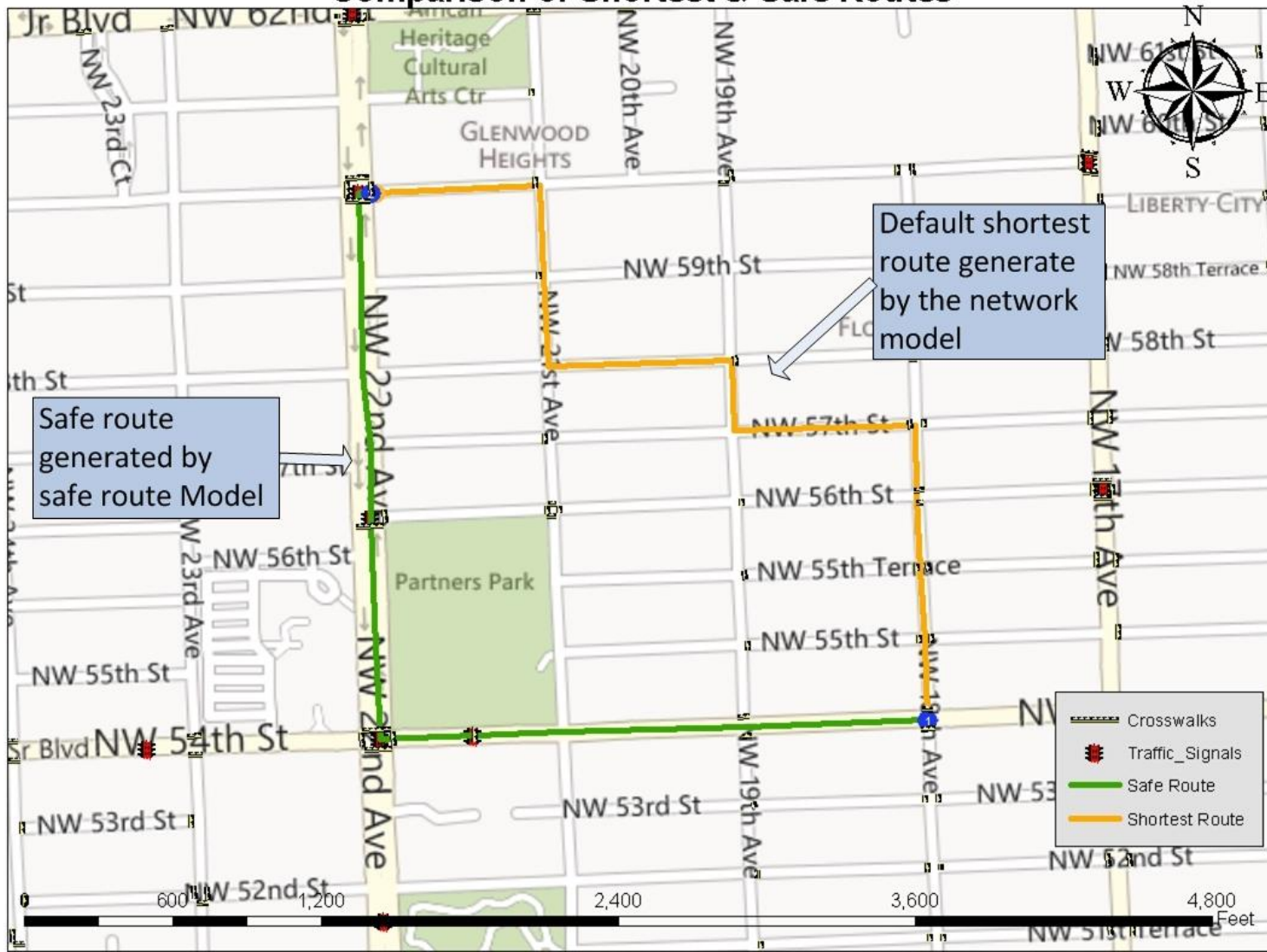
Cost distance = cost time * 4 ft/s



Safe Routes to Schools

Methodology – Criteria and algorithm

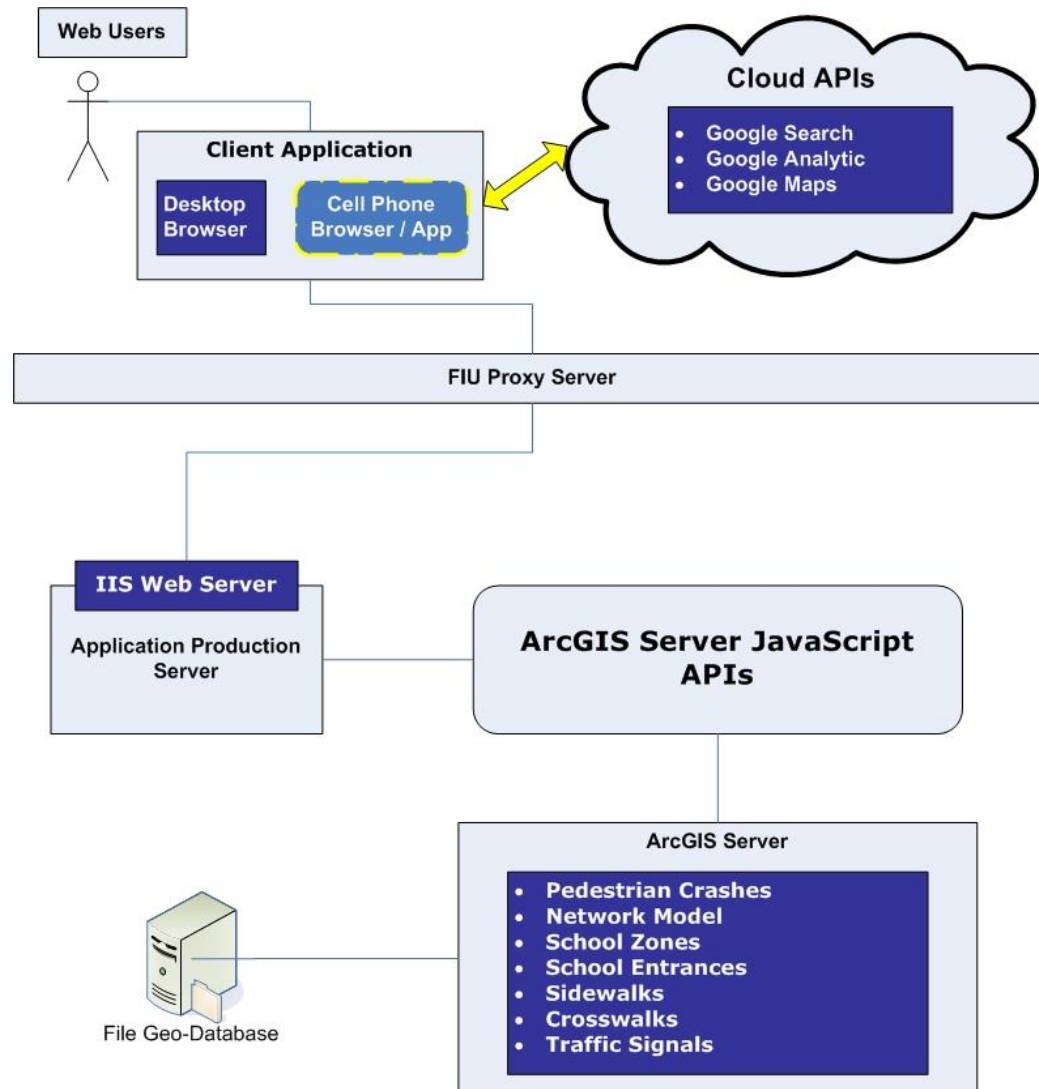
Comparison of Shortest & Safe Routes





Safe Routes to Schools

Methodology – Web Solution





Safe Routes to Schools

Methodology – Web Solution

Safe Routes to Schools

Search or Drop Pin on Map
Click button to add Drop Pin mode

Selected Home
1741 NW 68TH TER, MIAMI, FL, 33147
Click and drag the home icon on the map to re-define your home address.

Selected School
Liberty City Elementary
If this is not your school name, please select the correct one from the list above.

Directions

1 Start from home	0.00 mi
2 Go west on 68TH toward 18TH	0.20 mi
3 Turn right on 18TH	0.45 mi
4 Turn left on 71ST	0.08 mi
5 Arrive at school with distance	0.73 mi

PRINT

Fully enabled Google Search APIs

Simple user interaction interface design for better user experience

Printable map available

The school you selected is Liberty City Elementary
If this is not your school zone, please select the correct one from the list above.

ArcGIS Server integration

1. School Zone layer
2. School Entries
3. Route from network model

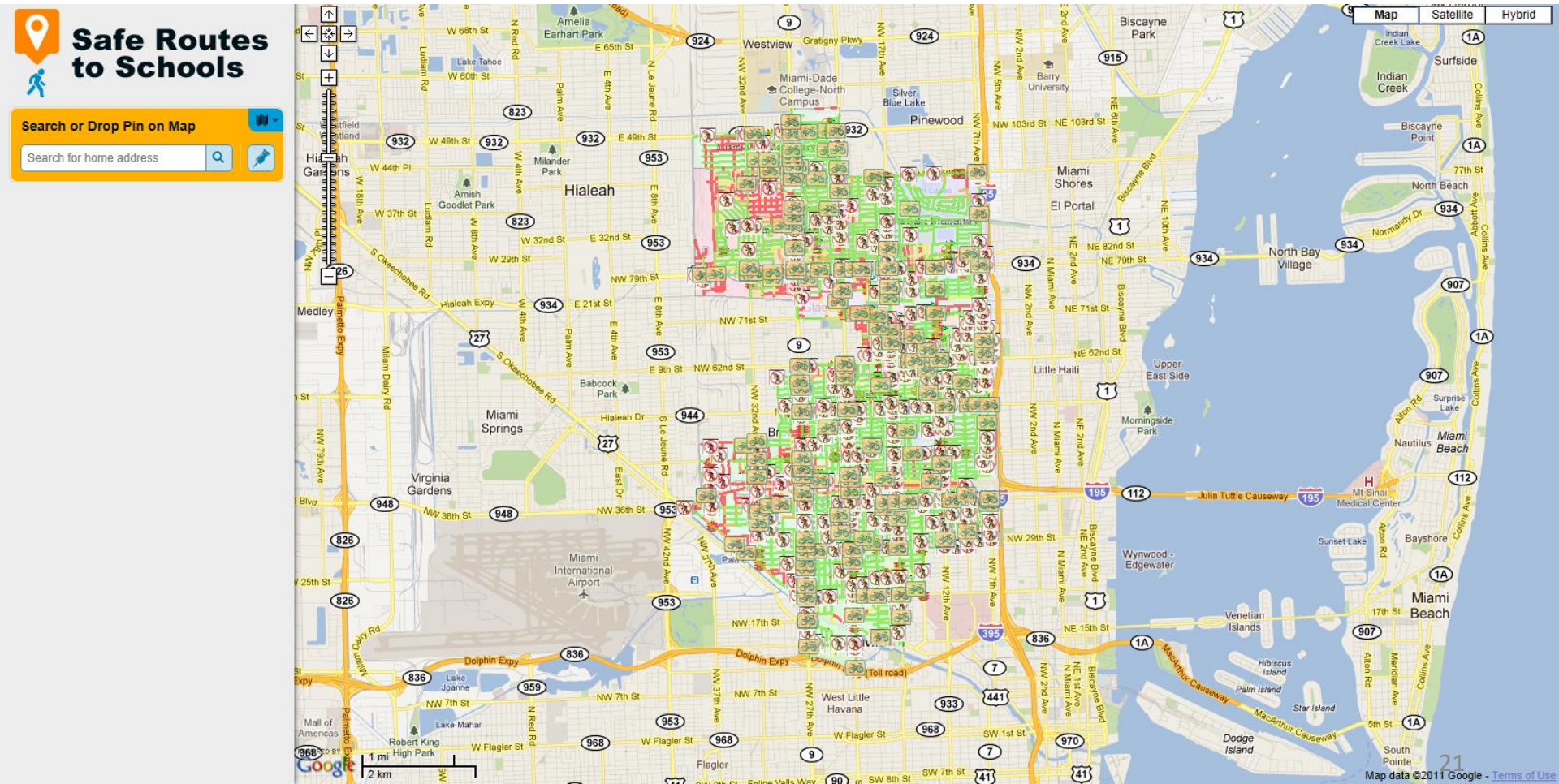
Map | Satellite | Hybrid

Map data ©2013 Google



Safe Routes to Schools

Methodology – ArcGIS Server Integration





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Future Work -- Go Mobile

- ❖ Adapt the user interface of route planner for Web browsers on mobile devices, including side panels, school selection menu, location search box, map window, and routing directions;
- ❖ Convert location selection through mouse-clicks to selection drop pins for the tactile user interface.
- ❖ Pinpoint the user's current location in the map window using the integrated positioning capabilities of the mobile device, such as GPS or WiFi;
- ❖ Provides step-by-step turn instructions along the route in real-time using the user's current location in the network.



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Future work -- User-feedback

- Leverage on the current parent and teacher network and outreach/education platform
- Conduct usability studies of the current Web based Walk to School Route Planner.
- Customized feedback functions for user interface and computed routes.
- Feedback function to report on observed conditions in the network, e.g. poor sidewalk condition

Safe Routes to Schools

Search or Drop Pin on Map
Click button to end Drop Pin mode

Selected Home
1805 NW 53RD ST, MIAMI, FL, 33142
Click and drag the home icon on the map to re-define your home address.

Selected School
Oinda Elementary
If this is not your school zone, please select the correct one from the list above.

Directions	Distance
1 Start from home	0.00 mi
2 Go west on 53RD toward 19TH	0.17 mi
3 Turn right on 19TH	0.12 mi
4 Turn left on 54TH	0.24 mi
5 Turn right on 21ST	0.18 mi
6 Arrive at school with distance:	0.70 mi

PRINT

Crowd Sourcing technology will be adopted to collect the feedback for the network.

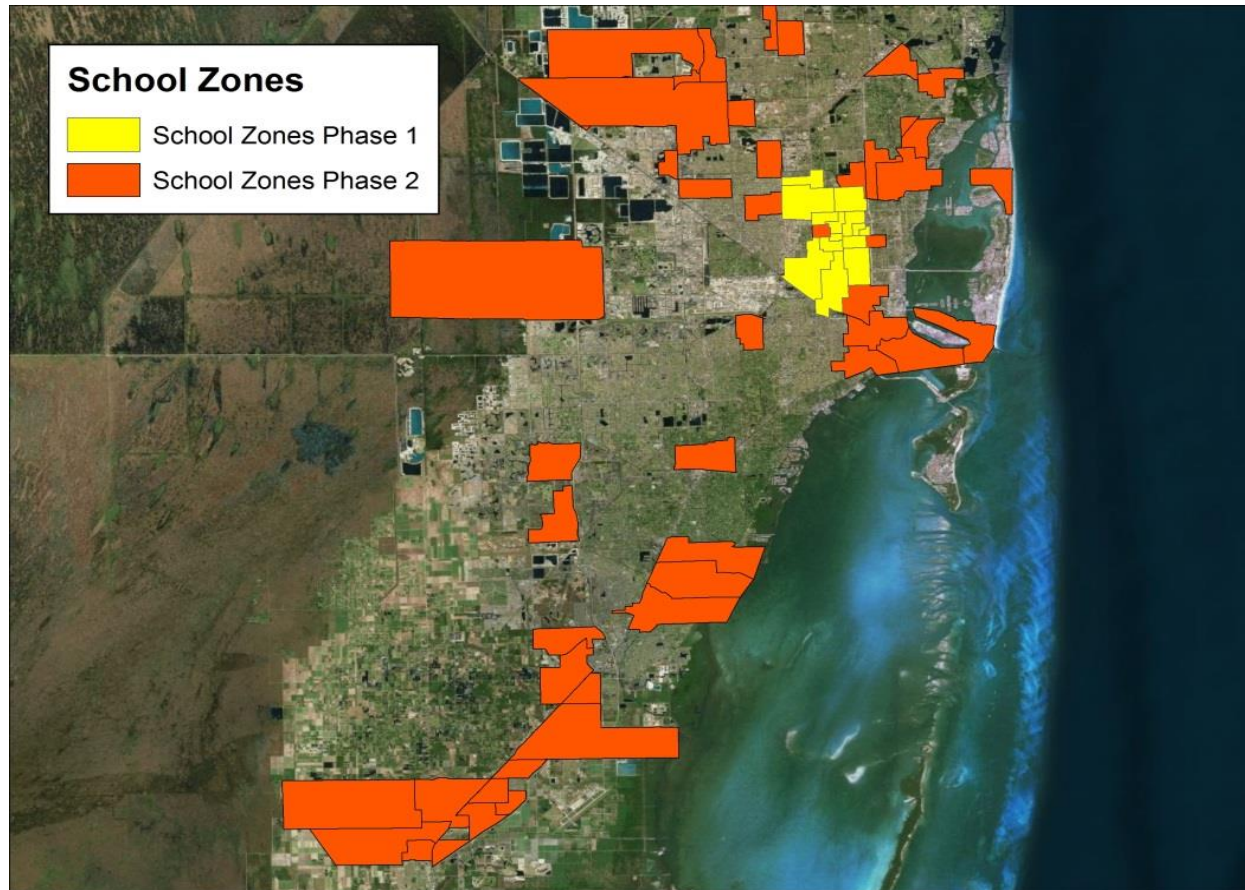
A phone App will be developed for the end user with GPS function. End user will be allowed to take pictures or even video on the field to submit the feedback. If any critical deficiencies on the road have been identified, the path will be marked as a barrier for the network modal so that the deficiencies will be avoided.

Commenting from the web application for the route. The feedback information will be analyzed periodically. Any statistical conclusion will be applied back to the formula.



Future work -- Expansion

Expansion from 13 to 63 school zones





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to Schools**

Thank you!
Any questions?