Extending the Twin Cities Cyclopath Tool to Enable Multimodal Routing

What Was the Need?
In the Twin Cities, all Metro Transit buses and the Blue Line and Northstar Line trains offer free racks so bicyclists can bring their bikes with them on the bus or train. However, information about multimodal routes that combine biking and transit is not widely available. The popular Google Maps route-finding application, for example, provides routes for both bicycling and public transit, but not routes that combine the two.

A multimodal route-finding tool was needed to help bicyclists identify routes that combine multiple types of transportation for journeys that are impractical by bike or bus alone because of length, traffic, roadway design, route limits or other conditions. Cyclopath, a geowiki-based tool operated by the University of Minnesota’s GroupLens Research, provides bicycle-friendly route-finding in the Twin Cities area based on existing maps and user-contributed information. The tool also offers a promising platform for providing multimodal route information. In addition to providing a service requested by cyclists, readily available multimodal route information can help MnDOT achieve its goal of increasing the percentage of trips made by methods other than personal motor vehicles to help reduce traffic congestion and environmental impact.

What Was Our Goal?
The goal of this project was to upgrade Cyclopath to enable multimodal route-finding that includes biking, transit and walking options, and to determine how this extension would enhance the tool. This upgrade should increase the viability of alternative forms of transportation and may encourage their use in journeys where bicycling or busing by itself may not be a practical option.

What Did We Do?
Researchers began by interviewing 10 multimodal transit users to determine their needs for multimodal routing in Cyclopath. To implement multimodal routing, researchers developed a prototype that incorporated the open-source Graphserver multimodal route-finding algorithm into Cyclopath’s algorithm. Graphserver finds the shortest path between two points through linked graphs of the Twin Cities road, bicycle trail, and transit networks and schedules. While Graphserver is written in the C programming language and Cyclopath in Python, Graphserver “wraps” its core functionality in Python so Cyclopath can easily integrate it.

Graphserver lets programmers define variables such as average biking speed, the effect of slopes and the transfer penalty for boarding a bus or train, which are needed to find the shortest route. It also incorporates parameters to fine-tune routes to avoid undesirable roads even if they do provide the shortest path.

Seven frequent cyclists who sometimes use multimodal routes tested the prototype by finding three routes using both Cyclopath and Metro Transit’s route generation tool to
test the new Cyclopath design and identify interface improvements. These users suggested changes, and researchers also observed the tests to see what caused users’ difficulty. Multimodal routing was deployed in the public version of Cyclopath in summer 2011.

What Did We Learn?

Interviews revealed that users wanted:

• A simple process for requesting routes.
• A way to specify the balance between cycling and transit, which researchers achieved by allowing them to specify a maximum cycling distance.
• Rich data about routes, including road conditions, safety for night cycling, and locations of transit stops and bike parking racks. Cyclopath includes a wiki with an active community of users that contributes this type of information, so the quantity of available data will grow over time.

Many users found it difficult to identify the transition between transit and bike route segments on the map. Frequent requests included text or background color changes and a summary that includes information like bus numbers and transfer wait times (which appears on mouse over, but which few users discovered). Additionally, the maximum cycling distance parameter was poorly understood. Most users preferred more cycling to longer waits at bus stops, and researchers adjusted the algorithm to take that into account.

Approximately 15 percent of the 100 to 150 route requests that Cyclopath receives each day of the bicycle riding season are for multimodal routes.

What’s Next?

A MnDOT-funded project is currently under way to expand Cyclopath to include all of Minnesota, with plans to launch it officially in spring 2014 to coincide with the start of biking season. This statewide introduction will include a promotional push; similar promotional efforts in the past have led to both short-term spikes and long-term increases in the tool’s usership. Information about route bikeability and amenities will improve as more users contribute to the system.

Using an iterative process based on user feedback, researchers are working to simplify Cyclopath’s interface and to find solutions to problems identified in user tests. They are also working to add functionality to a mobile app that will integrate the tool across mobile and desktop interfaces.