PERSONALIZED TRANSPORTATION AND MOBILITY AID (PTMA):
ENHANCING ACCESS TO PUBLIC TRANSPORTATION

Addendum to Funding Proposal to Traffic21
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Proposal Summary

The high-level objective of this proposal is to help foster a greater sense of independence in the lives of people with disabilities by providing them with enhanced mobility options that are un-intrusive and socially acceptable. Individuals who have mobility challenges need practical, customized, low-cost, and easily-deployable mobility aids to help them safely navigate urban environments. We propose designing, implementing, testing, and deploying a mobile phone-based personalized transportation and mobility aid (PTMA) to encourage people who lack personal transportation options to safely and independently navigate urban environments, better utilize existing transportation infrastructure, and enhance the overall navigability of the Pittsburgh region. The core idea involves enhancing existing route-planning applications that provide navigational directions from a start location to a goal location to take into account sensory and mobility constraints. Based on personal customization, the route-planning mechanism of the tool will provide the user with the best mobility option to get from point to point. Additionally, the tool also provides options for users to make changes based on their experience in the real world (location of obstacles, landmarks, etc.) and to dynamically re-plan paths. We envision the tool to ultimately be used in both outdoor and indoor environments for tasks varying from point-to-point navigation, emergency evacuation, etc.

Towards ensuring project success, we have established a working relationship with two leading organizations, Western Pennsylvania School for Blind Children (WPSBC) and Blind and Vision Rehabilitation Services of Pittsburgh (BVRS), dedicated to working with people with disabilities in the Pittsburgh region. Both community partners are highly supportive of this research and have conveyed that they see clear potential for its wide acceptance in their communities. The core ideas explored in this project will have far-ranging utility beyond the developed application. Results from the work are expected to have immediate impact on enhancing existing transportation and mobility options. Public policy enhancements are also likely to benefit from this work, especially in the arena of enhancing independent mobility for people with disabilities. The project fits with the Traffic21 Initiative, whose goal is to stimulate a broad community partnership to deploy "intelligent transportation system" advancements to Pittsburgh's transportation system. Finally, in line with the White House objective on using technology to enhance the lives of people with disabilities, the work will also contribute to the efforts to promote Pittsburgh as an internationally-recognized location that employs technology to help people with disabilities to achieve a better standard of living.

Current Status:

All of the short-term objectives we proposed except the outdoor navigation component have now been accomplished at some level:

- Enhanced route-planning customized to the individual while accounting for sensory constraints for test users
- Effective use of existing intelligent transportations infrastructure and the inertial measurement unit on the smart phone
- Multi-modal interactive interface for test users
- Pilot deployment in controlled environments in and around CMU

The pilot deployment was focused on improving mobility options for the users of our community partner organizations and was tested at Carnegie Mellon University.

Additional deployments planned by February 28, 2013

During our work on this project thus far and especially through the needs assessment and user testing sessions, we realized that we can deploy components of our solution which will be useful on their own and hence have planned the following additional deployments:

- A website that provides indoor navigation information useful to visually impaired people for select buildings in Pittsburgh
  - We will use our PTMA tool to generate this information and provide it via the website so this information is more widely available
- Enabling a regular touch-screen informational display to be navigated by visually impaired people using a smart phone
  - We will use the on-screen gestures developed for our PTMA interface and make these gestures more generally useful
- Long-term mapping of WiFi signal strength which can be used for multiple purposes
  - We will use our WiFi signal strength mapping mechanism developed for localization on the PTMA tool to create longer-term maps at CMU and WPSBC
- User testing of our PTMA interface and route planning components at WPSBC
- Sighted user testing to evaluate the ability of sighted people to give visually impaired users navigational assistance using the PTMA tool

Plan for Spending $50K from Traffic21

Thus far, we have spent a portion of the $50K to support personnel time on the PTMA development and deployment. We plan to spend the remainder of the Traffic21 $50K in the same way until the end of February, 2013. We are very grateful to Traffic21 for allocating this funding to us to enable the development and deployments summarized above. Many visually impaired people in the Pittsburgh area will benefit greatly from this work and it will help us to seed proposals for larger funding grants to enable follow-on work.