Ulster County

Non-Motorized Transportation Plan

Task 4 – Project Identification:
ITS Applications for NMT

May 23, 2007

Task Description

This technical memorandum provides a summary of Intelligent Transportation Systems (ITS) applications for the Ulster County Non-Motorized Transportation (NMT) Plan. The Plan will serve as a guide to the County for identifying and prioritizing NMT projects, and funding, constructing, and maintaining the NMT system. The plan will define a NMT system within Ulster County that will enhance multi-modal transportation, connect urban and rural areas, and increase recreation and conservation opportunities in the County.

The NMT Plan Scope defines this task under Task 4: Project Identification, as follows:

This task will include a section on the use of bicycle and pedestrian Intelligent Transportation Systems (ITS) technology and will identify locations where the implementation of ITS and advanced technology for bicycle and pedestrian safety and mobility could be deployed. This may include the use of audible signals, microwave detectors, countdown signals, automated data counting, surveillance cameras, and other devices to enhance non-motorized transportation safety and mobility.

ITS / NMT Applications

Intelligent Transportation Systems or "ITS" is a broad term describing the application of innovative technologies to improve mobility and safety. While this term, (and the majority of ITS investments in the U.S.) has generally been applied to high-tech information systems to improve conditions for motorists, ITS can have important applications for non-motorized travel.

The USDOT ITS website includes the chart on the right, along with the following text describing ITS applications for pedestrians and bicyclists:

<ITS> Pedestrian safety systems can help protect pedestrians by automatically activating in-pavement lighting to alert drivers as pedestrians enter crosswalks. Other systems include 'countdown' pedestrian traffic signals, and pedestrian detectors that extend the Walk phase for pedestrians needing more time to cross a street.

<ITS> Bicycle warning systems can use detectors and electronic warning signs to identify bicycle traffic and notify drivers when a cyclist is in an upcoming segment of roadway to improve safety on narrow bridges and tunnels.

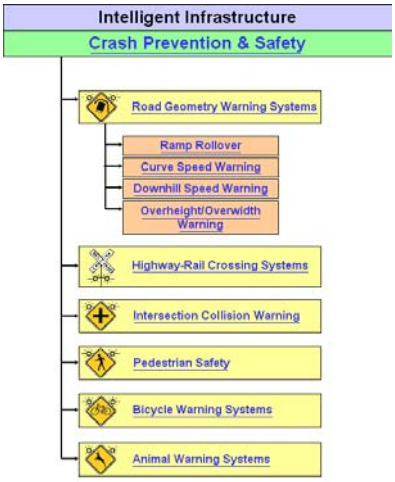


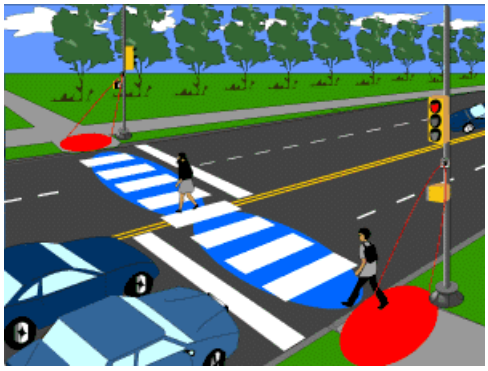
Chart indicating pedestrian and bicycle safety applications within the USDOT ITS program.

Source: www.itsoverview.its.dot.gov/Options

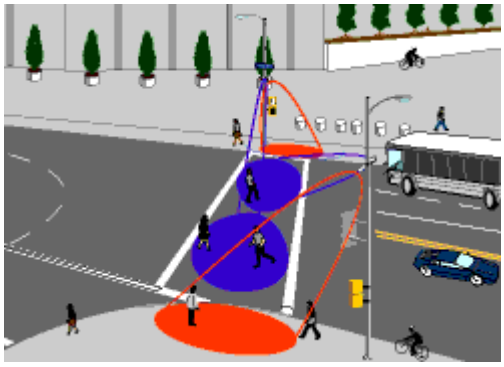
These applications are just a small part of the uses of innovative ITS technologies to improve NMT. The USDOT also created a project called PedSmart, developed by the UNC Highway Safety Research Center, to showcase "*recent developments in hardware and other technologies that offer the potential of improving pedestrian safety and access by addressing specific problems associated with crossing the street. Properly installed and operated, the application of these devices can enhance the traveling environment.*" Specific ITS technologies for pedestrian crossings include the features listed below, which are described in the following graphics from the PedSmart website, www.walkinginfo.org/pedsmart.

Microwave / Infrared Detectors
Count-Down Signals
In-Pavement Lighting
Accessible Signals / Illuminated Pushbuttons

Infrared Detectors: Pedestrians entering the curbside infrared detection zone (shown in red) will activate the pedestrian call feature,. while those detected in the crosswalk (shown in blue) will extend the clearance interval.



Microwave Detectors: Pedestrians entering the curbside microwave detection zone (shown in red) will activate the pedestrian call feature. At the same time, slower pedestrians detected within the on-street detection zones (shown in blue) will receive more time to cross the street.



Count-down signals are used in conjunction with conventional pedestrian signals to provide information to the pedestrian regarding the amount of time remaining to safely cross the street. Depending on user preference, the count-down timer starts either when the WALK or Walking Person indication appears or when the flashing DONT WALK or Hand indication appears. The timer continues counting down through the flashing DONT WALK (Hand) clearance interval. When the steady DONT WALK or Hand appears, the countdown signal will be at zero.

In-pavement lights are being used at crosswalks to alert motorists to the presence of a pedestrian crossing or preparing to cross the street. The amber lights are embedded in the pavement on both sides of the crosswalk and oriented to face oncoming traffic. When the pedestrian activates the system, either by using a push-button or through detection from an automated device, the lights begin to flash at a constant rate, warning the motorist that a pedestrian is in the vicinity of the crosswalk ahead.

Note: these devices have met with mixed success after test applications in NY State. The key issue has been durability of the lighting elements during snowplow operations.

The illuminated pushbutton is a simple technology designed to provide immediate feedback to the pedestrian that the button is working and that the signal will change. Use of the illuminated button may reduce the number of pedestrians who cross against the signal because they have no indication that a standard push button is working.

Accessible Pedestrian Signals (APS) include a number of devices which provide WALK and DON'T WALK information. These products produce a sound, vibration, or both, during the Walk interval. Currently available products are of four design types, plus various combinations, categorized by the location and type of WALK indication provided. These types are categorized as follows:

Pedhead-mounted
Pushbutton-integrated
Vibrotactile-only
Receiver-based

A woman in Sweden uses a tactile map on the side of this APS device to find out what to expect as she crosses the intersection.

In addition to these devices, there are also an increasingly sophisticated range of new automated pedestrian and bicyclist counting and tracking devices available. Automated counters, detectors and remote sensors can supplement traffic count programs to provide benchmark data for evaluating facitilites and programs. Addidional information on these technologies can be found in the Resources section of this document.

Note that specific warrants and conditions may apply to these devices, and a consistent process for implementation is important to ensure appropriate uses and locations. Some of these devices may not be included in the Manual on Uniform Traffic Control Devices (MUTCD). Before using any traffic control device that is not included in the MUTCD, the interested locality should submit a request for permission to experiment to FHWA's Office of Highway Safety (HHS-10), 400 Seventh Street SW, Washington, DC 20590. Guidelines for conducting an experiment can be found at the FHWA Office of Highway Safety web site containing information related to the MUTCD (mutcd.fhwa.dot.gov/kno-amend.htm).

For bicycling, there are a wide range of innovative ITS technology applications available, including improvemetns for roadways, bicycle parking, trails and intersections. A selection of these treatments are described in the following sections.

GIS / GPS Bike Route Mapping and Management: The use of global positioning systems (GPS) and geographic information systems (GIS) can provide sophisticated digital mapping and data regarding on and off-road facilities. Many agencies and organizations have developed websites that display route systems, complete with elevation profiles, photos and blogs. These tools can also be used to promote tourism, track numbers of facility users, and to maintain data about the conditions of facilities.

Trondheim Bicycle Escalator: perhaps one of the world's most unique bicycle infrastructure solutions is the "Trampe" bike escalator built into a street going up one of the steepest hills in Trondheim, Norway. Design Management AS developed the bicycle lift and a prototype was installed in 1993. It includes an electrically operated underground cableway, with footplates anchored to the cable at intervals of 25 m. The footplates are concealed within the housing, emerging only when a key card is inserted in the control panel. Cyclists put one foot on the slanted footplate and are gently pushed up the hill at a speed of 6 km/h. The prototype is 130 m long, has a 1:5 gradient, and carries 300 cyclists per hour. For more information, visit http://www.utopia-eu.com/reptex/rep51/rep08.htm

Bicycle Safe Rumble Strips: While not a 'high tech' application, rumble strips have been provided on a variety of roads in the U.S. to prevent motorists from driving onto the shoulder or off the road. NYSDOT requires a minimum clear shoulder width of 4' after the application of rumble strips, and generally discourages the use of rumble strips where bicylcists are present. An alternative approach was developed in Pennsylvania to provide rumble strips which were bicycle-compatible as a technique for improving safety for both motorists and cyclists. Additional details are available in the following technical reports: *Analysis of Gap Patterns in Longitudinal Rumble Strips to Accommodate Bicycle Travel;* Moeur, R.; Transportation Research Record, No. 1705, Pedestrian and Bicycle Transportation Research 2000, pp 93-98., and *Bicycle-Tolerable Shoulder Rumble Strips;* Pennsylvania Department of Transportation, Elefteriadoiu, L. et al., March 2000.

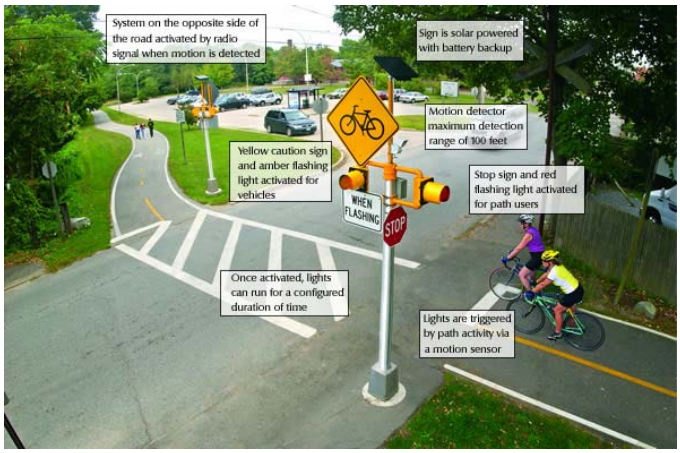
Trail-Roadway Intersections: Parks & Trails New York recently produced a report entitled *Road and Trail Intersection Safety: An examination of present practice, Recommendations for future actions.* The report (available at www.ptyn.org), makes the following recommendations for the design of trail/roadway intersections in New York State:

- Design intersections of trails and roadways with the appropriate assignment of right of way
- Design intersections of trails and roadways to alert trail users and road users of an approaching crossing
- Design roadways and trails to minimize risk at crossings

Recent innovations including "Yield to Pedestrians" devices that can be placed in crossings, remote detection-activiated flashing beacons, and new 'sharks tooth' yield markings can improve safety at trail-roadway intersections when combined with good design and operations practices.

Intelligent intersection design of a trail-roadway intersection, including devices for remote detection of trail users.

Photo: Cross Alert Systems, Inc.



Automated Bicycle Parking: At intermodal transit stations, educational sites, commercial and retail centers, automated bicycle parking can be provided to ensure safe, secure locations for bicyclists. Available systems include swiper-card operated bicycle lockers, fleets of 'free' bicycles available for use with a digital or fee operated security deposit, and fully automated systems that retrieve bicycles from storage systems. These features have also been combined with "Bike Stations" (www.bikestation.org) to provide a central location for bicycle parking, rentals, retail, repair and other services for bicyclists.

These ITS solutions can be useful tools for Ulster County to address bicyclist and pedestrian safety. As the NMT Plan is developed, specific locations for these applications will be considered, both through integration in ongoing projects, and as potential 'stand alone' / demonstration projects in local communities.

Resources:

An Evaluation of Technologies for Automated Detection and Classification of Pedestrians and Bicycles, University of Wisconsin, 2001, Raghuram Dharmaraju, David A. Noyce, Joshua D. Lehman, http://www.topslab.wisc.edu/publications/noyce_2001_0049.pdf

Applications Overview, USDOT Intelligent Transportation Systems (ITS) Joint Programs Office, www.itsoverview.its.dot.gov/Options

Accessible Pedestrian Signals: Synthesis and Guide to Best Practice, Project 3-62 Guidelines for Accessible Pedestrian Signals, National Cooperative Highway Research Program (NCHRP), University of North Carolina Highway Safety Research Center, http://www.walkinginfo.org/aps/2-17.cfm

Bicycle and Pedestrian Detection: Final Report, February 27, 2003, FHWA / Minnesota Department of Transportation Office of Traffic Engineering/ITS, Prepared by: SRF Consulting Group, Inc., http://ntl.bts.gov/lib/23000/23300/23330/BikePedDetFinalReport.pdf

Current Research, Federal Highway Administration, Pedestrian and Bicycle Safety Research Page, http://www.tfhrc.gov/safety/pedbike/research/current.htm

ITS: Benefits for Bicyclists, Gail Payne (MIT), http://www.netspeed.com.au/cr/bicycle/its.htm

Maximizing Mobility Options: The Art and Science of Pedestrian and Bicycle Data Collection, Transportation Research Board, 2004, Robert J. Schneider, Robert S. Patten, and Jennifer L. Toole, http://www.ite.org/Conference/papers/CB05B2104.pdf

National Bicycle and Pedestrian Documentation Project, TRB, 2006, M.G. Jones A.M. Cheng, www.altaplanning.com

PedSmart, ITS Applications for Pedestrian Safety Pedestrian Resources website, FHWA / University of North Carolina Highway Safety Research Center, http://www.walkinginfo.org/pedsmart/

Road and Trail Intersection Safety: An examination of present practice, Recommendations for future actions. Parks & Trails New York, December 2006. http://www.ptny.org/pdfs/greenways/road_trails/report.pdf