ITS America 2003 Student Essay Competition

Question 2: What future technologies hold the most promise and what results in the "real world" might be seen by their deployment at the 20th ITS America Annual Meeting in 2010?

"The Challenges facing Highway ITS: 2010 and Beyond"

By
Trevor Hanson
MScEng Candidate
University of New Brunswick
Fredericton, New Brunswick, Canada

Mailing address
Trevor Hanson
51 Morrow Road
French Lake, New Brunswick, Canada
E2V 4G9

Phone: (506) 357-2766
Fax: (506) 453-3568
Email: trevor.hanson@unb.ca

The Challenges facing Highway ITS: 2010 and Beyond

Introduction

What does the year 2010 hold for Highway ITS in our world? Realistically, the biggest hurdle to full ITS implementation in our daily lives is not technology, but the societal aversion to change and restrictions on our driving freedoms. Drivers have embraced cruise control, on-board maps, GPS, variable message signs, traffic websites, everything that enhances the control that drivers have over the vehicles. However, drivers are generally opposed to photo radar, speed limiters, and other items that put controls on driving. If drivers are so opposed to such simple technologies that would increase safety and mobility, how can they be expected to accept the complicated technologies of self-driving automobiles and assigned routing? Many current applications of Highway ITS are stop-gap measures designed to reduce congestion, yet they still rely on the same premise that resulted in congestion initially. As long as people retain the ability to dictate when and where they wish to access highways, today's ITS successes become tomorrow's problems.

Background

Before anyone can identify what technologies hold promise for the future, it is necessary to understand what has always governed human behaviour: self-preservation. This also has carried over to automobile driving. In fact there are two philosophies governing ITS development today that are split along lines of human self-preservation as an individual, and as a society:

1. Philosophy of improving individual safety and mobility
2. Philosophy of improving societal safety and mobility

Individual safety and mobility has been improved by the introduction of variable message signs (VMS) and other various traffic advisory programs. Collision avoidance technology and improved driver information technologies are being introduced based on the premise that an informed driver is a safe driver.

Can societal safety and mobility result from improving individual safety and mobility? Yes, in the sense that the sum of individual users that are now more informed of their driving surroundings form the society, but also no, in the sense that each driver attempts to maximize their own safety and mobility, with little regard to that of others.

Interestingly enough, these two philosophies often find themselves in conflict. It is counterintuitive, but by improving individual safety and mobility, society as a whole may suffer. Technologies that improve individual safety may encourage people to take more risks, and it may lure normally timid people into a false sense of security. Human factors play a huge role not only in the application of technology, but also in the acceptance of technology.

The Three Human Factors

There are three human factors that are hindering the adoption of ITS technologies that would save lives and increase mobility to an even greater extent: the control factor, the risk factor, and the cultural factor. By 2010, ITS organizations must recognize and address these in order to grow beyond today's simple applications of technology.

The Control Factor

How much of the human factor can be or should be taken out of driving? How many drivers will relegate the task of driving to computers? These questions are fundamental to ascertaining the future success of widespread ITS, and will also determine to what degree ITS will penetrate our lives. Human preferences will also dictate what ITS technologies are implemented, and what ones will never be. For example, technology has existed for 30 years that allow airplanes to take off, fly, and land by themselves, yet there are still two pilots on every airplane. Technology exists today that enable vehicles to drive themselves, but there are no lines of consumers waiting to purchase this technology.

Presently, society is overcoming the physical contributions to accidents, i.e. improving vehicle safety and roadway characteristics, yet the human factor still is able to defy these improvements. ITS attempts to give automobile drivers information that is accessible everyday to other transportation modes, such as in air transport, in an effort to replicate the safety benefits associated with these modes. However, highways can only become so safe. There is only so much information that can be presented to drivers before driver error is solely to blame for accidents. It is that threshold which society is approaching.

Society must decide how safe the highway can become. Not all accidents can be prevented by the introduction of ITS, however those accidents resulting from when the driver lacked information to adjust their driving can be. That number can be quantified, and that goal attained, but it still leaves the question: what next? Do drivers, specifically North American drivers, want to give up their personal driving and routing control of a vehicle to reduce their accident risk?

The Risk Factor

Looking at people's reactions to air travel can give great insight into the collective psyche. Airplanes are operated by professionals, are under surveillance by a multitude of controllers, and have impeccable safety records, yet it is the automobile that is generally regarded as the safer of the two means of transport. Through a combination of routing, maintenance, and technological advances, a traditionally hazardous activity (flying) has experienced a great risk reduction. Still there are accidents, and statistics show that the majority are caused by human error (1).

In the United States, the number of people being killed on the roads every year is equivalent to having two 350-passenger Jumbo Jets crashing per week for the year (2). Any airplane accident is enough to shatter consumer confidence, however with automobiles people are more comfortable with assuming the risk. In an airplane, a passenger has no control over the vehicle, but in an automobile, they do. This preference for individual control over fate is one of the biggest hurdles facing implementation of an

ITS that would provide the biggest safety and congestion benefits, such as individual routing and central controlling.

The Cultural Factor

Since driving is by nature an individual effort, it is reflective of the cultural values possessed by the individual. A country, such as the United States, was founded on individualism within a collective; consequently individuals there place high value on individual freedoms, like driving. To illustrate, transit ridership in the US is very low, even though it has many areas of high population densities (3). Because of the vast amounts of land available at the introduction of the automobile, US cities and population evolved around the automobile. This makes reducing access to the automobile difficult, as it is entrenched in their culture. In the Netherlands, where the culture is more communal, reducing automobile use, or banning it outright, would be seen as positive by the population.

ITS and Safety

Another issue facing ITS organizations is challenging each individual driver's notion that he or she is a safe driver. If drivers already feel safe, it is because they have been convinced that air bags and bigger cars will make them safe, and that their driver's license is an indication of their competency. They do not see the need for vehicles to be centrally controlled. There were traditionally two components of driving guiding highway design: understanding the limitations of the driver, and understanding the limitations of the vehicle. Successful ITS developed out of a perceived lack of a third

component, that is limitations on driver knowledge of highway conditions. More recently, ITS have been used to complement all three components. With promises of increased safety and mobility, drivers in major cities have warmed considerably to ITS technologies that aid their driving.

Successful North American ITS

Intelligent Transportation Systems have been credited with many improvements in mobility. The COMPASS system in Toronto, Canada combines a central control station with incident cameras and VMS to keep drivers abreast of disruptions in the traffic flow. Accidents, lane closures, and weather conditions are monitored by the central control station and subsequent information posted on the VMS. The system is regarded as highly effective at keeping traffic moving on Highway 401, one of the world's busiest highways. In seven years, systems like COMPASS will become more prevalent throughout smaller cities and over regional areas. The basic technology and premise will remain the same, that is, a central advisory controller warning motorists of impending incidents.

Other jurisdictions have implemented traveler information centres, such as websites, TV channels, and radio that keep drivers up-to-date with current traffic conditions. This allows drivers to select their route according to the traffic conditions they perceive. The irony is that with reduced congestion comes increased demand from those who traditionally ignored highways in favour of public transit. Seven years should show how these traveler systems have impacted long-term traffic patterns in these jurisdictions.

The Future of ITS

It is difficult to foresee many improvements to mobility and safety in addition to those currently being experienced now in certain jurisdictions due to ITS. The mood among North American drivers suggests they are willing to accept ITS technologies provided they help them do what they do currently, but better. The proliferation of VMS has been great, if not late in blossoming. It is certain that current technologies will trickle down to smaller jurisdictions in time.

It is difficult to justify investing in ITS technology that the majority of today's drivers do not regard as essential, such as self-driving vehicles. As with traveling to the moon, people must want to go before money is invested. It should be the role of ITS organizations to convince the public and government that they want to see the role of ITS expanded to where real gains in safety and mobility will take place. It will not take seven years, but perhaps seventy to convince the public that everyone is better off with the technologies of ITS applied to serving the public good, in addition to individuals. ITS are evolutionary, and while we possess the technology today, not everyone is ready to use it. It is people, not technology that need to change, otherwise efforts and creativity in technology will not be recognized or applied.

References

1. Grabowske, J.G., Rebok, G.W. 2001. "Fewer Airline Crashes Linked To Pilot Error", John Hopkins Medical Institutions. [Online] Available URL: http://www.sciencedaily.com/releases/2001/01/010109083707.htm Accessed Jan, 27, 2003

2. USDOT, 2002. Fatality Analysis Reporting System (FARS) Web-Based Encyclopedia- National Highway Statistics. [Online] Available URL: http://www-fars.nhtsa.dot.gov/ Accessed Jan 27, 2003

3. Newman, P. and Kenworthy, J. 1999. Sustainability and Cities: Overcoming Automobile Dependence. Island Press, Washington D.C. USA, pp. 231