Policy Update: Intelligent Roads

Vehicle accidents account for nearly 1.3 million fatalities per year globally, not to mention non-fatal casualties and other damage.[1] While the total number and rate of fatalities have been declining in the western world, more can be done to protect drivers, pedestrians, and infrastructure. With approximately 90 percent of road accidents attributed to human error, innovative external systems have become a focus of making roads safer.[2]

The intelligent road system was originally conceptualized as a project for arctic roadways, where weather and surface conditions decrease road safety, but the model applies to all road networks. By incorporating more technology into road infrastructure, safer and more efficient travel may be achievable. Imbedding sensors, displays, and monitoring technology into roadways can make real-time updates available to drivers, transportation authorities, commercial operators, and government bodies, including information on road conditions, weather, and traffic flow.

The Challenge

While traveling down a road at high speeds, human perception can be flawed, as judgments of acceleration, steering, and reactions to other vehicles are made in seconds. The main challenge for increasing road safety is how to enhance automatic and electronic systems to reduce these human errors. Weather can cause a road to lose friction resulting in tires unable to gain traction due to wet, slushy, icy, or snowy roads. It can be difficult to distinguish the differences between these conditions and even harder to determine the appropriate response while driving. Intelligent roads seek to deliver this information to drivers with real-time weather information using roadside technology.

The challenge becomes even greater, however, when determining how to effectively incorporate new technology into older infrastructure and the cost of implementing and maintaining these systems. In the United States, one third of all roads are in "poor or mediocre" condition, and funding for repair and maintenance is uncertain in the long term.[3,4] (Report Card, White House). This is especially important because deteriorated roads increase the likelihood of an accident and in many cases result in greater damage. Advances in research and development do not necessarily find their way into federal plans and even then, the budget is a substantial barrier.

On a small scale, the intelligent road systems make sense, but the cost-benefit ratio changes as the project grows. The U.S. alone hosts over 165,000 miles of highway networks, excluding city and rural roads. In harsher climates, where the original plan was envisioned, the technology could save more lives per dollar spent, whereas implemented on a national, continental, or global scale, the costs begin to outweigh the potential benefits.[5]

[1]World Health Organization. (2010). Number of road traffic deaths. Retrieved January 12, 2016, from http://www.who.int/gho/road_safety/mortality/traffic_deaths_number/en/

[2]NHTSA. (n.d.). The Relative Frequency of Unsafe Driving Acts: Background. Retrieved January 12, 2016, from http://www.nhtsa.gov/people/injury/research/udashortrpt/background.html

[3]ASCE. (2013). 2013 Report Card for Americas Infrastructure: Roads D. Retrieved January 12, 2016, from http://www.infrastructurereportcard.org/roads

[4]White House. (2014). An Economic Analysis of Transportation Infrastructure Investment. Retrieved January 12, 2016, from https://www.whitehouse.gov/sites/default/files/docs/economic_analysis_of_transportation_investments.pdf

[5]DOT. (2015). Intelligent Transportation Systems. Retrieved January 12, 2016, from http://www.itscosts.its.dot.gov/its/benecost.nsf/CostTerminators/RWM Surveillance Monitoring Prediction

Recommendations

Improvements to vehicle and roadway safety are a necessity, especially as infrastructure ages. Balancing innovative technology with cost-effective construction plans will help ensure the potential of this concept is reached, when appropriate. Investment in research and development of road technology is a must. Until all the glitches are discovered and the technologies are perfected, any large-scale investments could amount to wasted public funds, and actually delay implementation of life-saving technologies.

When these technologies are lab ready, small-scale pilot projects – limited to a few small cities or stretches of freeway – should be used to determine the technologies' viability in real world conditions. Only after working out bugs, monitoring the efficacy and maintenance costs, and building a strong case for public safety should the projects be pursued on a larger scale.

If proven to be viable, the natural next step is building complimentary technology into cars that work in concert with the road-based technology to assist drivers and further reduce error. Notifying drivers of upcoming road conditions can make them aware of it, but notifying the vehicle could prepare it to reduce speed if the driver does not – similar to Positive Train Control technologies that are being integrated into the freight and passenger rail network.

The Alliance for Innovation and Infrastructure (Aii) is an independent, non-profit alliance focusing on infrastructure innovation through awareness and education. Aii