Impacts and potential operational benefits of the cv

Transportation

ASSIGN BUSTER

Impact on long range planning models

Connected vehicle technology will have a profound impact on the long range planning and land-use models used today. It will provide planners with a greater insight into each step than ever before leading possibly to more precise models and providing enhanced information for better decision making.

CV and geometric design of highways

Roads and signalized intersections are usually designed based on the behaviour and characteristics of human drivers. This human behaviour might differ vastly from the driverless vehicles' behaviour. Unlike people, automated vehicle uses sensor systems to locate itself along the path and communicate with other vehicles and/or infrastructure along the network. This element could lead to optimize the geometric design of highways enabling the use of minimum control radii, horizontal and vertical curves.

Impacts on capacity and traffic operations

One of the major benefits of CVs and AVs is their potential to increase capacity on freeways and other uninterrupted flow facilities. AVs can improve capacity by using their equipped radars and other sensors to maintain a consistent gap to the vehicle ahead; thereby, reducing the headway between vehicles compared to human-driven vehicles.

Highway safety

Research found that deployment of connected vehicle stems and the combined use of (V2V) and (V2I) applications have the potential to address 81% of unimpaired driver crashes in all vehicle types (i. e., cars and heavy vehicles). Highway crashes can be reduced when vehicles can sense and communicate the hazards around them.

Mobility

According to the Texas Transportation Institute, U. S. highway users wasted 5. 5 billion hours stuck in traffic in 2011. CV mobility applications will enable system users and system operators to make smart choices to reduce delay through providing actionable information and tools to affect the performance of transportation system in realtime.

Environmental benefits

The principal pollutants of vehicle emissions include nitrous oxides, Sulfur oxides, and Carbon monoxide, which have negative health effects. Connected vehicle technologies will generate real-time data that drivers and transportation managers can use to make green transportation choices .

CONNECTED VEHICLES APPLICATIONS

There are different, but not necessarily separate, types of connected applications:

Safety applications

Connected vehicle safety applications that increase situational awareness and reduce or eliminate crashes include driver advisories, driver warnings, and vehicle and/or infrastructure controls; further safety applications include:

V2V applications

By V2V applications, drivers will be alerted to imminent crashes, such as merging trucks, cars in the driver’s blind side, or when a vehicle ahead stops suddenly. They include: forward collision warning, Emergency Electronic

Brake Light, blind spot/lane change warning, not pass warning, intersection movement assist and left turn assist.

V2I Applications

By V2I applications, drivers will be alerted when they are entering a school zone, if workers are on the roadside, and if an upcoming traffic light is about to change. They include: curve speed warning, red light violation warning, stop sign gap assist, smart roadside and transit pedestrian warning.

Mobility applications

Besides the unused DSRC bandwidth, other non-DSRC sources, such as cell phone bandwidths and current wavelengths used for wireless traffic detection equipment, can be utilized for mobility applications. To address these mobility applications. The U. S. DOT developed two mobility-centred programs in its 2010–2014 ITS Strategic

Environmental applications

Connected vehicle environmental applications might advise drivers about how to save fuel with changes in maintenance and driving style. Environmental applications can also help integrate travel by personal vehicles with public transit, or help drivers plan trips for off-peak times. In addition, connected vehicle environmental applications will give motorists the real time information they need to make “ green” transportation choices[7].

PUBLIC PERCEPTION ISSUE OF CV APPLICATIONS

Due to the wide range of potential applications and technologies, this section will focus on public perception issues such as privacy, security, the cost of deploying a system, data ownership, driver distraction, and equity.

Privacy

Privacy is a top concern to both public and private sectors. The public sector is concerned with the potential misuses of the data which could preclude deployment if they are perceived as threats, and once a system is deployed, misuse of data could undermine the system (Persad et al. 2007). Privacy concerns should be a central consideration in decisions about how information is collected, archived, and distributed (Briggs and Walton 2000). CV system could violate drivers' expectations of privacy. Therefore, agencies planning to deploy ITS must address privacy concerns and may have to market the benefits of the program to gain public support (Persad et al. 2007). The data collected through connected vehicles and other ITS applications could potentially be useful for purposes not related to the drivers themselves. For instance, the data could be used by state departments of transportation or other road managers for analysing road use patterns and planning maintenance and improvements [8].

Security

The ability of hackers to capture data or alter records is a major security issue that must be addressed before a CV system can be successfully deployed. If the public perceives a system as being vulnerable to attacks that could affect individual users, public support for the system will suffer. Raya and Hubaux (2005) emphasize vehicle communication systems using

DSRC and describe various threats to vehicle networks. These specific attacks include providing bogus information to other drivers, cheating with positioning information to avoid liability, identifying and tracking of other vehicles, using denial of service attacks to bring down the network, and masquerading as another vehicle. To protect against these attacks, the authors propose security requirements including: vehicle authentication, verification of data consistency, availability, non-repudiation, privacy, and realtime constraints. It is also suggested that authentication and data analysis be handled by separate entities [9].

Cost

An important determinant of the public perception of ITS applications is the cost associated with implementation (Sorensen et al. 2010). Public costs will stem from the specialized methods, personnel, and equipment required in deploying, operating, and maintaining a connected vehicle system. Initial deployment costs and training requirements could be significant and may require a major upgrade and overhaul of existing databases and security infrastructure. To convince drivers to use connected vehicle technology in their personal vehicles, they will have to perceive the cost of the technology as less than the benefits they accrue through the use of connected vehicle applications. Furthermore, to gain broader public acceptance from taxpayers, a connected vehicle system needs to be accessible to a broad range of drivers, who perceive benefits from the system, and it may need to offer value even to those who do not purchase in-vehicle technology. [9]

Governance and ownership of data

The organization(s) in charge of managing and protecting the data will need to be trustworthy in order to gain public acceptance. The public will also need to trust the institutional setup for collection, management, and security. Institutional separation is one design method that could be used to generate trust and support. For instance, if the activities of tracking and identifying vehicles are divided between two different organizations, it diminishes the threat of potential privacy invasion compared to a scenario where the same organization is involved with both tracking and identifying the vehicles (Briggs and Walton 2000). There has been significant discussion as to whether ITS data ought to be collected and managed by public or private organizations. When considering the advantages and drawbacks of involving the public and private sector in the collection and management of ITS data, perhaps the most important predictor of how the data will be treated is not whether the organization is public or private, but rather what its goals and operating characteristics are (Briggs and Walton 2000).

THE CHALLENGES TO THE CV TECHNOLOGY

The challenges to the development and application of the CV may be summarized as follows:

Cars take longer to develop than Smartphones

The difference in lifecycles in the automotive and the mobile industry is a serious challenge for the future of connected cars. New features, such as operating system upgrades and new applications, are provided almost constantly for the Smartphone, whereas car manufacturers work on five-year cycles.

Carmakers need mobile partners

The automotive and mobile industries have different objectives, but they will need to find ways to collaborate in order to satisfy consumer connectivity needs. General Motors, for example, selected AT&T as its mobile partner.

Car dealers need to be tech savvy

The advent of the connected cars will dramatically change the dealership model. Salespeople must plan to spend an hour or more teaching customers how to use their car's advanced technology.

Connected cars will likely be shared cars

Automakers agree that selling ' just' cars is no longer feasible. It is mobility – with required connectivity to customer services and advanced functions like power management for electric vehicles – that is needed today. That creates opportunities for new ownership models, like Zipcar's car-sharing service.

Who will pay for connected car services?

Consumers are used to a one-off payment when purchasing a car, but with an embedded connection there is an additional bill to be paid in terms of connectivity. Will you add your car as a " device" to your existing mobile bill? Or will the added cost be rolled into your car payment? Who will pay for roaming and data usage? New business models will need to be developed.

CONNECTED VEHICLES AND PUBLIC TRANSPORTATION FUTURE OVERVIEW

Transportation mode decision making depends on many factors including safety, speed, availability and cost. This section highlights the main effects of connected vehicles and automated vehicles on public transportation future, assuming these technologies are applied to both public and private vehicles, and travellers accepted them. Connected vehicles safety applications reduce rear end accidents, a major public transportation problem caused by their frequent stopping. On the other hand, these applications might diminish the safety advantage of public transportation resulting from their large size and highly skilled operators, since private vehicles' safety will be increased. Thus, private cars attractiveness increases. This point raises doubt about the environmental advantage of CV due to reduced vehicle routes, which will be compensated by the increase in the number of private cars. From a futuristic point of view, the application of automated vehicles in public transportation could increase their level of service, thus people acceptance, through continuous operation, more frequent trips and relatively decreased trip cost. These advantages result from trips independency from human operators and high mobility on streets.