Role of ITS in Achieving Vision Zero by 2025

The big picture of the Vision Zero project involves ensuring there is no road-fatality and minimal crash-related injury at the highway level. The project started in Sweden [1] in 1997 and with the resulting road deaths turning out to be the one of the lowest in the world [2], the rest of the world caught on. Unlike a conventional project that bases analysis on cost by putting a price to human life and making a life-wealth trade-off, Vision Zero bases its analysis on two ethical ideals: (1) saving human life triumphs all other welfare concerns and (2) necessary steps are to be taken in the event of death and severe injury. With connected vehicle technology dominating most of the vehicular infrastructure in the upcoming decade, it can be stated to a level of certainty that ITS will play a major role in ensuring the success of this project. To discuss the role in detail, arguments are needed to be made in two major fronts (1) safety and (2) operation.

(1) **Safety**: While we talk about avoiding fatal crashes, safety is going to be of utmost importance. Vision Zero dictates speed limits based on vehicle-vehicle and vehicle-pedestrian interaction.
    (a) *Speed Compliance Enforcement*: Speed limits are expected to be lower for curves, construction zones and school zones. Connected vehicle (CV) technology deployed to alert the driver in the event of speeding will ensure adherence to speed limit. Also drivers are to be warned about imminent red light violations.
    (b) *Compliance with vehicle size standards*: In the event of upcoming height and width restricted road ways, drivers are to be warned beforehand.
    (c) *Emergency situations*: With ample real-time data available about traffic, estimates and informed predictions can be made on time and location of traffic incidents. Based on the information, drivers can be warned in order to ensure swift maneuver and evacuation.
    (d) *Crash warning*: In the event of an imminent crash due to simple rear-end collision, hard-braking by a vehicle in front, side-way collision with a vehicle from adjacent lane, the driver will be warned beforehand. Also, the driver could be advised against changing lane if a sideway collision is predicted. There should also be warnings to driver when it is deemed unsafe to cross or turn in an intersection[3]. Sepulcre & Gozalvez [2012] tested to success co-operative V2V communication systems in Spain under challenging situations.

(e) *Pedestrian warning*: Drivers are to be warned of presence of pedestrians crossing at the signalized intersection and vice versa. Special care needs to be taken to pass on information to the visually impaired about crosswalk orientation and crossing signal status [3].

While the steps mentioned above will ensure safety thereby giving us short-term gains, the historical records of warnings to drivers needs to be kept and used to update the warning algorithm to better suit the scenario and further reduce traffic incidents.

(2) **Operation**: While ideally taking all safety measures should encompass all goals of Vision Zero project, it is also essential to balance the delays because of over-cautious driving with usage of connected vehicle technology to ensure smoother and faster operation. Using real-time traffic and congestion information, one can dynamically reroute each CV enabled vehicle individually to the most efficient route. Since we are talking about the year 2025, having a mixed vehicular population with semi-automated vehicles is not beyond the realm of possibilities. Collaborative driving with the aid of V2V communications will contribute immensely to reducing delays. Studies related to this have been going on on many fronts. One such study by [Hallé et al., 2003] discusses the challenges related to car-platooning with the aid of simulations.

It is worth mentioning that while safety and smoothening of operations to compensate the over-cautiousness created by safety protocols are the two main criteria concerning the Vision Zero project, a very positive by-product from the connected vehicle technology is the dynamic feedback to produce greener routes. What we mean by this is, while real-time feedback saves time, a smarter and more comprehensive feedback loop should be capable of suggesting a route with requires less hard-braking and more energy-efficient routes.

It is noteworthy that in its initial implementation phase, Vision Zero may have yielded very positive result and to make it a long-term-success ITS has to play a major role. Having said that, we are at a very early stage and continuous updation of safety protocols based on current model architecture and results yielded from them is essential. While technology will play significant role it in, it is also on the drivers and pedestrians to ensure safety protocols are maintained on their part because at the end of the day it is the technology that needs to get integrated into our lives and not the other way round.

References:

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