The potential for Smart Roads to have a positive impact upon the safety of vulnerable road users.

Abstract

The function of roads is to facilitate the movement of traffic to support vital economic, cultural, and social activity. They increase accessibility and connectivity. Their use is framed by regulation as well as physical geometry and the expectations of those who use them. However, despite their obvious utility, roads also enable a wide variety of people, vehicles, conveyances, and objects that, due to enforced propinquity, can come into conflict, resulting in a great number of accidents. According to the World Health Organization (WHO), 1.35 million people die in road accidents each year. Pedestrians, cyclists, and others using active mobility are particularly at risk of serious injury and death from collisions with larger heavy forms of transport with whom they share the same road space.

There has been over a century of work to try and mitigate the risk to vulnerable road users (VRU's) by addressing safety through regulation, education, infrastructure design, safer motor vehicles and the expected behaviour of people. Many of the technological 'safe-system' approaches intervene in the motor vehicle itself, while roads remain largely, although not exclusively, passive in their intervention. Drivers are expected to comply with road rules or risk punitive measures if they do not. There have been huge advances in digital communication between the driver, the car, and the outside world. This has very much increased the pleasures of driving but also the safety of the vehicle's occupants. This sophistication in machine intelligence is hitherto less apparent or as developed in the building of roads and streets to the level enjoyed in automotive development.

This paper takes an exploratory look at the emerging concept of the smart road; a highway that, by way of digital communications and computational devices, is in some way 'enabled' in a way that a bitumen surface with a peppering of signposts and illuminated signals is not. The authors examine contemporary approaches to the shaping of the concept of the smart road and examine the potential of a road equipped to monitor, learn, and intervene could have on road design and safety in the future.