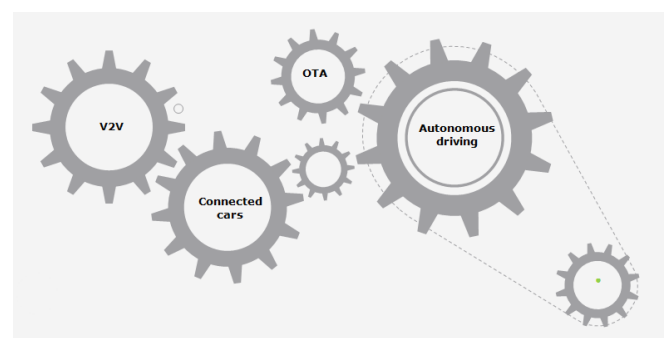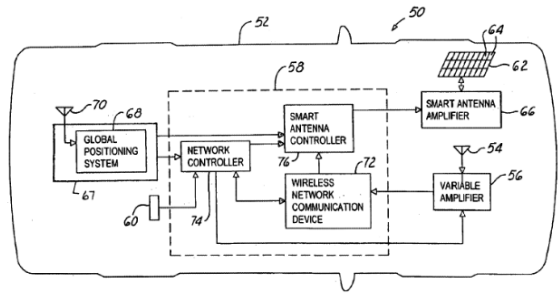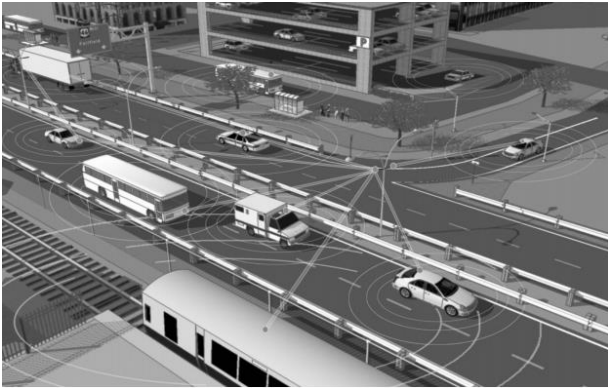# Vehicle to Vehicle Communication

At a Glance

Vehicle-to-vehicle (V2V) communication is touted as the future of machine-to-machine communication industry. According to the U.S. National Highway Traffic Safety Administration (NHTSA), V2V is implemented via a system that transmits basic safety information between vehicles to facilitate warnings to drivers concerning impending crashes. Though V2V equipped cars can't self-drive, they can interact with each other to share vital information. This interaction is accomplished by Dedicated Short Range Communications (DSRC) that transmit data collected from sensors and cameras - wherein the data primarily corresponds to vehicle's position, speed, brake status, steering-wheel position, etc.

V2V is a technology seemingly within reach, though it is not the only building block of an Intelligent Transport System. V2V is often pitted against autonomous driving, connected car technologies such as Apple's Carplay system and Android's Android Auto, and over-the-air (OTA) software updates. However, most experts believe that these technologies will coexist and not necessarily vie against each other.
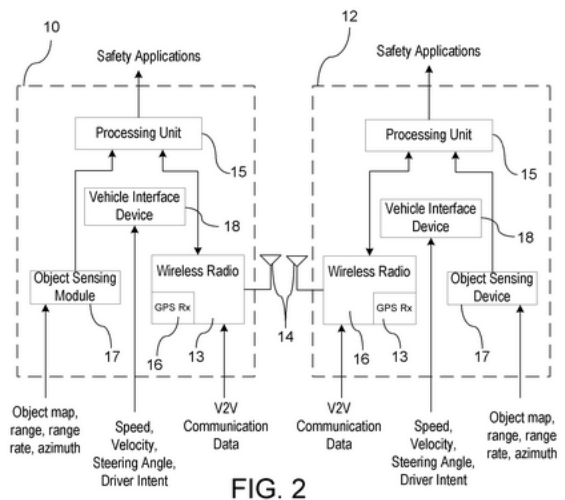
Intelligent Transport System's building blocks

Who's in control?

General Motors is the first major car company to disclose that it would release a V2V-equipped Cadillac by 2017. Toyota also indicated that it will start to incorporate V2V technology on 2015 Japanese models. The company has recently developed a Communicating Radar Cruise Control feature that allows vehicles to maintain safe distances between one another on highways using V2V technology.

Mercedes has expanded its horizon by a Car-to-X V2V communications system. A Mercedes vehicle equipped with Car-to-X system can collect data from other nearby Car-to-X-equipped cars and compatible broadcast systems. Some other notable demonstrators in this sector include Ford, Honda, Nissan, and Volkswagen.
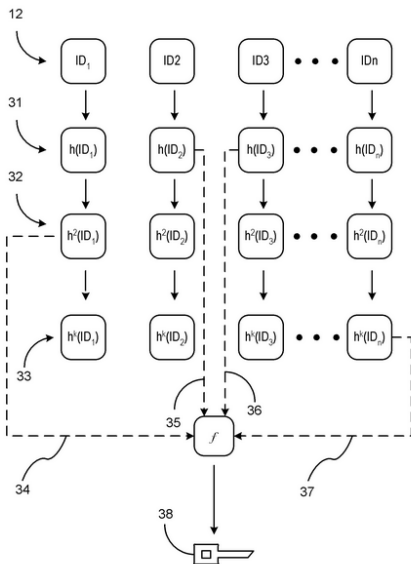
Patent View

Let us take a sneak peek at some V2V concepts that are being addressed by patents:

1) **Smart antennas** are employed to ensure improved transmission of pattern signals between vehicles

2) **Intelligent object detection mechanisms** are developed to accurately assess vehicle location and conditions with respect to surrounding vehicles.

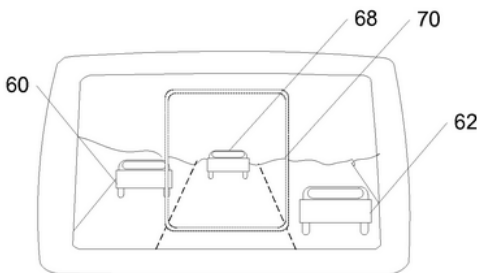US patent 8,229,663 by GM Global Technology

FIG. 2

3) **Improved authentication schemes** are being developed to ensure secured wireless communication

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US patent 8,526,606 by GM Global Technology

4) **Dashboards** are being improved to allow drivers to receive and display views generated by video cameras installed in other participating vehicles

US patent 8,345,098 by IBM

Complementary technologies

To improve safety on two-lane roads, Samsung has released a technology called "Safety Truck", wherein a wireless camera is mounted in front of a truck to capture view of the road ahead. The captured image is continuously transferred to a LCD screen installed at the back of the truck, thereby allowing the trailing drivers to see the traffic cruising their way. Samsung has conducted extensive tests of this prototype in Argentina, given the high statistics on traffic accidents in the country. As the next step, Samsung plans to perform the corresponding tests in other countries to comply with the existing protocols and obtain the necessary permits.

Samsung Tomorrow

As an organic expansion to V2V systems, GM is developing a pedestrian-detecting system that uses Wi-Fi Direct - a peer-to-peer standard that allows Wi-Fi devices to connect directly to each other without the need for a wireless hotspot. The idea is to integrate it with other driver alert systems such that pedestrians and cyclists carrying Wi-Fi Direct-enabled devices are detected by vehicles, thereby adding an additional layer of road safety.

In June 2015, GM also disclosed that it is collaborating with Cisco to allow both Wi-Fi devices and V2V safety systems to work in same band without causing interference - on a 'listen, detect and vacate' basis.

Regulations

In August 2014, NHTSA issued an Advance Notice of Proposed Rulemaking. This motion requires automakers to include V2V technology in all production cars in view of public safety.

The road ahead

While the V2V systems are being developed full throttle, these are plagued by a few challenges. All V2V systems will require robust security to ensure that the data exchanged between vehicles is not spoofed. The mechanism to implement such security framework will be complex. In addition, the DSRC communication technology can be affected by multi-path and Doppler signal distortion.

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