

# Intelligent Vehicles and Intelligent Traffic Highlights

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## ABSTRACT

**“ See How Technology is Changing the World! – by  
Anonymous 1923 ”**



Most people in the world drive vehicles. You drive your car. I drive my car. Being a driver for so many years, one should have a lot of fun and at the same time have a lot of grievances. These phenomena are common to all worldwide. No matter you are happy or not, you must have tons of comments to appreciate and also to complain. One may not only comment on vehicles. One may comment also on road, traffic and transportation. In this high technology world, all drivers in the world are anticipating something innovative to satisfy their expectations.

A few months ago, the author had a chance to read a very interesting article on “ What is an Intelligent Vehicle? ”. It made the author curious to learn and to spend more time to explore the latest technology worldwide. The paper is not of research nature but it will be on the report, highlight and technology sharing.

Latest development, definition, trend of Intelligent Vehicle Technology (IVT) will be reported as well as the Intelligent Transportation System (ITS). Latest information from Germany, Japan, USA, China, etc. will be provided in and reported in the paper.

Keywords: Intelligent Vehicle Technology (IVT),  
Intelligent Transportation System (ITS)

## **INTRODUCTION**

Today, vehicle developments are advancing from “Functional” cars to “Intelligent” cars. Many traditional car manufacturers sell built-in intelligent systems for new cars. They sell GPS (Global Positioning System), Voice Command Control System, Internet Links, Video Entertainment and Life Services. These systems are undoubtedly greatly help the drivers to some certain extends. However, these are not real intelligent!

In one of the latest technology and innovation exhibition, people pointed out that some mobile phone technologies have developed to their critical points. For the vehicle industry, they are advancing at great speed and about to overtake. All these relates to one thing. The computer microprocessor! Intelligent vehicle system requires very fast microprocessor speed in order to support for high speed calculations for auto-driving and safety. Today, some scientists expressed that the ITS is even more clever than the mobile phones.

Advance technology from Audi and Mercedes enable developments on “Virtual Seats”, “Extra Large LCD Display on Windscreen”, “Map GPS on Windscreen”, “Unmanned Driving”, etc. All these technologies will merge with 4G Internet, Auto-driving, Radar Sensing, Hi-speed data processing, etc. to form a complete solution.

Fully intelligent vehicles will make dream comes true in just a few years!

## **1. DEFINITIONS**

It should be corrected that ITV is not related to their energy source. Vehicles use diesel, gasoline, electric, hybrid or other renewable can all be intelligent. As long as the vehicle can be self-adjustable and self-thinkable, they fulfill the requirements.

From the Wikipedia [i], IVT comprises electronic, electromechanical, and electromagnetic devices - usually silicon micro-machined components operating in conjunction with computer controlled devices and radio transceivers to provide precision repeatability functions (such as in robotics artificial intelligence systems) emergency warning validation performance reconstruction. IVT commonly apply to car safety systems and self-contained autonomous electromechanical sensors generating warnings that can be transmitted within a specified targeted area of interest, say within 100 meters of the transceiver. In ground applications, intelligent vehicle technologies are utilized for safety and commercial communications between vehicles

or between a vehicle and a sensor along the road. IVT provide instantaneous on the road information to the motorist who wishes to map a route to a specific destination and expects the system to assist in determining the best course of travel. The information provided by the in-vehicle system updates approximately every minute (depending on the speed of the vehicle) all the transmitter beacon information self-recorded by the vehicle while traveling on the road. That is, all vehicles traveling on the highway update such information to the local mile markers. The mile markers in turn communicate with the regional monitoring station and upload data so as to populate statistical bar graph trend of traffic flow progression. The information further made available for access to the data collected by the system established data exchange format through Internet communications links.

Having evaluated all the definitions from various sources, a true Intelligent Vehicle must fulfill the followings:

- ✧ Powerful and Active Safety Performance
- ✧ Active Self-regulating Function responding to Environmental Changes
- ✧ Unmanned Driving

## **2. AN INTELLIGENT VEHICLE**

To be a real intelligent vehicle, the high requirements of powerful and active safety, capable of self-regulating responding to environmental changes and unmanned driving are all interrelated.

Safety and comfort are considered as the basic criteria of buying a vehicle. If anything relates to life safety, it automatically becomes the most important issue. An intelligent vehicle has to be intelligent enough to bring active safety to passengers. In the market, many vehicle manufacturers have established active and mature safety systems. These systems can actively determine safety situations and carry out active remedial measures to ensure safety.

In the market, there are concepts of developing self-adjusting computers which are fast enough to carry out radar detections of nearby cars, moving and stationary objects, pedestrians, traffic lights, road signs, junction roads, etc. These rely on a fast computer, fast radar reception, lights and signs recognitions, software, actuators, internet receptions, etc.

Unmanned driving is beginning to be a must for an ITV. Goods or container drivers drive their vehicles continuously for many hours from day to night. Men can be

tired, fatigue and feel sick during driving. A computer will not. It can drive continuously without the need to take a rest. The driver can pass the steering wheel to the computer whenever they feel like. It is just like pilot flying.

To be a true Intelligent Vehicle, there should be at least equipped with 4 typical types of sensors, namely:

- Radars
- Cameras
- Laser Scanners
- Ultrasonic



Fig.1 Radar sensors are distributed all around intelligent vehicles

For passenger driving, there will be no driver's seat in the future. When someone sits on a car-like machine, he can speak to the computer of his destination. The machine will take him and his passengers to the destination without fail. When he arrives at the place, he can ask the car to park by itself into a nearby carpark. It will find by itself. After some time, the car will be requested to drive itself out of the carpark to meet him. So convenient! Of course, such automatic arrangement must be supported by an integrated Intelligent Car Park System (ICP) and other facilities.

Specifically, an intelligent vehicle system involves the following major factors:

- ◇ Sophisticated Radar Alert Surrounding the Vehicle
- ◇ Blind Spot Alert
- ◇ Dazzle Driving
- ◇ Adaptive Cruise Control
- ◇ Speed Limit Sign Recognition
- ◇ Collision Avoidance
- ◇ Pedestrian Detection
- ◇ Auto Braking at Junctions
- ◇ Safety Alert to Passengers

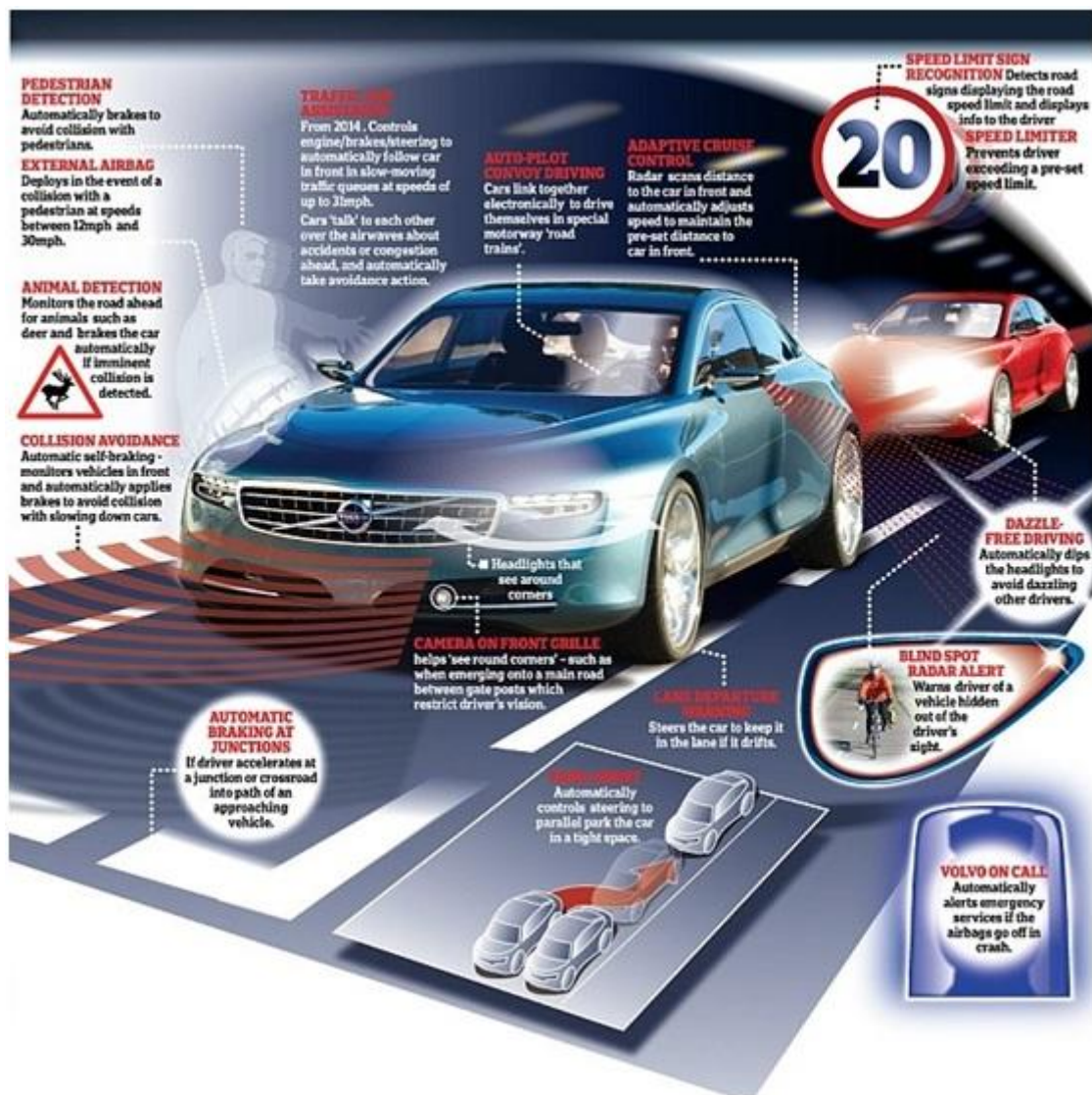


Fig.2 Various requirements to become a true intelligent vehicle

### **3. TOTAL INTELLIGENT SYSTEM**

Total system intelligence means accountability of every IVT equipped vehicle traveling on the road. Vehicles can use gathered information from the road to determine lane specific vehicle usage and scenarios such as lane closures (in-vehicle notification warning), construction zones, emergency situations, etc.

Intelligent vehicle technologies target transmission capable beacons provide for information signal data that are employed infrastructure to vehicle and vehicle to vehicle for exclusive precision remote communications to the specific one vehicle traveling in a given lane on the highway, for example – or a convoy of vehicles in a given travel lane, or multiple vehicles traveling in all affected lanes. All lanes are beacon tagged so as the vehicle travels down the road the ground beacon maintains communication with the vehicle for that particular lane – so it is therefore possible for example, for law enforcement to direct and provide for specific in-vehicle aural and/or visual information to a target vehicle traveling in a given lane (or multiple vehicle in multiple lanes as desired).

Vehicles traveling in the vicinity of an accident scenario, for example, are simultaneously queried by the in-vehicle police intelligent beacon system computer which repeatedly updates and processes all dynamic passing vehicle data received, identifying and classifying all passing vehicles in real-time – for example, an aural visual command instruction is sent to all the in-vehicle emergency warning beacon system computers as a reminder that no rubbernecking, for example, or viewing of the accident is permitted and vehicles are instructed to safely maintain a given speed limit. Ease of managing, operating, and reducing traffic congestion of the transportation system is therefore achieved.

A Total Intelligent Traffic (TIT) System will consist of Intelligent Vehicles and Intelligent Beacon System for emergency warning, severe braking warning, accident warning, traffic diversion, etc.

### **4. INTELLIGENT TRAFFIC**

In the USA California, there is an Interstate 15 Express highway using a so called Zipper Barrier-Transfer system to increase 1 or 2 more lanes in the rush hours. The system is making use of a moving machine to move the road divider barrier blocks like zippers to increase traffic on the rush hours efficiently. The Express is of 40 km from Escondido to Kearny Mesa.



There are other road zipper systems around the world such as Mexico City, San Diego, Sydney, Boston, Auckland, United Kingdom, New York, etc. The scale varies from large to small.

It is also believe that intelligent traffic will continuously be applied to other roads not restricting to highways. During traffic jam or accident, the Intelligent Traffic system will adjust itself to provide the best solution for an extra lane to relive traffic congestions.

## **5. CONCLUSION**

Intelligent Vehicle Technology (ITV) will invoke the need for Intelligent Beacon System, Intelligent Traffic and Intelligent Car Parking. Therefore, a Total Intelligent Traffic (TIT) System will be the ultimate solution that contains the above constituents. We shall open our eyes to **See How Technology is Changing the World!**

## **6. REFERENCE**

- (i) Wikipedia, Intelligent Vehicle Technologies.
- (ii) Newair magazine, May 2015.

## **7. COURTESY**

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## **8. AUTHOR**

Ir Dr Leonard Chow is currently the Chairman of HKAAEE and the Past President of the Association of Energy Engineers (AEE) Hong Kong Chapter. He is also the past chairman of Asian Institute of Intelligent Buildings (AIIB).

In September 2015, Dr Chow was recently elected the Fellow of the Institution of Mechanical Engineer (FIMechE), UK.

In 2011, he was awarded International title of the “2011 Energy Engineer of the Year”

by AEE USA. In 2013, he was granted the one of the ten “Fellow of AEE” which indicates his significant contribution to the energy industry worldwide. He is also appointed as the “Court Member” of Imperial College London since 2012.

Dr Chow is also the scholarship donor for Imperial College London since 2014. His scholarship is for a Hong Kong student studying a Master degree in Engineering.

He achieved the title of Certified Energy Manager (CEM) in 2005 and the Certified Building Commissioning Professional (CBCP) in 2006 granted by the Association of Energy Engineers (USA). He was graduated at the Mechanical Engineering Department with First Class Honours at the Imperial College of Science and Technology, U.K. He practices as a Mechanical and Building Services Engineer for over 20 years. Subsequently, he obtained his Master MSc and PhD degree in Engineering at the University of Hong Kong. Dr Chow is currently a chartered engineer in UK, a registered professional engineer in Hong Kong and a chartered professional engineer in Australia. He establishes his own company ISPL Consulting Ltd in the mid 1995 and will celebrate the 20<sup>th</sup> year anniversary in 2015. His company is the consultants in Mechanical, Structure, Safety and Environmental (Energy & IAQ) aspects with about 35 employees. Dr. Chow is actively involved in professional institution contributions. He wrote over 50 technical papers, guidelines, manuals and conducted over 28 technical seminars in Hong Kong, USA (Atlanta), Tokyo, Beijing, Nanjing, Xian, Shanghai, Fuzhou and Singapore in the recent years.

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