汽車發明伊始 智慧化腳步未停歇

文／林一平 講座教授

林一平手繪之 William Rae Young, Jr.。

當一個設備由電力驅動，或能產生電力，資通訊技術就有機會與之緊密結合，產生創意及智慧。汽車就是很好的例子。傳統汽車引擎的動力能轉換成電能，因此與資通訊技術的結合相當自然。而世界潮流往電動車方向發展，對於發展汽車的智慧化更有推波助瀾的效果。

汽車剛發明時，人們對於汽車能提供的諸多附帶功能就有不少想像，並加以實踐。例如讓駕駛者能隨意打電話的智慧型駕駛科技早在 1940 年代就被提出。將電話和汽車結合是貝爾實驗室 (Bell Labs) 的構想，於 1946 年在密蘇里的聖路易市完成建置，提供汽車電話服務。主要的發明者包括 Douglas H. Ring 和 William Rae Young, Jr.。

行車安全的一個重要議題是：開車是否能使用行動電話講話或送簡訊。美國大部分的州政府只准駕駛者使用免持手機 (Hands-free)，禁止手持手機 (Handheld)。汽車免持手機設備取代了手機的揚聲器和麥克風功能，必須處理標準手機的相同擴音問題，主要的聲學問題是回聲消除和雜訊抑制。已開發取消電話中的回聲的許多方法，良莠混雜。

開車時，從免持手機設備撥打電話的人會在呼叫中引入大量噪音。這種情況很複雜，因為軟體不僅必須消除他周圍的噪音，而且必須清晰而大聲地將他的聲音傳送給與他有聯繫的人。最好的軟體解決方案將回聲消除和降噪合併為一種技術，大大增加其靈活性。

交通警察只要看到駕駛者使用手持手機，可直接開罰單。我就曾經被拍照開車拿手機，罰了一大筆錢，著實肉痛。(編按：違規行為，請勿效仿！) 美國大部分的州政府更規定新手開車 (Novice Drivers) 或校車司機乘載學生時不准使用任何手持或非手持的手機。美國對新手開車有特別規範，因為研究顯示，新手開車時若同時講電話，比較不能注意前方路況，並會有蛇行跡象。

行車時伴隨而來的安全問題，導致更進一步的科技研發。而結合資通訊的智慧型汽車也在 1950 年代前就有人構思。一直到近代，智慧型汽車一直不斷的改進，尤其在無線及資通訊技術加持下，現在已有自動停車以及自動導航的技術。甚至駕駛只要一指按下停車鈕，車子就自動倒車入庫。這是否會影響到駕駛執照的考試方式？

我相信新科技的汽車將會改變人們開車行為，也會改變駕駛的規則。當然了，在汽車資通訊中最重要的應用是行車安全，相關的技術包括防撞雷達等等。然而乘車安全仍需靠搭車者的自我保護，例如 2012 年起台灣規定後座乘客也要繫安全帶。目前市面販賣的車種已有全自動的安全帶，但多屬於兩點式安全帶，與我們平時正常使用的三點式安全帶相比，在安全性上大打折扣。

Intellectual Footsteps Have Never Stopped Since the Invention of Automobile

A device which generates or consumes electricity may integrate closely with information communication technology to boost creativity and intellectual ability. Vehicles would be good examples for such integration. Unlike gasoline-powered vehicles, electric vehicles that are powered by electrical energy would naturally utilize a lot of information communication technology. Furthermore, shifting to electric cars has already become a worldwide trend, which may have a great impact on the advance of intelligent vehicles.

When the automobile was first invented, many whimsical ideas bloomed, and experiments regarding the ancillary functions of cars abounded. For example, the idea of smart driving technology that integrated telephones in automobiles was proposed in the 1940s. The technology initially envisioned by Bell Labs was invented by Douglas H. Ring and William Rae Young in 1946, who installed phones inside the car and tried a pilot scheme to provide in-car telephone services in St. Louis, Missouri.

An important safe driving issue: should making phone calls or sending messages while driving be allowed? Most states in the United States ban drivers from handling cellphones behind the wheel, unless the cellphones are hands-free. To substitute for the speaker and microphone of cell phones, hands-free driving devices also need to deal with the same sound amplification issues as regular cell phones do. The major acoustical issues are noise suppression and echo cancellation. Different techniques of echo cancellation specific to telephony have been developed, but these mechanisms are neither consistently effective nor efficient.

Making a call from a hands-free device while driving would introduce a lot of background noise. The situation is complicated because the device software not only eliminates the background noise, but also amplifies the caller's voice clearly. The best solution is to integrate echo cancellation and noise reduction into one algorithm to make them work together seamlessly.

The police can pull you over and ticket you for texting or using your cell phone. I was spotted using my cell phone while behind the wheel and slapped with a hefty fine, which really hurt. (Editor's note: please do not imitate this violation of rules and regulations.) Most states in the United States prohibit novice drivers and on-duty school bus drivers from the use of cellphones at all. Many state driver licensing laws have specific provisions for novice drivers. A study shows that novice drivers talking on cell phones while driving are more likely to not pay full attention to the road and engage in careless lane weaving.

The safety requirements for driving have led to further technological development. Smart vehicles with integrated information and communications services were conceived of in the 1950s. Up to the present moment, smart vehicles have been continuously evolving as new technology became available. Wireless technology and information communication technology have been applied to automatic parking systems and automatic navigation systems. Drivers only need to press a button, and the system can enable the car to roll automatically into a garage. One may wonder if driving tests would be changed with such technologies introduced?

I believe that cars with new technologies will transform driving behavior and then change driving regulations. Of course, driving safety is still the most important application in vehicular communication systems, which includes technologies such as collision avoidance radars and more. However, passenger safety relies on the full awareness of the rider. For example, a revision of Taiwan traffic laws in 2012 requires passengers to wear a seatbelt in the rear seat of a vehicle. Nowadays, automatic seatbelts for vehicles are available on the market, but most of them are two-point seatbelts. Compared with the three-point seatbelt as a standard feature, the security of two-point seatbelts is greatly reduced.