Bill Ford: The future of self-driving cars is closer than you think
“Here we stand on the cusp of a series of revolutions,” Ford said. “The car is really becoming a rolling group of sensors.”

Driverless-car bill aims to smooth technology fast lane
“...Sen. Mike Kowall, R-White Lake, who introduced the bill in February, said the bill is less about legalization and more about promoting autonomous technology in Michigan. "This is really a huge economic development bill," Kowall said. "This is going to have an effect of attracting new companies and building upon existing companies that are already here."...”

ITS America: Building the Infrastructure for V2X
Sure seems like ITS America continues to lead with what may not be the right horse. Nothing against V2X BUT Why the exclusive focus of "connected vehicles" (V2X)?

While V2X has some virtues, its coordination requirement and or its infrastructure requirement places a substantive burden on its ability to avoid collisions. As such, its benefits don't begin to accrue until its penetration into the vehicle mix and/or the infrastructure is substantial. For example, even if my car is so equipped, an imminent collision that I am about to have with another car in an intersection requires the other vehicle or the intersection to also be so equipped. Otherwise, nothing good is going to have a chance of happening. So the chances aren't good for me until most others have chosen to have their cars so equipped or most of the dangerous intersections have been instrumented. AASTO, in 2011 (AASHTO Connected Vehicle: Infrastructure Deployment Analysis: Final Report, June 17, 2011; Publication Number: FHWA-JPO-11-090), suggested that the penetration rate in the vehicle fleet might finally reach 30% by 2023 (p84). Since the funding sources for instrumenting intersections have not been identified estimates of the instrumentation rates are very speculative. They will likely lag vehicle penetration rates. That means that even in 10 years the chances that V2X will help me avoid a collision is not much above 30%, and that assumes that I’m not impaired (p2) at the time (but of course I won’t be).

To avoid a random accident at an intersection one must consider the probability that I have so equipped my vehicle. The probability that V2X could be relevant in avoiding a random collision is the probability that the 2nd vehicle is so equipped, given the probability that the 1st is equipped. Thus, the probabilities need to be multiplied (each of those
probabilities are independent). So by 2023 the expectation that a random intersection accident is avoided by V2V is less than 10%. The probability that V2I is relevant is the product of the probability that one of the two vehicles is equipped given that the probability that the intersection is instrumented. If instrumenting intersections lags vehicle adoption, this contributes little. More importantly, the expectation doesn’t become better than a coin flip until the penetration rate approaches 70%. Even with that penetration rate, one also needs that at least one of the equipped driver not be impaired (hopefully that probability can someday approach 1) and that given the shared information, that the drivers know what to do. Alternatively, automated algorithms could kick in to have each vehicle automatically “do the right thing”. Unfortunately, V2X is irrelevant in avoiding collisions with non-vehicles (trees, poles, parked cars, deer, pedestrians ...).

This brings me to what I believe many of us, including ITS, should focus on: helping figure out “what is the right thing for my vehicle to do to drive defensively and avoid collisions” and what improvements in the design, maintenance and operation (including rules of the road and defensive driving strategies that also get me there on time) that make it easier and more robust for my car to figure out “what is the right thing to do” in each and every accident scenario. This knowledge could then be used to:

- Improve automated individual vehicle-based collision avoidance systems to perform autonomous crash avoidance. Since such systems would over-ride any user response in avoiding a collision, much as my anti-lock brakes over-ride my (unintended) attempts to lock up the brakes in emergency situations. Such systems would deliver value to the acquirer from the time the vehicle left the show room (and would work even if the driver became distracted). Also such systems would be ready to enhance the collision avoidance function should additional useful information be available from an eventual V2X communications channel.
- Suggest improvements in the maintenance of the roadway infrastructure to allow not only the proper delivery of roadway information to human drivers, but to allow the vehicle-based sensors to also reliably gather comparable information. Investigations of lane markings and signage that best serves BOTH humans and the evolving vehicle-based sensors are obvious beginnings.
- Highway design modifications that, again, best serve both human and automated driving.
- Augment the operations paradigms (rules of the road, defensive driving tactics, ...) that encourage the evolution of automated driving while continuing to serve at the highest level the human operation of motorized vehicles.

Finally, it is my belief that the even the first round of these vehicle-based automated collision-avoidance driving systems (for example, the 2014 Mercedes E-class) will substantially reduce the lifetime collision probability of each so equipped vehicle. Currently the Mercedes system has an incremental price of $3,000; or an annualized cost of less than $500. As these systems evolve they can be expected to behave as Moore’s Law: collisions-avoided will increase while the cost of the systems will decrease. Consequently, if not at the very beginning, then shortly thereafter, the tangible value of these collision-avoidance systems are likely to be so substantial that a price-leading insurer will emerge to offer discounts that more than pay for the incremental cost of such systems. Once that happens, such features become free.

So while there is no incentive for early adopters to purchase V2X features, Geico (or Progressive or ??) is likely to provide incentive discounts to early-adopters and completely underwrite following-adopters to acquire these features. If correct, the marketplace will fuel the rapid adoption and evolution of these technologies. It is imperative for us to play a leading role to ensure the best evolution of our roadway transportation system by focusing on the evolving technologies of automated driving.

Alain

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North Korea's GPS Jamming Prompts South Korea to Endorse Nationwide eLoran System
http://www.insidegnss.com/node/3532

Really, surprise,surprise?? Any ham radio operator can jam GPS. eLoran isn’t jamable??
This is why I’ve focused on computer vision as a primary sensor and not relied on GPS. GPS is unreliable. In fact automated vehicles will need to rely on vision to determine "where am I?". The code will need to be written to enable
them to read roadsigns and mile makers. If GPS is available, they'll then just do it "the old fashion way". This information is sufficient for the automated vehicle to prepare itself to make the right turn once it comes in sight and should it miss the turn, allow for the route ahead to be recomputed and to key up the new appropriate next turn. No problem!

From the Public Sector: My response to the US DoT on Surface Transportation System Automation (http://orfe.princeton.edu/~alaink/SmartDrivingCars/Kornhauser_%20Response2AutomationRfI.pdf)

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Calendar of Upcoming Events:

Stanford University, Palo Alto, CA Transportation Research Board’s premier multidisciplinary research and policy conference focused on Road Vehicle Automation. If you are actively involved in road vehicle automation and would like to actively contribute to the success of this conference by becoming a patron or sponsoring one of the meals, please contact me at alaink@princeton.edu.

June 26-28, Gold Coast, Australia

June 11-12, Detroit MI

Smart Driving Cars
Thursday, April 25, 2013

Mercedes is 1st Mover and Lifts Bar with ’14 Mercedes E-Class Safety Features
Supported by the following TV Commercials (If you haven’t seen them on TV they are worth watching)

“Hard to Imagine” Commercial
http://www.youtube.com/watch?v=Hr-vxprjMVE

“Clown” Commercial
http://www.youtube.com/watch?feature=player_embedded&v=Xx2m5KMeShY

From the Public Sector: My response to the US DoT on Surface Transportation System Automation (http://orfe.princeton.edu/~alaink/SmartDrivingCars/Kornhauser_%20Response2AutomationRfI.pdf)

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Summaries:

Smart Driving Cars
Friday, April 19, 2013

April 18, Atlantic City, NJ I spoke on “Smart Driving Cars: Where Are We Going? Why Are We Going? Where Are We Now? How Might We Get There? Where Might We End Up?” Presentation was similar to that which I gave at the ITE meeting except it included an expanded section on the rudimentary business case for Smart
Driving Cars as well as some of the ride-sharing and fleet size estimates for a New Jersey area-wide autonomous Taxi System findings in Chris Brownell’s senior thesis

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Smart Driving Cars
Monday, April 14, 2013

The Business Case for Smart Driving Cars: For the consumer, Smart Driving Cars have three main values: increased safety, comfort and convenience. Of these safety is most easily quantified because damages are largely adjudicated in monetary terms. AAA estimates that traffic fatalities and injuries amounted to $256B in 2011, or a cost of about $1,328 in ’05 dollars for each licensed driver. Of this amount approximately 50% ($664) is paid by private insurance, the pass-through portion of insurance premiums. Individual crash victims absorb 26% ($340) of the cost (basically the deductible of what the insured has to absorb if involved in an accident), other 3rd parties absorb 14% ($185), the Federal treasury absorbs 6% ($80) and local municipalities 4% ($50). Google’s simulation of the operation of its self-driving car on the range of real crash scenarios resulted in a forecast of 81% fewer fatalities and 65% fewer injuries. This substantial reduction in car crashes would save in the US $183 billion annually. Moreover, these safety improvements would be enjoyed proportionally by each owner/user of a Google car. Thus, the insurer of the average licensed driver switching to a “Google car” could expect to reduce its pass-through liabilities by an average of $475 per year. Since these are simply pass-through dollars, one could expect that an insurance price-leader might readily offer discounts of up to, say, $450, keeping the expected remaining $25 for its “generosity”. The Google car user would also forgo $247 in expected “deductible self-insured” obligations.

The $450 insurance discount could readily finance, if not the expensive Google “lidars”, the lower cost radars and cameras contemplated by the auto industry for its initial wave of automated lane keeping and “always-on” collision monitoring and avoidance systems. For example, the Mercedes “jam-assist” system is expected to be available on 2014 models as a $3,000 “driver assistance safety option”. While jam-assist doesn’t have all of the features of a Google car, it may be able to capture as much as two-thirds of the safety benefits through the collisions that jam-assist can be expected to avoid during the car’s lifetime. If so proven, then the $300 discount that Flo, or the Gecko, or Good Hands or the General or some other insurer can readily offer would essentially finance this $3,000 safety feature. In fact Flo should escort you to the Mercedes dealer and pay for the option if you agree to buy a Mercedes and continue your current policy payments. (Remember, in giving Mercedes $300 per year over say 12 years, she is also keeping that $25 “generosity” for her effort, so she is happy.) In addition to substantially reducing the probability that this car is going to kill you, what’s in it for you? Well, how about the two-thirds of the $247 self-insurance expected obligation that you would avoid each year. More importantly you get the anxiety-relief that flows from having driving assistance while traveling in some of the most tedious, boring and unpleasant roadway conditions. Finally, society wins because we can’t really place a value on the injuries and fatalities that will be prevented. They are priceless!

Going all the way with Google Cars (or even just two thirds of the way with “jam-assist”) would mean for New Jersey an annual avoidance of 500 (340) fatalities and 28,000 (19,000) injuries “valued” at $3.55 ($2.38) Billion per year.

We MUST make this happen. Everybody wins.

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Smart Driving Cars
Monday, March 31, 2013

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Smart Driving Cars
Monday, March 25, 2013

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Smart Driving Cars
European Update: Workshop: Automation in Road Transport (contains links to participants & presentations)

...As background if you haven’t read it: from June 29, 2011: Definition of necessary vehicle and infrastructure systems for Automated Driving Final report SMART 2010/0064

Smart Driving Cars

Smart Driving Cars

Smart Driving Cars

Smart Driving Cars

This is BIG!!!

Continental and BMW Group Working Together to Develop Freeway-Grade Highly Automated Driving

BMW Press Release

Continental Press Release

This is BIG, not only because they have “an agreement to jointly develop an electronic co-pilot for this purpose”, but because...

- It aligns a component supplier with a manufacturer. Where does this leave Daimler and VW/Audi? To join up with Bosch? What about Delphi? Join back with GM on this one?? Where does this leave the other manufacturers; will they align? The competitive race to attract consumers to the showroom has really heated up.

- They’ve realized that safety is now clothed in comfort & convenience. Together, they make a powerful message to the car buying public. This technology will draw people into the showrooms. The wake-up call was delivered by the emergent competitor, Google, rather than government edicts or rule-makings. “…[i]n capitalist reality…, it is not [price] competition which counts but the competition from the new commodity, the new technology…- competition which commands a decisive cost or quality advantage and which strikes not at the margins of the profits and the outputs of the existing firms but at their foundations and their very lives.”  

Joseph A Shumpeter (1883-1950)