A Legal Perspective on Three Misconceptions in Vehicle Automation

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Abstract In this chapter I address three commonly misunderstood aspects of vehicle automation: capability, deployment, and connectivity. For each, I identify a myth pervading public discussion, provide a contradictory view common among experts, explain why that expert view is itself incomplete, and finally discuss the legal implications of this nuance. Although there are many more aspects that merit clarification, these three are linked because they suggest a shift in transportation from a product model to a service model, a point with which I conclude.

Keywords Vehicle automation • Automated driving • Autonomous driving • Self-driving • Driverless • Law · Regulation • Tort law • Levels of automation • DSRC • V2V • V2I • V2X • Telematics • NHTSA

1 Introduction

In my talks on vehicle automation, I often confront a specific preconception, fostered in part by casual media reports, of the “self-driving car.” It is, many audiences assume, a car that is fully capable of driving itself on any road and in any weather

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while its occupants, should there even be any, are asleep in the back. It coordinates with other vehicles by exchanging electronic messages. And it is nearly ready to be sold to consumers—or it would be, if not for those darn lawyers.

I am not constructing a strawman (or strawcar): These assumptions seem to persist even as the public hears and learns more about vehicle automation. And because inaccurate perceptions can lead to imprudent policy, countering them is crucial.

To this end, automotive experts frequently emphasize incremental automation over full automation, contrast research platforms with production vehicles, and distinguish connected vehicles from automated vehicles. While these clarifications are correct in many ways, they also risk blinding automakers and regulators to transformative changes in transportation.

This chapter argues that some kinds of truly driverless vehicles are actually imminent; that the line between research and production will be blurred by novel deployments; and that connectivity, if properly defined, is integral to automation. The critical insight is that tomorrow's vehicles will belong to tomorrow's world, not today's [6]. As this chapter concludes, that world is likely to emphasize services over products—a shift with significant legal consequences.

2 Capability

In early 2012 Google released a video of Steve Mahan, who is legally blind, traveling around town in the driver's seat of one of the company's research vehicles. The video, which has been viewed more than five million times, reinforced the popular vision of the automated vehicle: A late-model car (in this case a Toyota Prius) retrofitted with electronics (most prominently a spinning laser system) that enable it to operate safely in any environment (including a Taco Bell parking lot) without assistance from the human user (who may even be blind).

This popular view—that fully driverless cars and trucks are imminent—is generally rejected by automotive experts, who instead speak of a gradual shift from human drivers to computer drivers. Influential taxonomies developed by the German Federal Highway Research Institute (BASt), SAE International,[1] and the US National Highway Traffic Safety Administration (NHTSA) all focus on intermediate levels of automation in which humans and computers consecutively or concurrently perform the driving task. An ongoing study initiated by NHTSA in partnership with General Motors and Google, among others, studies only this "mushy middle" of automation. And notwithstanding the headlines generated by their recent flurry of press releases, major automakers have in general promised at most to introduce cars over the next few years that can drive themselves in some environments.

By focusing on automobiles, however, this expert embrace of incrementalism tends to obscure alternative vehicle technologies that are more amenable to higher

[1] I am involved in this work. Before changing its name to an unintelligible anachronitialism, SAE International was the Society of Automotive and Aerospace Engineers.

levels of automation. While a two-ton car might not drive itself unsupervised through a city at 30 miles per hour any time soon, some truly driverless systems that are low-speed, low-mass, geographically restricted, and centrally supervised are actually nearing commercialization. These simplifying constraints help reduce both the risk and the broader uncertainty inherent in deployment: For most irregular occurrences, the system might achieve a minimal risk condition simply by stopping the vehicle and requesting assistance.

These alternate systems hold promise for both passenger and freight applications. Automated passenger shuttles like those demonstrated in the European Union's CityMobil project could be particularly well suited for airports, city centers, business clusters, university campuses, convention centers, military bases, retirement communities, amusement parks, and last-mile transit applications. Small robotic trucklets could similarly facilitate on-demand and last-mile freight delivery.

Because of their unique promise and peril, these emerging concepts merit explicit attention from policymakers. Focusing exclusively on incremental automotive automation will result in laws, policies, and practices that are inapposite to these alternate concepts. This mismatch could either stymie these technologies or leave policymakers unprepared for their eventual debut.

With respect to existing law, there are at least two dimensions to this potential disconnect: These vehicles are driverless, and they are not carlike.

Driverless vehicles will face legal issues not present at lower levels of automation [3]. Cars that can drive themselves on freeways, for example, will generally fit well within existing vehicle codes: Although the legal obligations of the human operator are not entirely clear, at least this person will be physically present and readily identifiable. In contrast, the legal operator of a driverless shuttle may be a passenger, a remote supervisor, or no one at all. Recent state laws specifically regulating automated vehicles do not help: Who "causes the autonomous technology to engage" when a driverless shuttle is placed in service by an engineer, requested by and automatically dispatched to a passenger, and overseen by a technician in a remote facility?

Even if they are manually driven, special vehicles like shuttles face another legal issue: On the question of vehicles that don't quite look like a car (or quack like a truck), state and federal law are terrifically muddled [4]. Depending on how it is treated by NHTSA and by state governments, a low-speed shuttle might have to meet the full set of federal motor vehicle safety standards, a less demanding standard intended for low-speed vehicles, or none at all. Whether the shuttle must be registered, whether its operator (whoever she is) must be licensed, and if so what kind of license she must obtain will all depend on where and how the shuttle is deployed—and on how governments interpret their own ambiguous laws.

These questions are starting to get some attention. SAE International's taxonomy expressly contemplates driverless shuttles as an instance of "high automation." Thanks in large part to Adriano Alessandrini, one of the research needs statements to emerge from the workshop that inspired this book concerns the legal status of these vehicles. And California's ongoing rulemaking process for automated vehicles of all kinds provides a particularly important opportunity to meaningfully address the development and deployment of these driverless systems.

3 Deployment

Casual consumers of automated vehicle news—though not the many casual producers of this news—could be forgiven for concluding that driverless cars are ready to be sold to ordinary drivers. States are passing laws, companies are testing cars on public roads, and commentators are declaring that “the technology is here.” The corollary of this belief is that, if such vehicles are not yet ready, then fault must lie elsewhere—with consumers for not accepting them, with governments for not “legalizing” them,[2] or with lawyers for outright blocking them.

A 2013 radio interview is illustrative: The first guest, a reporter, asserted that “the technology is here” and that “right here and now we can have driverless cars.” I replied that the research vehicles under discussion were neither designed nor demonstrated to operate at a reasonable level of risk under a full range of unsupervised driving scenarios. After a short break, the host resumed the discussion by reminding listeners that “the technology for driverless cars is in fact available, and we’re trying to figure out why we don’t then have them.”

Automotive experts recognize that the path from research to product is long—and that there is a tremendous difference between, on one hand, a research system that well-trained technicians carefully maintain, update, and operate exclusively on certain roads in certain conditions and, on the other hand, a production system that poorly trained consumers neglect and abuse for two decades in almost any conceivable driving scenario. For this reason, production vehicles take years to be developed, tested, and certified to a complex array of highly detailed public and private standards.

Recent state laws regarding automated driving embrace this important distinction between research-and-development testing and consumer operation: Nevada’s infinity-styled “autonomous vehicle” license plates, for example, are red for test vehicles and, one day, will be green for all others.

However, a yellow license plate may, at least metaphorically, be most appropriate for a set of potential deployments that do not fit comfortably in either category. The first deployments of the low-speed shuttles described above are likely to be pilot projects. Volvo Cars intends to place 100 automated vehicles on public roads in the Swedish city of Gothenburg by 2017.[3] Internet companies that are comfortable with invitation-only beta rollouts of their software and hardware may adopt a similar approach for their updatable automotive products. And an individual who uses a vehicle that she herself has built or modified may likewise straddle the divide between testing and operating.

These hybrid deployments may push up against state and federal regimes that assume a more straightforward product path for research, development,

[2] Referring to the “legalization” of automated vehicles is misleading [3].

[3] Similarly, as part of the US Department of Transportation’s field study of dedicated short-range communications (DSRC)—a related but, as discussed below, distinguishable set of technologies—nearly three thousand ordinary vehicles in Ann Arbor, Michigan were retrofitted with DSRC equipment.

production, sale, resale, and disposal. For example, while automakers currently self-certify that their vehicles as originally manufactured meet federal safety standards, this date of original manufacture may be less determinative of the safety of vehicles subsequently modified. Similarly, while state tort law often looks to the date that a product is originally sold to a consumer, as a practical matter this date may become less clear or less relevant to alleged harms.

Indeed, automakers concerned about the post-sale modification of their vehicles by third parties have lobbied successfully in Florida and Michigan (and unsuccessfully in California) to expressly limit their liability for injuries caused by such modification. These statutory provisions, however, largely restate existing principles of tort law, which makes both the insistence on and the opposition to them rather striking.

The complete lifecycle of early automated vehicles does present significant concerns. The mechanical life of these vehicles may be much longer than the functional life of their automation systems. Consumers in the secondary market may face a hodgepodge of proprietary driver assistance systems with different capabilities and limitations that cannot be easily intuited. And vehicles may long outlive some of the companies—whether small startups or legacy behemoths—responsible for their design, sale, and ongoing support. For these reasons, what I have called "planning for the obsolescence of technologies not yet invented" should be a key consideration for automakers, regulators, and insurers [5].

4 Connectivity

The final element in my troika of popular misconceptions is the assumption that self-driving vehicles navigate by communicating in real time with each other or with some central computer. Media reports routinely refer to driverless cars talking to each other, and an (unsuccessful) ad in Florida bemoaned a state senator's interest in "legalizing driverless *remote-controlled* cars." This assumption encourages the belief that only when all vehicles on a given highway can drive themselves will any one vehicle be able to do so—an all-or-nothing view of automation more appropriate for the last century than for this one.

Contrary to the assumption, however, most of the automated vehicles to achieve celebrity status—Stanley, Boss, Shelley, and the Google fleet, to name a few—do not utilize information or instructions electronically transmitted either by other road users (V2V) or by local infrastructure (V2I). These vehicles typically lack the equipment for dedicated short-range communications (DSRC). With some exceptions, they rely less than commonly believed on satellite—and ground-based navigation systems like GPS. And, as research platforms, they generally do not engage in even the most basic forms of signaling, including honking the horn, engaging lights, and gesturing.

Automotive experts accordingly distinguish between "automated vehicles" and "connected vehicles." The research platforms of the previous paragraph are, or aspire to be, automated. The DSRC-capable vehicles involved in the US Department of

Transportation's Safety Pilot in Ann Arbor are connected. Some systems, like the platoons that have now been demonstrated on three continents, are actually both. As Steven Shladover explains, automation and what he calls "cooperation" may be symbiotic, but they are not synonymous [2].

The more common distinction between automation and "connectivity" has unfortunately abetted a casual conflation of the latter with DSRC. As the catchall term V2X suggests, vehicle connectivity is much more than just real-time communication with nearby vehicles and infrastructure. Today's vehicles already use cellular-based telematics for emergency assistance, vehicle monitoring, and the provision of entertainment and navigation services [1], and Tesla has been remotely updating critical systems in its vehicles since 2012. Consumer-ready automated vehicles will need to receive remote updates for their maps and their algorithms—updates that will likely depend on the real-world data that these vehicles collect and transmit. In other words, even if they never use DSRC, automated vehicles will be connected.

This broad connectivity, in turn, is just one aspect of what I call proximity: the information, access, and control that companies increasingly enjoy with respect to their products, product users, and product uses [6]. By making certain behaviors—such as warning a driver about newly discovered dangers, remotely updating vehicle software, or even restricting an owner's use of her vehicle—possible or practicable, this growing proximity may expand the legal obligations and liabilities of automotive companies toward people harmed by their products.

Consider, for example, an automaker that receives reports that a newly constructed bridge confuses a crash avoidance system on vehicles that it sold years earlier—vehicles that it has both the technical ability and contractual authority to remotely update. At this point the automaker faces a range of options: do nothing, warn consumers but do no more, release an update (voluntary or mandatory) as soon as possible, release an update (again voluntary or mandatory) only after it has been thoroughly tested, or disable the relevant system until this fully tested update has been released. Each of these choices might prevent some crashes but contribute to others. Should these crashes occur—and perhaps even if they do not—the automaker may need to defend its choice in court.

5 Conclusion

This chapter has addressed misconceptions regarding the capability, deployment, and connectivity of automated vehicles.

Despite the popular belief that cars will soon drive themselves anywhere and everywhere, the shift from human drivers to their computer counterparts will be more gradual—and yet driverless specialty vehicles are an exception that should be addressed proactively in law.

Despite the popular belief that research vehicles are consumer-ready, the path from research to production is long—and yet alternative deployment models will blur testing and operation in a way that merits more contextual regulation.

Despite the popular belief that all self-driving vehicles talk to each other, automation may not require this kind of real-time communication—and yet advanced automation will require some form of connectivity that could expand the tort obligations of automakers.

The key examples I have used for each of these—driverless shuttles, pilot deployments, and remote updates—collectively suggest that automation will accelerate the shift in transportation from products to services. Companies operate shuttles, manage pilot programs, and update software systems for which individual consumers are likely to pay, directly or indirectly, on an ongoing basis. In short, the automated vehicles of the future may be copiloted by companies as much as they are by computers.

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