Will My Next Car Be a **Libertarian** or a **Utilitarian?**

Who Will Decide?

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Change is coming.

Experimental, self-driving cars are plying public roads in many U.S. states, heralding what some automotive industry experts and regulators see as a profound and imminent disruption in the transportation industry, and a change to our way of life. With this change, a large swath of human choices regarding operation of vehicles, response to driving hazards, and compliance with important as well as petty laws will be consigned to computer software. Many of these choices are ethical in nature, and their expression in machine-controlled software will encode answers to important questions about liberty and utility — questions that remain a matter of serious social contention. Who will decide how these choices are encoded in software, and will their digital mandates be guided by respect for individual liberty or deference to social utility?

Although the pace of autonomous vehicle development has been accelerating, awareness of the accompanying social and economic changes is only

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now coming into view. According to the National Conference of State Legislatures, six states have enacted laws permitting regulated use of autonomous vehicles on public roads, and another sixteen states worked on such legislation in 2015 (1). These lawmakers are reacting to the rapid progress of autonomous vehicle technology. Throughout the automotive private sector, the debate is no longer *whether* but *when* autonomous vehicles will achieve self-driving skills superior to humans in terms of safety and efficiency. Dr. Egil Juliussen, Research Director & Principle Analyst for HIS Automotive — a leading market and consumer research firm — estimates that by 2025 self-driving vehicles will be emerging as an ordinary part of our daily commute, and by 2035 roughly 90% of the vehicles on the road will possess high levels of self-driving automation (2).The consensus among industry experts holds that autonomous vehicles will eclipse manual driving as soundly as motor cars eclipsed horses at the beginning of the last century.

Why is this Happening and Why Now?

The National Highway Traffic Safety Administration (NHTSA) reports there were 32 675 people killed in U.S. motor vehicle crashes in 2014 and 2.3 million injured (3). These 2014 statistics are not unusually high or low, and that explains, in part, why we are somewhat desensitized to them. In another study, NHTSA reports that *drivers* are the critical reason for crashes in 94% of cases (4). Aside from the horror of tens of thousands of violent deaths annually and the tragic familial mayhem in the aftermath of each, there are massive economic consequences. NHTSA estimated the total cost for traffic crashes to be $277 billion for the single year of 2010 (5). As a reference point, in fiscal year 2014 the United States spent $95 billion on the war on terror (6). (Also note that the money spent on terrorism is in response to a total of 3380 American citizen deaths over a period of 13 years (7).) The long U.S. history with traffic accidents has dulled awareness of their crippling effect on the U.S. economy.

Given these grim statistics, it comes as no surprise that NHTSA is interested in the advent of autonomous vehicles and their potential to eliminate death due to human driver error. In May of 2013 the agency published a policy on automated vehicles classifying five levels of vehicle automation, and providing states in the U.S. with preliminary guidance for testing the various levels on public roads (8). That 2013 NHTSA document enthusiastically cites anticipated safety, environmental, traffic efficiency, and economic benefits of automated vehicles.

Why has NHTSA only recently been spurred to publish an autonomous vehicle policy? The answer has to do with a confluence of technologic advances in computing power, software development techniques, and advanced sensor designs, as well as a parallel series of stepping stone successes in government and industry-sponsored robotic vehicle competitions. These, in turn, have driven commercial successes in the introduction of modest driver assist technologies that are incrementally approaching full automation. This assemblage of technological advances and incremental successes has triggered a sort of collective dawning in the minds of regulators, automotive industry veterans, and — just as important — Silicon Valley types. That collective dawning goes something like this: "Fully autonomous driving really can be achieved. It will be achieved soon, and it will be *big*."

A large swath of human choices regarding operation of vehicles, response to driving hazards, and compliance with laws will be consigned to computer software.

A long list of traditional vehicle manufacturers including GM, Ford, Toyota, BMW, Mercedes, VW, Audi, Volvo, and Honda are investing heavily in the development of self-driving cars. More surprising, non-traditional, West Coast U.S. players like Google and Uber are betting big on not only participating in the autonomous driving arena, but on shaping the playing field. As of this writing, Google's experimental autonomous cars have self-driven more than 1.2 million miles — a statistic they proudly cite alongside video links to non-actor elderly and handicapped folks joyfully experiencing the sort of independence a test ride in Google's driverless car promises (9). Some industry pundits speculate that Google is positioning itself to become to the auto industry what Microsoft is to the computer industry — the prime purveyor of operating systems and software applications. Another non-automotive company, Uber, intends to both lead as well as to "ease" the transition to self-driving cars by investing in their own R&D program and morphing their ride-share business into a driverless on-demand transportation service (10). Though no Uber self-driving prototypes have been unveiled just yet, the company's level of seriousness about this market is evidenced by Uber CTO, Thaun Pham, publicly communicating his 2015 hiring goal of 1000 engineers (11). Not to be outdone, Uber's fiercest competitor, Lyft, has partnered

with General Motors whereby GM is developing self-driving vehicles for Lyft's on-demand transportation service and funding an additional $500 million to help Lyft keep up with Uber's relentless expansion [12].

Social Inflection and Ethical Concerns

Dr. Jeffery Greenblatt of the U.S. Department of Energy's Berkeley Lab estimates the widespread adoption of automated vehicles into the U.S. taxi fleet will reduce greenhouse gas emissions by 87-94% on a per vehicle basis by 2030 as compared to today's taxis [13], [14]. Greenblatt bases his estimate on the observation that 87% of U.S. light duty vehicle trips transport only 1 or 2 people. Therefore, elimination of the driver in automated taxis will result in taxi fleets dominated by small, two-occupant vehicles. Additionally, the driving habits of these smaller automated vehicles will be tuned for economy, and their diminutive size will be well suited for electric battery rather than fossil fuel power. Finally, the low cost per mile to ride in small, electric, driverless cars will encourage widespread use of ubiquitous on-demand fleets of self-driving taxis in place of privately owned vehicles.

Companies like Uber are betting that private individual ownership of cars will wane with the emergence of driverless vehicles.

Among industry followers, Greenblatt is not unusual in his estimate that private individual ownership will wane with the emergence of driverless vehicles. Companies like Uber are betting on it, and — given that the average American household spends 19% of their income on transportation [15] — the economics will press in that direction. Aside from economic rationality, the availability of ubiquitous, affordable, on-demand, automated personal transportation is likely to lure some folks away from car ownership by simplifying their lives. They will no longer have to deal with parking, fueling, maintenance, registrations, breakdowns, asset depreciation, road stress, and traffic citations. Additionally, the portion of their day previously spent driving will become available for leisure or productive work while in transit. At the recent Automotive Tech.AD 2015 conference devoted exclusively to vehicle automation, attendees seemed infused with excitement at the prospect of participating in what they see as an imminent social inflection point [16]. If things turn out as expected, the combination of waning personal vehicle ownership, increased leisure or productive time, reductions in greenhouse gas emissions, widespread reductions in traffic deaths, and pervasive trust in transportation "robots" will amount to nothing less than a paradigm change in the Western lifestyle.

Yet — serious work has barely begun on the ethical issues associated with the driving decisions that autonomous vehicles will be required to make. In essence, vehicle manufacturers will be shouldering the moral responsibility and legal liability for preprogrammed driving decisions that, in the past, have been the responsibility of human drivers. The technology is getting ahead of our social and legal frameworks.

California Polytechnic State University philosopher Patrick Lin points out that our laws are ill-equipped to deal with autonomous vehicles. He illustrates the difficulty by exploring variations of Philippa Foot's famous trolley problem [17]. Imagine a runaway trolley hurtles toward five people on its track. You have the opportunity to prevent the certain death of those five by actuating a track switch to change the trolley's course; however, in doing so you would be sending the trolley onto another rail occupied by one person. Is the correct ethical choice to stand by and watch the five die or to actuate the switch causing the one to die? Autonomous vehicle software will necessarily make similar — usually more subtle — ethical choices.

If, for the sake of illustration, we suppose that the sacrifice of the one to save five is, in effect, "using" him against his will, the trolley problem can serve as a contrast between utilitarian and libertarian ethics. Actuating the switch to save the five is an ethical stand reflecting John Stuart Mill's utilitarian view that our actions are right in proportion to the happiness they promote and wrong in proportion to the unhappiness they promote [18]. Under utility, our decisions should be guided so as to bring about the greatest good for the greatest number of people, and that guidance is a core tenet of modern liberalism. In contrast, a refusal to sacrifice the one to save five would be an ethical stand reflecting Immanuel Kant's principle that individuals are ends in themselves and not means to the ends of others [19]. Libertarian philosopher Robert Nozick further developed Kant's principle by insisting that, if an infringement on another person for one's own ends is wrong between individuals, it is just as wrong between society and individuals. To Nozick, respect for the rights of individuals is an inviolable side constraint to human action, and individuals may not be used without their consent for the greater good of others [20].

Some thinkers might argue that actuating the track switch is not "using" the one to save five since the five

would be saved due to the switch actuation even if the one were not on the diversion track (21). Therefore, there has been no violation of a human right to be protected from involuntary use of their body or work for the greater good of others. In other words, the one person being sacrificed is dying as a matter of collateral damage. He is not being "used" to save the five. Of course, the importance of this distinction is likely to be lost on the one being killed, since he could justifiably feel that he has a right not to be sacrificed without his consent. In fact, according to libertarian philosophers Vallentyne and van der Vossen, a core tenet of libertarianism holds that persons have a right of full self-ownership. That right of self-ownership is violated when an individual is subjected to non-consensual and unprovoked killing, maiming, enslavement, or forcible manipulation (22). Additionally, the fact that such a nuanced distinction, between collateral human sacrifice and unfair use, might be offered — in an attempt to blunt the troubling ethics of sacrificing others — underscores the need to carefully vet technologies that would electronically adjudicate these sorts of unsettled ethical controversies.

We can imagine trolley-like scenarios for automobiles. Two young children dash into a street before an oncoming vehicle, one chasing the other. The driver has no time to brake yet can swerve just enough to miss them — but only by hitting a single bystander child on the road shoulder. It is one thing for a human driver to be faced with such an awful choice and live with the consequences. It is something entirely different for choices like this to be preprogrammed into a machine, thereby encoding mandates to ethical questions that are far from settled in our civil polity. In the first case, someone onsite makes a heart wrenching ethical decision and takes responsibility. In the second, someone offsite makes an advance calculation without witnessing the effects, and attorneys fight about responsibility in the aftermath.

During the Automotive Tech.AD 2015 conference I posed the above "two-vs-one" child scenario during an "ice breaker" round table discussion, and was not surprised to hear the utilitarian reply. All who responded felt that running over one child was preferable to running over two, even though it would involve a choice to purposefully steer into the one. These were senior managers and executives from companies directly involved in the development of autonomous vehicle technologies, and their replies reflected a social utility that most — though not all — of us intuitively accept. We want to minimize the sum total of human suffering, though we are often unsettled as to what constraints should be applied to the means by which we achieve that goal.

As a follow up to their utilitarian reply, I offered a description of another — this time non-automotive — ethical choice that is championed in a journal paper coauthored by Katarzyna de Lazari-Radek and the famous utilitarian philosopher Peter Singer. In that paper the authors present a hypothetical scenario about a brain surgeon operating on a patient (23). The patient is an ideal organ donor. There are four other dying patients who could all be saved by the organs of the surgery patient — each via receipt of a different organ. Singer and de Lazari-Radek argue that, according to utilitarian consequentialism, the brain surgeon would be right to kill the patient being operated on and use her organs to save the four in waiting — provided that the surgeon can do so without being discovered and does not publically condone the act or publically promote acts of this nature (23, p. 40). This "esoteric morality" is a coherent — albeit extreme — extension of utilitarian consequentialism, provided that absolute secrecy of the act can be maintained. Singer and de Lazari-Radek note that secrecy is needed (in part) to avoid negative consequences regarding loss of faith in the medical profession if doctors are known to kill some patients to save others. They acknowledge that keeping these sorts of secrets is difficult, and also that doctors who carry out such practices are likely to lead themselves into more risky moral judgment calls. Therefore, they admit we should advise doctors against such practices even though the execution by surgery would be the morally correct thing to do — so they claim (25). The folks that I shared a round table with at the conference were quick to condemn the notion of a doctor sacrificing one patient to save many. Their self-conflicting reactions to the autonomous vehicle steering into the child versus the murderous doctor epitomize the ambivalence that we as individuals and as a civil polity experience when confronted with the insoluble tension between serving the greater good and respecting the rights of individuals.

A notion of duty toward vehicle occupants offers yet another ethical challenge to those who are developing autonomous vehicles. Would it be acceptable for an autonomous car to swerve into a lamppost thereby sacrificing you, its sole occupant, in a utilitarian effort to avoid the two children in the road? When you engage a self-driving vehicle to transport you, is there a duty — born by the vehicle's designers — to protect you above all others in all circumstances? Suppose that you and your own child are on board. The utilitarian calculation must consider the greater probability that you and/or your child *might* survive the lamppost as compared to the odds against the two children on the street. Is it ethical for engineers programing vehicles to take those sorts of chances with the lives of occupants if the greater good is served?

Examples of children at dire risk in the street are, of course, rare in terms of our daily driving experience.

Nonetheless, we make many driving decisions of lesser ethical import every day. We chose to exceed the speed limit by 5 mph, cross a double yellow line to avoid a pothole, speed just long enough to pass a slow moving car, roll-stop a stop sign when nobody is around. If vehicle manufacturers were to program their cars to do these sorts of things, they would need to accept liability for traffic citations. Yet it seems that, as free agents, we have the right to decide for ourselves when circumstances make a rule petty. Whether trivial or profound, there are occasions when pedestrians, bicyclists, bad roads, weather, faulty vehicles, or other drivers create circumstances demanding decisions that challenge the ethical underpinnings of human drivers — decisions that, for fully autonomous vehicles, would be preordained in the software. Who is to determine those preordained decisions? Software engineers? Their managers? Attorneys? Government bureaucrats? Legislative committees?

Something in Between All-or-Nothing

We might want to consider a solution that preserves some vestige of the liberty — and associated responsibility — we now enjoy with respect to our freedom to choose how we will be transported from place to place. In the near future, many if not most of us will, on occasion, cede control of driving functions to the vehicles we ride in. Yet, we need not cede command. Perhaps the ethical choices that automated systems make should be open to advance selection by the humans riding in and commanding those vehicles. In practice such advance selection would be no more complicated than taking a written driver's license exam, except there are no "right" and "wrong" answers. The ethical commitments of a person wishing to command autonomous vehicles can be determined via a series of questions requiring ethical choices under differing and difficult driving circumstances — call it a "command profile." Of course, every possible driving scenario cannot be explored this way. There are too many of them. Nonetheless, the queries could be structured to cover classes of scenarios such that autonomous vehicles are subsequently instructed to make choices commensurate with the ethical commitments of the designated commander. The distillation of those commitments into a digital code would be scanned into the autonomous vehicle as a person takes command. In practice this would be as simple as swiping a credit card or entering user login credentials.

What is the down side? Utilitarian minded folks might complain that facilitating human command of these automated systems would allow people to make poor choices falling short of the greater good ideal. On the other side, libertarian minded folks might complain the command profiles would allow people to make poor choices violating the rights of innocents. These objections, of course, talk past the fact that most people *already* are licensed to command and control manual vehicles. If the worry about preserving some vestige of human command is that people in general are not good at making ethical choices, we then need to ask, *who* will alternately decide the "correct" choices to be universally codified into vehicle automation systems? As pointed out by philosophers David Schmidtz and Jason Brennan in response to a proposal that people are better off when their choices are limited, "…if people are no good at running their own lives, letting them run other people's lives does not solve the problem" [24]. By separating command from control and preserving command as a human function bearing on otherwise autonomous vehicles, we trust ourselves to continue doing what only our species seems able to do — wrestle with the unyielding ambiguity of ethical choice.

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Commentary

(continued from page 28)

of these companies has ceased to be advertising, but an unremarkable way in which one communicates with the public.

Can or should anything be done? One can imagine competition regulators stepping in to break up Facebook, or compelling social networking services to interoperate so that individuals can join the provider of their choice without fear of losing their friends on other networks. Scandinavian regulators have, in fact, have taken action to curb undeclared advertising of social media companies on their public broadcasters [4]. One can further imagine public broadcasters establishing public social networks (see [4, p. 152]). But these are all relatively heavyweight solutions, and perhaps some lighter-weight options deserve consideration first.

Firstly, to be fair to the ABC, it also invites its audience to communicate through text messaging and (sometimes) telephone, allowing those who choose not to join its favored social networks to participate.

Secondly, to be fair to my hobby group, the previous branch to which I belonged had a policy that all official announcements were to be made via email, and that its Facebook group was only for social chit-chat. This policy ensured that everyone with email knew what the group was doing, and served to remind Facebook users that not everyone read it.

My last point requires me to tell a quick story first. I was once a member of LinkedIn, having received an invitation from a colleague back when social networking services were new and I thought it worth a try. After a few years of failing to find anything I could do with it, and hearing little or nothing from "connections" via LinkedIn or otherwise, I began replying to new invitations with a personal email explaining that I didn't really use LinkedIn. In response to one such email, my would-be connection admitted that she didn't really use LinkedIn either; she just felt compelled to click on the "Do you know?" button.

In a later conversation about the worth or otherwise of LinkedIn, one of my colleagues observed that it felt rewarding to accept connection requests, and rude to decline them. I countered that this was exactly *why* I'd deleted my LinkedIn profile: it seemed superficially rewarding to accept connection requests, and at first I thought they might lead to something, but this quickly turned to disappointment when I realized that I wasn't actually connected to these people in any meaningful way. I wonder if we instead ought to feel rude for allowing Internet companies to exploit our relationships in order to build their customer bases, and to present contrived social networks built up by automated messaging and idle button-clicking?

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