# Robot Cars from the Fifties

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## TEASER

In his short story "Sally" from 1953, Isaac Asimov envisioned the functions, chances and risks of self-driving cars. Now, advanced driver assistance systems increasingly take over actions from the driver, and fully autonomous prototypes seek to become an everyday feature on our roads. Asimov's story already confronts the reader with some problems discussed in machine ethics today.

## THE STORY BEGINS

Sally is a convertible and has been the "favorite" of Jacob Folkers (the first person narrator of Asimov's short story) for five years. He operates a farm where out-of-order "private automatics" (aka "automatobiles") are put out to pasture (s. [1] and [3]). In Folker's world, sedans are male while convertibles are female. Sally "had the cleanest, finest lines I've ever seen on any model, bar none" [1] and she takes care of her good looks. Just like the other automatics on the farm she is able to wash herself, and she can even wax and polish her chassis. Folkers wants to install this function in all convertibles as he thinks they are vain. Sally is not only attractive, she is also free, almost autonomous. In all that time on the farm, "there'd never been a human being behind her wheel" [1].

One day Raymond J. Gellhorn comes to the farm. He wants to gut the metal machines and salvage their old engines to install them in new vehicles. Automatobiles are very popular but they are also very expensive. Most people cruise only on board of "omnibus-automatics" (aka "automatobuses"). Folkers tells the reader: "I can remember when there wasn't an automobile in the world with brains enough to find its own way home. I chauffeured dead lumps of machines that needed a man's hand at their controls every minute. Every year machines like that used to kill tens of thousands of people. The automatics fixed that. A positron-

ic brain can react much faster than a human one, of course, and it paid people to keep hands off the controls. You got in, punched your destination and let it go its own way." [1] The introduction of the new cars was met with resistance: "We take it for granted now, but I remember when the first laws came out forcing the old machines off the highways and limiting travel to automatics. Lord, what a fuss. They called it everything from communism to fascism, but it emptied the highways and stopped the killing, and still more people get around more easily the new way." [1]

## CHARACTERISTICS OF AUTONOMOUS AUTOMOBILES

The first pages of the story already precisely describe the principles, functions, and opportunities of self-driving cars. They are controlled by computer chips respectively artificial intelligence. With the help of surveillance and navigation systems, they can drive to any desired destination. They can respond quickly, they will probably optimize traffic flows and they will likely reduce the number of vehicle accidents and casualties. Every year, approximately one million humans plus some billions of higher developed animals are killed on the roads all over the world (one million vertebrates each day in the United States alone). These figures are screaming for a radical change (s. [5]). Several projects on self-driving cars are already in progress. Google, Daimler, BMW, Audi and several German, US-American and Japanese research institutes are dedicated to this matter. The applied advanced driver assistance systems are pre-stages of self-driving, autonomously acting cars. They are self-parking and brake automatically in tailbacks and dangerous situations. They operate magnetic parking brakes and switch on the headlights in tunnels or at night. They can do a growing number of things that once only humans had been thought capable of. Some of their decisions are an object of machine ethics, which we will look at in more detail below.

With amazing clairvoyance, Asimov describes not only the possibilities offered by autonomous cars, but the risks of innovation and the societal response to these risks. One example of these risks and the societal response is the issue of control versus liability. Asimov's automatics permit manual operation, but they do so with simultaneous personal liability: when an accident happens in the story, the police urgently warns people against driving in manual operation mode after nightfall. A relevant analogy is in air travel: we feel safe as passengers in an airplane and yet have no

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Prof. Dr. Oliver Bendel – Zurich, April 13, 2015

control; as such, passengers do not carry liability insurance, but pilots do. By replacing human autonomy with machine autonomy, self-driving cars simultaneously incapacitate citizens and divest them of liability. These issues should be dealt with within jurisprudence, technology assessment, technology ethics and information ethics.

## ON THE ROAD TOWARDS MACHINE ETHICS
Ethics normally refers to the morality of humans, of individuals and groups, and in a certain sense also to the morality of organizations, corporate ethics being one example. Ethics can also refer to the morality of machines such as chatbots, robots and UAVs, medical or technical monitoring systems, or computers in algorithmic trading (s. [5]). Or to the morality of self-driving cars, which are not precisely specified by the popular term "unmanned ground vehicle" (UGV) considering that a human being is present – even if only as a passenger. When more or less autonomous programs and systems of this kind are the issue, one can speak of machine ethics (s. [5]), and reference it to information ethics (or, more precisely, computer ethics and net ethics) and technology ethics, or, considering it seems to address a non-human morality, one could understand it as an equivalent to human ethics. In the USA, thanks also to publications of Michael and Susan Leigh Anderson ("Machine Ethics", 2011) as well as of Wendell Wallach and Colin Allen ("Moral Machines", 2009), machine ethics is being established as a discipline. Individual aspects with respect to robot cars will be discussed briefly in the end.

## THE STORY GOES ON
Folkers is incensed by the request from the unscrupulous businessman. Let us recall: Gellhorn wants to gut the machines. For Folkers, his Sally is like a mistress, and the other cars have grown on him too. They do not just seem to have regular personalities, for him they actually do have them. When Sally is merry or amused, she opens her twin doors and bangs them shut. "That's the way Sally laughs." [1] After Gellhorn "knocked out" the convertible and drove around in it, endangering the lives of two sedans, he is chased away from the farm. But he comes back with his accomplices and an automatobus. He wants to disconnect and take away 25 positronic engines, but he forgot to take the private automatics into account. They hunt him and escort him through the streets, with Sally playing a heroic part. In the end Gellhorn is killed by his own bus. It turns out that the cars can "talk" with each other. Obviously, the automatobiles instigated the automatobus. Folkers is deeply shaken, and this changes the relationship to his favorite. "Lately, I notice that I'm even beginning to avoid Sally." [1]

## CAR TO CAR COMMUNICATION
Are talking, intelligent cars pure science-fiction? Quite the reverse in fact! Models with image recognition are already available on the market, like the new Mercedes-Benz S-Class, and various initiatives and projects aim to enable cars to communicate with each other (car to car communication) and with an environment (car to infrastructure communication). Normally, the goal will be to determine the distance between the vehicles, their direction and destination to optimize traffic flows, and to warn one another of hazards. However information on the value of the car and on the passengers would also be accessible. In case of an accident – which cannot be excluded even in the brave new world – cars could discuss and settle the damage among them, by transferring real or virtual money. Especially in case of minor damage this could be realistic. Or they could make a decision before the impact to opt for the lowest monetary or physical damage.

## THE FUTURE OF CARS
This brings us right back to machine ethics and ethics in general. Letting autonomous machines make morally relevant decisions is reasonable as such. However care must be taken that these decisions will not disadvantage the poor or weak. In Asimov's fictional world, only the rich can afford an automatobile. The poor have to take the automatobus. It would be fatal if one could no longer feel safe on the roads because of machines that were too intelligent or driven by questionable interests and might disadvantage someone for surreptitious reasons. It is not a given that machine ethics will yield real moral machines. Science and ethics want as much as possible – sometimes too much. Discussions with car manufacturers are urgently needed. Modern assist systems can distinguish between humans and animals – the mentioned Mercedes-Benz is one example. But what does that mean in practice? When will the car brake and when not? For whom will it brake and for whom not? Can the human still make this decision? Or will it be made by the car, as in "Sally"? In other words: At the end of the day, who will be left behind (s. [2])? These are questions to which machine ethics, information ethics, technology ethics, artificial intelligence, computer science and economics must find sensible answers.

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