Key Ethical Issues for Use of Automated and Autonomous Vehicles

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ABSTRACT

Artificial Intelligence (AI) robotic vehicles—air, ground, space, or water—operate autonomously. A variant is assisting a human operator. An AI vehicle is a robot. Such technologies already operate in early forms. One applied ethics problem is designing rules for operation of these vehicles. The problem is to minimize harm to humans and damage to property while maximizing social benefits. There is a public policy decision about whether to ban or to mandate AI robotic vehicles. Such vehicles may be much safer but at higher financial cost. A related ethics problem is how to set standards for product liability in case of harm to humans or property. Choices involve strict versus negligence liability, within differences between U.S. civil litigation and evolving European Union mandatory compensation approaches. A third approach might be a societal compensation fund. Analysis of AI robotic vehicles may assist with a broader range of coming AI technologies.

INTRODUCTION

Expanding use of Artificial Intelligence (AI) robotic vehicles, as the ultimate integration of automation and driverless autonomy, involves multiple ethical issues. Ethics concerns right and wrong actions in relationship to good and bad outcomes. The essential idea is a vehicle – air, ground, space, or water – for passengers or cargo or both that operates using an AI system, whether supplemented by an onboard human driver or functioning without the presence of a human driver or functioning with a distant controller either AI or human as for a drone. There might be a robot on board acting as a driver, or the driverless vehicle might be a robot, meaning an AI-programmed machine that is either independently mobile or mobile in the sense of being a part of the vehicle. A robot driver can enter and leave the vehicle on its

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own power. A robot that is fixed to the vehicle, driving it like a human, is a robotic tool. It seems more likely that an autonomous driverless vehicle only needs an AI system, not a robot or robotic driver tool. A variant reflected in present-day drones is that a distant human controller operates the vehicle without being onboard. An AI system might replace this distant human controller when operating drones or similar vehicles. A fundamental consideration is that vehicles, when operating, move in public spaces with other vehicles, human beings, and property of various kinds. A mobile device involves various risks of harm to others, especially when in motion (Krügel & Uhl, 2024). Even a vehicle airbag is an automatically deployed safety device that can malfunction.

The following section discusses AI in general. The third section provides background information on AI vehicles. The subsequent section discusses ethical issues involved with AI vehicles. The fifth section discusses the long-established trolley problem, the trolley being potentially a driverless autonomous AI system for conveying passengers. The sixth section looks at key organizational implementation issues, to put ethics into practice. This section provides the most detailed discussion including case illustrations and proposed regulatory standards. The final section summarizes conclusions and provides recommendations. Key terms and definitions appear at the end.

ARTIFICIAL INTELLIGENCE (AI)

As expressed in 1955 (reprinted in 2006) by John McCarthy (Dartmouth College), Marvin L. Minsky (Harvard University), Nathaniel Rochester (I.B.M.), and Claude E. Shannon (Bell Telephone Laboratories), who introduced the term, the basic idea of "Artificial Intelligence" is the development of machines (i.e., technology) that behaves in ways that simulate human intelligence (McCarthy et al., 1955, 2006). The notion of a "machine" can include programmable computers and information systems; human intelligence might involve multiple dimensions. AI is programmed "technology" embodied in computers and machines that can simulate various dimensions of human intelligence.

There is active discussion of the potential benefits and risks of future AI development and the social role of giant technology companies like Alphabet, Amazon, Apple, Meta, Microsoft, Nvidia, and Tesla (Chow, 2024). The social considerations are enormous. The case of forcing TikTok, a Chinese short-form video hosting service widely used, by a 2024 statute to be divested or banned from the U.S. reached the U.S. Supreme Court in December 2024. TikTok, which is Douyin in China and Hong Kong, is owned by ByteDance, a Chinese internet firm. There will be significant advantages in health care, scientific investigation, and similar dimensions of future social welfare.

There are also serious problems being debated, particularly concerning the ultimate big picture of whether AI might displace human labor and come to dominate human society. There are several options concerning this big picture: voluntary self-restraint emphasizing caution over profitable and knowledge opportunities, careful social regulation, or a complete ban. The latter is likely not feasible given the advantages of AI and the profit and scientific knowledge drivers of pursuing AI where it leads. The future will arguably be AI systems and robots of various kinds for multiple purposes. The reality will be how to combine voluntary self-restraint and social regulation. The expressed approach of the European Commission (2020) is to promote both the excellence of products and the trust of users and society. An interpretation of this approach is that businesses and society must determine how to minimize risks and harms and maximize benefits. The ideal is perfect AI including advance prediction, risk assessment, and handling of human errors.