Ethics for ITS professionals

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ABSTRACT

This paper gives an overview on some ethical aspects of ITS development and applications. The technical evolution of ITSs is a basis for development of various ITS technologies, systems, applications, and services. The future ITSs will become more and more intelligent and autonomous in their behavior. The new kind of advanced ITSs will emerge in the future, e.g. ITS with artificial moral agent. There will be a need for creating a new kind of "machine" ethics, called ITS ethics, for ITS professionals, namely ITS designers, manufacturers and users. ITS ethics addresses a number of moral issues which arise if researchers are able to build up intelligent systems with intellectual capacities that behave analogically to human beings. The most important problem will be: who or what is morally responsible for malfunctions of ITSs? The malfunctions of ITS usually cause some unnecessary suffering to people, and it is immoral.

KEYWORDS: technoethics, ITS ethics, moral agent, responsibility, code of ITS professionals

1. Introduction

ITS ethics may be understood as a sub-branch of technoethics. The term *technoethics* itself was coined in 1974 by the philosopher Mario Bunge to denote the special responsibilities of technologists and engineers to develop ethics as a branch of technology [1]. It is expected that technoethics will continue to expand with new areas of technology in the 21st century. Technoetics refers to a number of modern technologies. These can be nanotechnologies, ICTs etc. Technoetics considers moral and ethical aspects of the technologies in today's and future society. It is very important to underline that according to The Law of Technoethics: *ethical rights and responsibilities assign to technology and its creators increases as technological innovations increase their social impact* [2]. Technoethics comprises various branches of ethics, for example, artificial intelligent ethics, machine ethics, computer ethics, robot ethics, etc.

ITS ethics might be defined as the analysis of the philosophical nature of ITS and social impact of ITS technologies and justification of policies for the ethical use of such technologies and systems in transport, and moral obligations of ITS professionals. ITS ethics studies and analyzes social and ethical impacts of ITS technologies and systems. Ethics of ITS technologies tries to identify and articulate ethical issues of ITS technologies and systems that already exist or are likely to develop. A number of moral obligations for ITS professionals appears when designing, manufacturing and using ITS systems and technologies in transport. Some of the obligations are potentially in conflict when sharing the responsibility between ITSs with human moral agent (HMA) and artificial moral agent (AMA). The reason is that the distribution of moral responsibility is often no longer clear [3]. It seems that ITS autonomy may also be a relevant concept for distinguishing between quasi-responsibility of AMA and traditional responsibility of HMA. Therefore, there is a need for a code of ITS professionals in the sector of transport.

The Code of ITS Professionals lays down a set of moral values which should be respected in their work. The code in general should regulate ITS profession conduct.

2. EU *Etica Project* – ethical evaluation of ICT technologies

In general, ICT (information and communications technology or technologies) is a kind of umbrella term that includes any communication device or application, including: radio, television, cellular phones, computer and network hardware and software, satellite systems and so on. Besides, it refers to the various services and applications associated with them. ICTs are often spoken of in a particular context, such as ICTs in education, health care, libraries, and transport. According to Pilar Pasquale [4] there are some ethical controversy over ICTs. A kind of debate is needed on the positive and negative aspects of ICT technologies when applied in modern society.

EU *ETICA* (Ethical Issues of Emerging ICT Applications) [5] is a project (2009-2011) which is funded by the European Commission under the 7th framework programme. Its main objective has been to identify ethical issues of ICT technologies and their potential application areas to analyze and evaluate ethical issues arising from these in order to identify and to rank foreseeable ethical risks in Europe. Within the project some recommendations are formed as a basis of more general policy recommendations aimed at addressing ethical issues in emerging ICTs before or as they arise.

3. ITS enabling technologies

In general ICT (information and communications technology or technologies) is a kind of umbrella term that includes any communication device or application, including: radio, television, cellular phones, computer and network hardware and software, satellite systems and so on. Besides, it refers to the various services and applications associated with them. ICTs are often spoken of in a particular context, such as ICTs in education, health care, libraries, and transport.

ITS enabling technologies are a part of ICT technologies. As is commonly known there is a variety of information and communications technologies that can be applied in combination to solving of transport problems. They are called enabling technologies because they enables the development of ITS. In sum, ITS is the integration of information and communication technologies with transport infrastructure, vehicles and users.

The enabling technologies ITS comprise the following elements [6]: wireless and wireline communications, computer data storage, and processing device, database

management systems, information displays, location device, including GPS, sensors, including e.g. inductive loops, infrared beams, vision-based sensors, acoustic sensors, and actuators (gates and display). All of them enables in combination to create ITS systems and numerous ITS applications in transport. The main feature of automatic intelligent transportation net is precise and real-time interaction between vehicles and a network of roads.

The typical architecture of ITS may be described as a combination of the following elements: hardware, software and interface with an ITS operator, for example, a driver or users. The software of ITS is the key element of such an intelligent and automated system. The semi-automated and fully-automated ITSs seem to be the feature of ITS development in the last years. Today's examples of such systems in operation are Advanced Driver Assistance Systems (ADAS), eCall, Automated Road and Street Traffic Systems, Automated Driverless Metro Systems, and Automatic Pilot. Automation has been applied in various ways in the transport industries. The ITSs gain more and more autonomy with the development of artificial intelligence in transportation, especially urban transport [7].

Within the period of 15-25 years a new form of advanced ITS will be emerging. From a moral standpoint it may be said that some future ITSs will have a kind of *artificial moral agent* [8, 9, 10] integrated within it. AMAs should be able to make some moral decisions to share ethical standard, protect civil rights and individual liberty, and the welfare of others. A new machine ethics for such ITSs will be needed. It should be explained here that AMA may be treated analogically to the free will of an acting person, however, it is a kind of software with artificial moral rules embedded. Therefore it is possible to consider AMA to be responsible for functioning in difficult morally situations. For ITSs with AMA it is the utmost vital to function precisely according to the moral rules embedded in its memory.

Summing up, moral agency is a general philosophical category that outlines criteria for attributing responsibility to humans for their actions. It may be extended to artificial entities, for example ITS with AMA, however it raises some controversial ethical issues.

4. Key ethical issues of future ITS technologies and systems applications

As is commonly known, the ITS benefits may be considered as the positive effects of an ITS project [11]. The nature of ITS benefits is usually a mesh of *bonum delectans* (comfort of travelling) and *bonum utile* (economic, instrumental, and technical, social values). But the gist of

key ethical issues of future ITS technologies applications is the situation when advanced ITSs fail and the mentioned goods are not fully achieved. The given ITS malfunctions. It is connected with " bad deeds" of ITS towards human beings, for example the death of them [12]. The basic question is: Who is morally responsible for it?

Today in such a case the situation is clear from the legal point of view. According to the criminal law the operator of a given ITS, for example, a driver is guilty. The driver as a physical person is nearly fully responsible and he or she can be convicted in court. Seldom the fault can be divided between the driver and the ITS manufacturer or ITS designer. But from the moral point of view it is not quite clear who takes the full responsibility. In the future when emerging ITSs with AMA the moral responsibility for ITS malfunction should also be shared between the man as a higher supervisor of ITS and an ITS with AMA. The basic question will be: who or what is responsible for malfunction of advanced ITSs with AMA and to what degree?

5. A moral code for ITS professionals

It seems to some people that ITS codes of professional ethics are pointless and unnecessary. Many others believe that ITS codes may be useful and important. People in ITS profession don't want to behave in a wrong way in their profession. They want to follow certain moral principles and moral norms that are kept in places of their work. It is clear that the adoption of a code of conduct is significant for the professionalization of an occupational group.

It is commonly known that professionals care for the moral issues that arise when providing a service to the public [13]. The users of ITSs want to be sure that ITS will be functioning properly. Here we are interested in the ITS professionals who are engaged in providing proper ITSs and services.

A moral code for ITS professionals should be based on moral responsibility of ITS professionals for future malfunctioning of ITSs. From the ethical point of view, we should avoid moral evil in advance according to the rule of ethics of responsibility (the precautionary principle) [14].

Generally speaking, there are three categories of ITS professional (moral agents) who are responsible for creation and proper functioning of advanced ITSs. Any code of conduct of ITS professionals may be based on a set of moral values, important to the moral agents. The values are the rules by which we make decisions about what is good and what is bad, what should or shouldn't be done.

The first and most important of them are values for ITS designers, especially those who are engaged in designing hardware and software of ITSs. The core value for ITS designers is the reliability of ITS when functioning in collaboration with other human or artificial systems in various circumstances. ITS reliability refers especially to the ability of an ITS with HMA or AMA to perform and maintain its functions in routine circumstances, as well as some unexpected circumstances. The second one is a group of people who is called ITS elements or systems manufactures. For them the most important value is to achieve the highest accuracy of the ITS model. And the last of the categories may be named the users of ITSs. They should perform their tasks according to precise user's instructions.

Any moral code for ITS professionals should refer to the values of each categories of the above mentioned group of people. They are chiefly responsible for good functioning of any ITS. The values should be treated as leading moral values of any moral code for ITS professionals, and a starting point of building up of it. Compliance with these moral rules allows us to avoid ITS malfunction, and consequently bad deeds of ITS with AMA.

However, summing up, it may be a kind of moral conflict of human-ITS responsibilities. To what degree each of them is responsible for ITS fails? The conflict may be solved in each case separately, which is a "norm" when considering moral problems in practice.

6. Conclusion

The future of ITSs seems to be directed towards the application of ITSs with AMA. These are fully automated and highly intelligent, and therefore autonomous. ITSs will be morally "responsible for their bad deeds". The problem of ITS artificial evil will be a serious one in transportation, especially the death of people. AMA as an autonomous agent will be acting on its behalf. However human beings still remain responsible in general for malfunctioning of ITS with AMA, but only partly as a higher supervisor, and ITS designers fully and ITS manufacturers to some degree. A new theory of moral responsibility or quasi-responsibility of ITSs will be needed. A moral code for ITS professionals will also be wanted, and to be based on the above mentioned moral values for each categories for the professionals.

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