Service Robots from the Perspectives of Information and Machine Ethics

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Abstract. Service robots are becoming ever more pervasive in society-at-large. They are present in our apartments and our streets. They are found in hotels, hospitals, and care homes, in shopping malls, and on company grounds. In doing so, various challenges arise. Service robots consume energy, they take up space in ever more crowded cities, sometimes leading us to collide with them and stumble over them. They monitor us, they communicate with us and retain our secrets on their data drives. In relation to this, they can be hacked, kidnapped and abused. The first section of this article presents different types of service robots—like security, transport, therapy, and care robots—and discusses the moral implications that arise from their existence. Information ethics and machine ethics will form the basis for interrogating these moral implications. The second section discusses the draft for a patient declaration, by which people can determine whether and how they want to be treated and cared for by a robot. However, individual specifications may violate personal interests or the business interests of the hospital or nursing home. The author argues such a patient declaration will be vital in a world ever more impacted by these service robots.

Keywords. Service robots, ethics, information ethics, machine ethics, moral machines, patient declaration

1. Introduction

This contribution introduces different service robots and then brings out ethical questions that refer to specific service robots. The author will approach the implications of service robots from two perspectives: information ethics and machine ethics. He will discuss different service robots, like transport robots, therapy robots, and care or nursing robots. While noting that service robots offer some great opportunities, this article will focus on the ethical risks. In the second section, the paper focusses on therapy and nursing robots. The author introduces the concept of a patient declaration and discusses the opportunities and risks it has.

First, it will be important to differentiate information and machine ethics. Information ethics deals with the morality of the members of the information society. It researches how these moral agents behave, or should behave, in moral terms, when offering or using information and communication technologies, information systems, and digital media [5]. Technology ethics, business ethics, and medical ethics are further examples for the classical fields of applied ethics.

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Machine ethics refers to the morality of semi-autonomous or autonomous machines, certain robots, bots or software systems [5]. They become special moral agents; depending on their objective and their behavior, we can call them moral or immoral machines.

In recent years, the author has developed several artifacts of machine ethics [2]. These include GOODBOT and BESTBOT (chatbots that respond to the user's statements in a morally adequate manner), LIEBOT (a chatbot that can systematically lie) and LADYBIRD (a vacuum cleaning robot that rescues certain insects).

2. Service Robots from an Ethical Perspective

Service robots are becoming more prevalent in households, leisure gardens, shopping malls, hospitals, and nursing homes [3]. They take over both simple and complex activities; they inform, support and monitor people. We can distinguish between: (a) domestic robots, (b) therapy and care or nursing robots, (c) security and surveillance robots, (d) transport and delivery robots, (e) information and navigation robots, and (f) entertainment and toy robots. In addition, there are military robots, space robots, and robots for scientific purposes, which could also be referred to as service robots. The use of service robots raises serious ethical questions that will be investigated in the following sections [3, 7].

Household and garden robots help in the household or garden, as vacuum cleaning and mowing robots, pool robots, or window and barbecue cleaning robots. They are widespread and almost as common as washing machines and dishwashers. An example is JISIWEI i3, a vacuum cleaning robot. It has a surveillance camera, a motion detector and is Wi-Fi capable. It can be controlled via app and delivers a live stream of the apartment to the user's smartphone.

The following questions arise from the perspective of the classical fields of applied ethics:

- How are we supposed to deal with the possibility that the robot sucks in and kills small animals?
- How should we deal with personal data collected in private space by the provider or the manufacturer of the robot?
- What if information about the apartments or houses that the robot cleans is collected and passed on?

The following questions arise from the perspective of machine ethics:
- Should the vacuum cleaning robot spare small animals like ladybirds for moral reasons?
- Should it have a menu to set its morality (which could allow it to kill vermin)?
- Should it be able to exclude the residents from surveillance?

Care or nursing robots support, and in more extreme case replace, human nurses [3]. They administer the drugs and food that people in care need, and help them with mobility issues, like getting up or lying down. They entertain patients and can act as auditory and visual interfaces between patients and human nurses. Some have language skills, or are able to learn in general, and are intelligent within certain limits. Well-known products and prototypes of these kind of robots are Care-O-bot and Robear. Care-O-bot is the

'product vision' (or just the prototype) of a mobile robot assistant that gives active support to people in their home. It has a loudspeaker, microphones for speech recognition and cameras for facial and gesture recognition. It can show different moods via its display.

Facial or face recognition is the automated recognition of a face in the environment or in an image. More systematically, it is the automated identification, measurement, and description of the features of a face in order to recognize a person ("face recognition" in the strict sense) or gender, health, origin, age or emotional situation ("emotion recognition").

The following questions can be asked from the perspective of the classical fields of applied ethics:

- Who is responsible for incorrect care given by a care robot?
- Will a nursing robot help to avoid the kind of shame that you might have if humans were caring for you?
- What should happen to personal data that is collected in private or semi-public spaces for analysis by the provider or the nursing home?
- What about the insights gained with facial and voice recognition?
- Is the robot primarily a competitor or a support for nursing staff?

The following questions arise from a machine ethics perspective:

- Should the nursing robot be designed to look like a human or an animal?
- Should it remind patients that it is just a machine?
- Should it simulate emotions and sympathy?
- How should it deal with feelings that patients develop towards it?
- How should it prioritize tasks (e.g., if several patients need to be supervised simultaneously)?
- How will it react if a patient wants it to kill him or her?

In her master thesis at the School of Business FHNW, Christine Fahlberg found that some patients would prefer to be washed in their intimate areas by a robot than by a human [8]. Whether the machine should emphasize that it is a machine in this context is an important question. The GOODBOT, mentioned in the introduction, had a meta-rule that required exactly this [6]. In certain conversations, it said: "Sorry, I'm just a machine, you need a person, please call this number." Some care robots could actually kill patients upon request, especially those that are collaborative robots in their essential elements.

Therapy robots may support or replace therapists [3]. They can support or carry out therapies independently of humans. They can perform exercises with paraplegic patients, entertain dementia patients, and challenge them with questions and games. Some have mimicry, gesticulatory, and language skills, and can learn within certain limits. Well-known products are Keepon and Paro. Paro is used in therapy to treat dementia and autism in Japan, as well as in several European countries. It has sensors that record brightness, temperature, noise, and touch. It responds to its name and is a self-learning system.

The following questions can be asked from the perspective of the classical fields of applied ethics:

- How can we differentiate therapy robots from robotic toys?
- Who is responsible for the machine providing poor therapy?
- What should happen to personal data that is collected in private or semi-public spaces for analysis by the provider or hospital?

- What if the robot were to reduce a patient's social contact?
- Is the robot primarily a competitor or a support for therapists?

The following questions arise from a machine ethics perspective:
- Does a therapy robot have to consider the patients' needs and parameters?
- Should it pretend to have feelings and sympathy?
- How should it negotiate feelings that we develop towards it?
- Should it make clear to patients that it is a machine?

Security and surveillance robots are spreading across urban areas, in shopping malls and on company grounds, predominantly as rolling and flying machines [4]. Their job is to provide security for firms, visitors, and customers. Well-known products and prototypes are REEM, AnBot, K5, and K3.

REEM is a 'Robocop' that navigates autonomously in Dubai. It has a video camera, a face and a gesture recognition system. It can compare faces with a police database and read vehicle license plates. It is able to talk to customers and citizens in their language. Meanwhile, K5 is used in California, where it travels autonomously in shopping malls and on company grounds. It has a video camera, a face recognition system, several sensors, a radar, and a microphone. It is equipped with artificial intelligence and reports criminal suspects to a central office.

The following questions can be asked from the perspective of the classical fields of applied ethics:
- Who is responsible for collisions between the robot and humans or animals?
- How should the robot's analysis and monitoring in this context be assessed?
- What if the robot is hacked and used as a weapon?
- Does a security robot undermine the respect we have for security staff?
- Is it predominantly a competitor or a support for the security staff?

The following questions arise from a machine ethics perspective:
- Should a security robot be designed so that it is frightening, or so that it inspires confidence?
- Should it be able to carry out actions, such as arrests, on its own?
- Should it be allowed to use a weapon on its own and if so, in which cases and against which persons?

There was an accident some time ago that brought these questions to stark reality. The K5 collided with a young boy in Silicon Valley and caused him bruises [3]. The Chinese colleague of the robot, the AnBot, has a stun gun. However, it cannot operate it itself.

Transport and delivery robots convey items of all kinds, like parcels and purchases from one party (often the provider or broker) to another (often the customer) or they accompany and relieve pedestrians and cyclists of their burden [3]. Well-known products and prototypes of this are Gita and the robots of Starship Technologies. Gita transports parcels or foodstuffs. You will be able to admire the cylindrical machine on the public streets and walkways in the future. It can follow a person, or roll autonomously in an environment it has already mapped. Multiple cameras are embedded within its shell to aid this. The robots from Starship Technologies transport parcels or foodstuffs as well. They will be found on public roads and walkways in the future, where they will move

autonomously from A to B (partly remote controlled in some cases). They are also equipped with cameras and sensors.

The following questions can be asked from the perspective of the classical fields of applied ethics:

- Who is responsible if people stumble upon the transport robot or if animals bite into it?
- How do you deal with the fact that the robots increase traffic, and thus complexity, in cities?
- What if the robot can look under the skirt or kilt, and the data it collects is stored and spread?
- Is the robot a primarily competitor or a support for postmen and postwomen?

The following questions arise from a machine ethics perspective:

- Should transport robots avoid certain animals or behave defensively towards them?
- Should they systematically exclude certain areas such as intimate areas or faces when analyzing the environment?
- Should they refuse to transport certain things like drugs or weapons?

That transport robots refuse to transport anything is, of course, science fiction. But in principle, you could teach them this ability.

Entertainment and toy robots serve the entertainment and amusement of users, not only of children and young persons, but also adults [3]. They dance, sing, play music, etc. Some are humanoid, while others resemble animals. Well-known products of this kind are Aibo and Pepper. Pepper is an entertainment and toy robot, or a companion robot. It is found in households, shopping malls and care homes. It can recognize emotions and react accordingly. It has four microphones, two HD cameras, a distance sensor and is Wi-Fi capable.

Questions about Pepper from the perspective of the classical fields of applied ethics are:

- Should you leave children alone with Pepper, and if so, for how long?
- What should happen to personal data that is collected in private or public spaces for analysis by the provider or a company?
- What if the robot gets hacked and a stranger sees through its "eyes"?
- How do we deal with people who have feelings for Pepper?
- Should Pepper's emotion and voice recognition be used in retail to better understand the needs and personalities of customers?

Questions on Pepper from a machine ethics perspective are:

- Should Pepper show emotions although it does not have any?
- How should it deal with feelings that we develop towards it?
- Should it speak more human-like to be more convincing?
- Should it be able to refuse to do certain things, e.g. steal from other people, or kill a patient with a knife or a syringe?

Stealing or killing is something Pepper might do well. Its hands correspond to our hands, and it can hold things of up to two kilos.

3. Considering the Use of Service Robots

Political, business and scientific forces must ensure that the robots do not consume too much energy, do not restrict our habitat and do not harm or kill us. Hacking is also a serious concern in this context. Politics and business must create spaces and situations where service robots are not present or where a robot quota exists, in order to avoid the risks mentioned. Some service robots should be banned in cities, such as transport robots.

Service robots can improve our personal autonomy but they can endanger our informational autonomy by spying on us and monitoring us [4]. Face and voice recognition are particularly dangerous in this context. All these technological feats are also open to abuse in the form of hacking and misuse of data by creators. Again, politics and business must create spaces and situations where service robots are not present or where a robot quota exists. Certain functions may be prohibited. In the case of security, care and therapy robots, people must be informed of how their data is being used, and there must be strict regulation.

Business and science forces can create moral machines, but the moral skills of service robots are not always practical and acceptable. Robots like ROBOCAR (a car that brakes for large and small animals) and LADYBIRD are plausible examples of moral machines [2]. They qualify animals as the owner would qualify animals. Autonomous cars that qualify or quantify people could be a bad idea, as it might lead to valuing one human over another. However, it would be very difficult to find appropriate rules that are supported by everyone.

4. Patient Declaration

In 2016, the author put forward a proposal for a (supplement for a) patient declaration online (www.informationsethik.net). With this, one can determine whether one wants to be treated or cared for by a surgery robot, therapy robot or nursing robot. It is also possible to specify the contexts in which a robot would be allowed to operate. Such patient declarations should also be developed and made available by government agencies, hospitals and nursing homes.

The author will probably determine that he doesn't want to be treated with Paro. The reason is very personal. He imagines himself holding Paro in his arms and smiling. And he doesn't like that idea. He would prefer a cat or another pet. There are various arguments against such an attitude: You should not make decisions about the future if you don't know what the future will look like. If you want the robot when you get dementia, you have to have consented to it.

But these arguments can also be answered: Not only your current well-being should be valued highly, but also the fundamental freedom to make independent decisions as long as this is possible. Furthermore, it is not feasible to satisfy every patient wish, e.g., if his or her wish would have unethical or illegal consequences, or if it would be financially impossible to fulfill. All in all, it must be possible to regulate a patient's future with the help of a patient declaration. If the responsible persons can decide arbitrarily against the patient declaration, the patient declaration is fundamentally questioned.

5. Summary and Outlook

Service robots are becoming ever more prevalent in closed, semi-open, and open worlds. Questions arise from both information ethics (and other fields of applied ethics) and machine ethics. In [1] and [3] some of these questions are answered. Much remains to be done, however, and these issues must be discussed not only by science, but also by society and political powers.

Currently, the individual does not have many options for deciding whether he or she would use service robots or not. He or she can, of course, become politically active or become involved in non-governmental organizations to try and change this. But for most, this is not realistic. In the end, we need the help and insight of political, business, and scientific forces. If there are such opportunities in individual areas such as health care, it is essential to take them into account. One viable option is that proposed by the author: a patient declaration.

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