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Yueh-Hsuan Weng, *Peking University*

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Short paper

Beyond Robot Ethics: On a Legislative Consortium for Social Robotics

Yueh-Hsuan Weng [a,b,*]

[a] Peking University Law School, Beijing, P. R. China

[b] Yushan Studio for Artificial Intelligence and Law, No. 5 Yiheyuan Road, Haidian District, Beijing, 100871, P. R. China

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Abstract

As robots are increasingly integrated into human society, associated problems will resemble or merge with those in other fields — we can refer to this phenomenon as the 'robot sociability problem'. In this paper, the author first analyzes the dynamic relationship between robot ethics, robotics and robot law, and then proposes a 'practical robots' approach for solving the robot sociability problem. As this approach is based on legal regulations, the author posits that a functional platform such as a 'legislative consortium for social robotics' is crucial at the initial stage for social robotics development. In conclusion, the author discusses how a legislative consortium for social robotics will be a useful approach for solving the robot sociability problem, especially emerging structural legislative problems that are related to autonomous robots.

Keywords

Robot ethics, robot policy, robot law, social system design, social robotics

1. Introduction

The term 'roboethics' (robot ethics) was first officially mentioned in a symposium that was organized by several European robotics institutes in 2004 [1]. Following this, the European Robotics Research Network (EURON) published the 'Roboethics Roadmap' [2] and the South Korean government has prepared a draft of a 'Robot Ethical Charter' [3] as a guideline for building a human–robot co-existing society. In addition, the Japanese Ministry of Economy, Trade and Industry (METI) has issued a series of 'Robot Policies' that address business applications [4], safety regulation proposals [5] and the creation of a sound service robot market for the next two decades.

* E-mail: weng.yuehhsuan@gmail.com; ysail@pku.edu.cn

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Robots with the capacity to perform autonomous behaviors can adapt to complex environments and interact with humans. As robots are increasingly integrated into human society, associated problems will resemble or merge with those in other fields — we can refer to this issue as the 'robot sociability problem' [6]. Sociability is a skill, tendency or property of being sociable or social, of interacting well with others [7]. This ability is important to human beings, but because robot sociability is artificial, the relationship between humans and robots can be controlled by humans. The author proposes that a design for robot sociability be divided into two aspects: one is technically centered on human–robot interaction and the other is legally oriented, determining the ethics, policy and law to be applied to independent robots, hereafter referred to as the 'social system design'.

In this paper, the author focuses on the robot sociability problem from a legal perspective, especially the robot legislative issue; note that the discussion is limited to structural problems for developing robot laws and what kind of measures might reduce the risks that arise from the mentioned structural legislative problems for social robots.

2. Structural Problems for Robot Law

2.1. Beyond Robot Ethics — From 'Ideal Robots' to 'Practical Robots'

The possibilities of social robots can be divided by three metaphors corresponding to robotics, robot ethics and robot law: possible robots, ideal robots and practical robots (Fig. 1). Robotics tests the limits of innovation and creativity, so it is possible that all manner of artificial beings could be created, including those that could be harmful to human society. On the other hand, robot ethics holds a moral philosophical approach to examine the existence of these artificial beings; however, sometimes this may be thought of as wishful thinking as there is always a gap between theory and application in the real world.

Finally, robot law, which is not merely concerned with 'What a social robot can be' or 'What a social robot should be', calls attention to the intersection between

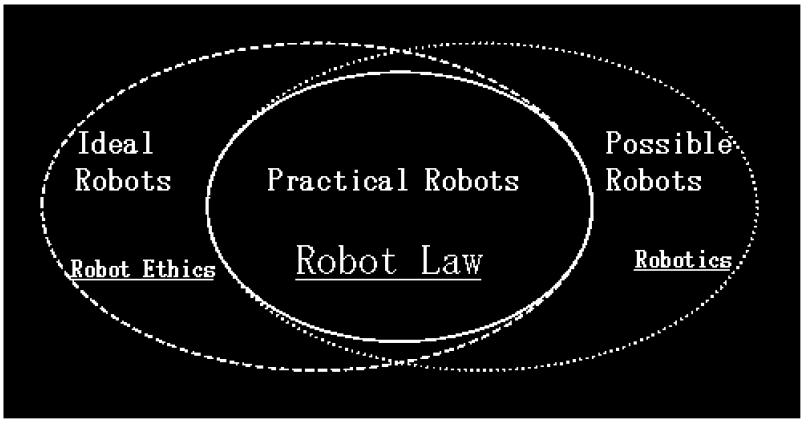

Figure 1. Three metaphors for robotics, robot ethics and robot law.

the two issues. It represents a practical perspective for social robots, and this attitude is useful and necessary to maintain human–robot co-existence in the long run. The author believes that by taking a 'practical robot' attitude, 'robot ethics' can be developed practically; furthermore, this attitude helps law makers move beyond a 'pure' robot ethics or moral philosophical knowledge domain and take a realistic viewpoint when performing their legislative work on regulating social robots.

2.2. Robot Legislative Policy Is as Important as Robot Safety and Industrial Policy

A large number of robot-related policies must be debated and enacted before a foreseeable mid-century 'robot-in-every-home' era begins: labor force displacement, physical safety, supervising research and development, and the shape of robot technology marketing, among many others. The breadth of these issues makes the appearance of a single, all-encompassing robot policy unlikely. However, it is likely that governments will follow their established top-down approach in giving direction to new technologies, e.g., in 2005 METI created the above-mentioned Robot Policy Committee and invited robotics experts to serve on it. The committee's initial report emphasized the idea that Japanese governmental agencies and enterprises need to cooperatively address issues relating to business, safety and innovation [4]. Currently, robot policy research has already covered many crucial topics, such as 'How to address a sound business policy to establish the robot technology industry' [8] and 'How to plan a safety policy as to build a safety standard for next generation robots' [5]. The author predicts there is a strong demand for another 'legislative policy' within the next stage of robot policy development.

Comparing industrial robots and social robots, the major difference is based on the 'contact level' with society. Industrial robots perform their effective working ability only in structured environments (i.e., a factory assembly line); in other words, their contact level with humans and society as a whole is very low. Therefore, the social regulation of industrial robots is almost addressed in its machine standards under safety and business considerations, but rarely touched on the part of human laws. As for social robots, due to them having closer contact with society, when they are deployed into unstructured environments to perform their duties with humans, they may elicit changes in many current relationships with humans concerning right and responsibility in daily life. The author predicts that there will be a strong demand for a group of 'robot legislative policies' as guidelines to adjust many current existing human laws in preparation for a human–robot co-existence society. However, the current difficulty for developing a sound robot legislative policy is based on the 'complexity' of robots, e.g., the word 'robot' might refer to many kinds of different things. In addition, the technological domains for social robots may include mechanical engineering, electrical engineering, computer science, cognitive science, biological engineering and chemical engineering. Furthermore, the complexity of responsibility distribution of social robots is based on its Third Existence character — neither living/biological (first existence) nor non-living/non-

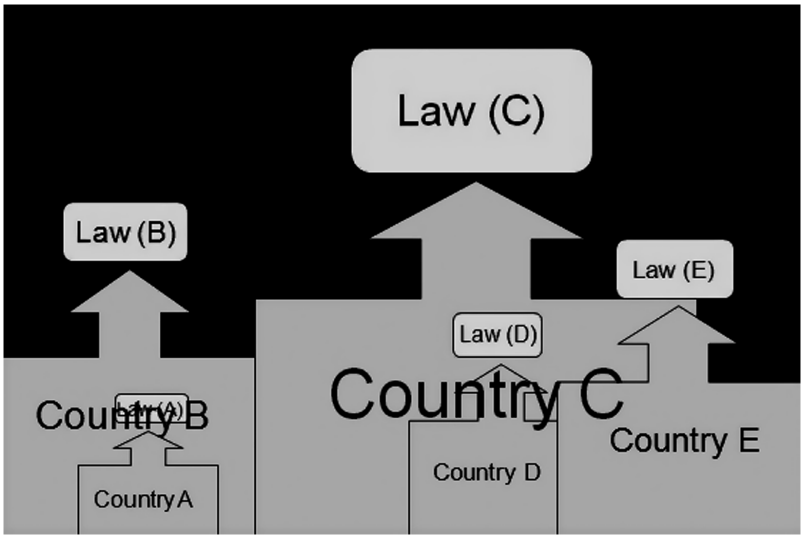

Figure 2. Colonization of robot legislative affairs.

biological (second existence) [9]. These factors might cause a serious situation for law makers to define their robot legislative policy well.

2.3. Avoiding the Colonization of Robot Legislative Affairs

Countries have different preferences for the usage and application of robotics, and these attitudes will be reflected by their domestic legislative policies as well as legal norms. However, what is worrisome is that if a conflict were to occur, an advanced robotics country's robot law may hold a relatively advantageous position. Less advanced countries may then be forced to modify their own domestic robot laws, and accept the belief and interests of advanced robotics countries, thus giving rise to a 'colonization of robot legislative affairs' (Fig. 2). It might form a global crisis when the legislative colonization touches on some crucial issues in robot sociability, such as the legitimacy of autonomous military robots access to human living spaces or to allow unethical applications that might harm world peace.

The author suggests that building a global consensus between countries will be a solution for avoiding the colonization of robot legislative affairs. Take an example from the global nuclear regulation organization — the International Atomic Energy Agency (IAEA). Established after World War II, the IAEA initially comes from US President Eisenhower's 'Atoms for Peace' address to the General Assembly of the United Nations on 8 December 1953. These ideas helped to shape the IAEA Statute, which 81 nations unanimously approved in October 1956. The Statute outlines the three pillars of the Agency's work — nuclear verification and security, safety, and technology transfer [10].

There are three reasons to support the IAEA as an effective solution to ensure the consensus of its three pillars between countries: (i) it is an inter-governmental organization, (ii) its relationship with the United Nations is regulated by special

agreement and (iii) it is an institution for regulating nuclear applications by international laws. Robot technology is similar to nuclear technology in that the technology itself is powerful, yet neutral; whether it is harnessed for 'good' or 'evil' outcomes is dependent on us as humans. Therefore, the author suggests that an internationally approved institution can help build consensus between countries so as to avoid colonization of robot legislative affairs.

3. Legislative Consortium for Social Robotics

3.1. Why Do We Need a Legislative Consortium for Social Robotics?

The author believes in an internationally approved legal institution such as a legislative consortium for social robotics that would serve not only to supervise the inappropriate or unethical application of robotics from its member countries, but also help its member countries to develop their domestic robot legislative policies by issuing guidelines. Note that due to the 'complexity' and 'contact level with the society' issues some small or less-advanced robotics countries might be unable to define their own robot laws because the scope of the domain issues are too complex and wide; a legislative consortium for social robotics as a third party institution itself might also prevent many countries with less-advanced robotics following a few advanced robotics countries' robot legislative policies (Fig. 3).

Other functions of the legislative consortium for social robotics will be to help the social robotics industry develop supervisory guidelines for the real-world use of artificial intelligence — programmed robots. In other words it can deal with very technically based issues, such as developing robot legal machine language [9] — to build robots embedded with legal guidelines for the robots to behave legally in a human living environment. From this viewpoint, the function of the legislative consortium for social robotics on advanced robotics is similar to the World Wide

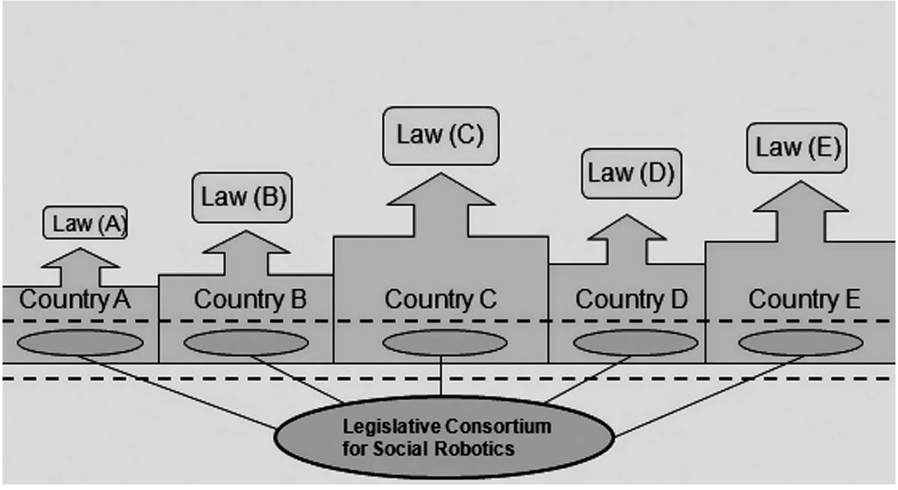

Figure 3. Legislative consortium for social robotics.

Web Consortium on the World Wide Web: its mission is 'to lead the World Wide Web to its full potential by developing protocols and guidelines that ensure the long-term growth of the Web' [11].

Programming social values and norms into robots designed to interact with humans requires input from legal and legislative experts regarding such topics as robot ethics and safety. However, there is currently a significant shortage of law scholars familiar with these issues, therefore my proposal calls for a platform for building and supporting expertise in the legal aspects of robot sociability in preparation for a human–robot co-existence society. It will be a gradual process over the next one or two decades; therefore, these legal policies need to be in place and will need to evolve as well [12].

3.2. Contemporary Tasks of the Legislative Consortium for Social Robotics

The legislative consortium for social robotics focuses on making robot legislative policies as well as other guidelines for social robots development. There are several crucial legal issues related to social robotics, including the following.

3.2.1. Preventive Arms Control Issue

The US Army plans to replace one-third of its armored vehicles and weapons with robots by 2015 [13]. These military robots are more effective and powerful than human soldiers in the battlefield. In other words, it might cause an asymmetric situation between countries that have a 'robot army' and countries that do not. Furthermore, it might also threaten the current international security system. The Treaty on Conventional Armed Forces in Europe sets 'troop ceilings' on military equipment, such as tanks, artillery pieces, armored combat vehicles, combat aircraft and attack helicopters. However, when military equipment is 'robotized', how to make a proper 'exchange rate' between conventional and robotized troop ceilings on military equipment will be an emerging challenge for international security.

3.2.2. Safety Issue

Currently, there are no safety standards for service robots in the world [9] and the International Organization for Standardization plans to create an international standard for service automations by 2011 [14]. However, in addition to an international robot safety standard, it is necessary to consider a set of domestic robot safety regulations as well. The author suggests that it is important to borrow the experience from 'automobile law' (US Intermodal Surface Transportation and Efficiency Act, European Type Approval, etc.) in order to save time and resources. As a senior official the Japanese Robot Business Promotion Council remarked, 'As with automobiles, there needs to be a set of safety rules that are recognized by the public in order for service robots to become widely accepted' [14].

3.2.3. Privacy Issue

In order to ensure that social robots can safely interact with human beings while providing high-quality, personal fitness service, it is necessary to equip robots with

a considerable amount of sensors. The sensor itself may need capabilities for multifunction and advanced perception in order to support the robot to enforce its task through unstructured environments. An example of one kind of sensing mechanisms may be called 'moving object sensor technology': the whole process of data collecting and reuse from ubiquitous sensor networks and corresponding middleware is 'intrusive'. Consequently, this technology will result in high risks for personal data disclosure or illegal use of personal data [15]. The property of sensor data is very different from personal data received from current information technology and network technology. Although some raw data look 'pure' and do not reveal any personal information at first, if combined with middleware or data mining it is possible to disclose much personal information. However, current privacy protection falls short on coping with this issue and it is necessary for comparative legal research to address how to cover this legal gap.

3.3. Who Will Benefit the Most from a Legislative Consortium for Social Robotics?

First, a legislative consortium for social robotics will provide guidance for the small number of scholars currently working on robotics issues, and future scholars and experts who are expected to emerge as the robotics industry expands.

Second, the robotics industry will generate billions of dollars of economic activity while creating many unforeseeable legal, safety and insurance issues. A legislative consortium for social robotics has the potential to benefit the growing number of corporations entering the field of robotics research and manufacturing.

Third, as the industry develops, robots will enter the homes of millions of families who will enjoy their assistance for tasks ranging from simple housekeeping chores to providing security services to assisting medical homecare professionals to performing rescue operations. As these human–robot interactive duties grow in complexity, the need for a safety certification system will also grow. Thus, a legislative consortium for social robotics can be said to potentially benefit multiple levels of society.

4. Conclusions

The author believes that a 'legislative consortium for social robotics' will be a useful approach for solving robot sociability problems, especially those emerging global legal issues related to autonomous robots. As robots become more integrated into human society, the importance of a legal framework for social robotics will become more obvious. Determining how to maintain a balance between human–robot interaction (robot technology development) and social system design (a legal regulation framework), the author predicts, will be the biggest challenge — especially on safety and legal issues — when a human–robot co-existence society emerges [16].

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About the Author

Yueh-Hsuan Weng received his MS degree from the Department of Computer Science, National Chiao Tung University, Hsinchu, Taiwan, in 2007. He was a Project Assistant in the National Science Council and a member of the administrative staff in the Ministry of the Interior, Taiwan. He is currently a PhD student at Peking University Law School, Beijing, P. R. China, and the Chief Researcher of the Yushan Studio for Artificial Intelligence and Law (YSAiL; http://www.yhweng.tw). His research interests are in issues concerning the interface between advanced technology and law, including AI and law, robot legal studies, legal informatics, computational social sciences, and intellectual property management.