Roboethics
- a comparative analysis of social acceptance of robots between the West and Japan -

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1. Introduction

The study and application of social robots is entering the limelight in many countries, and nowadays there are a huge number of laboratories both in educational institutions and in industrial facilities dedicated to Robotics. In my opinion, there is an interesting difference in the study approach to Robotics between Western researchers and Japanese researchers. In the West, in addition to the actual development of robots, academic researchers often discuss how to apply social robots to human societies. The participants in the discussions have very colorful backgrounds, from the field of Engineering to the field of Liberal Arts. Such discussions have raised a new kind of academic study, Roboethics. Meanwhile, Japan, a country called the kingdom of the robot, is taking the world lead in the research and development of social robots. In fact, the actual application of social robots in Japan is already taking a step forward for economic purposes. In 2004 April, the Ministry of Economy, Trade and Industry (METI) of Japan presented a report on an unofficial meeting about future robots in 2025. In the report, METI presents a clear vision that the Japanese government is strategically targeting, and names this ambitious political strategy as "the Next-generation Robot." The future society of "the Next-generation Robot" project gives a very concrete vision of human life with robots, and these are not fantasy stories written by a science fiction writer. However, discussing the ethical issues of the application of robots to Japanese society seems to be less popular. In 2004, during my stay to study at the Sant'Anna School of Advanced Studies in Pisa in Italy I had many chances to talk with Italian researchers in both the Robotics and Roboethics fields. I noticed that they feel frustrated in discussing Roboethical issues with Japanese researchers because, according to them, the Japanese researchers are not able to provide profound feedback when asked their opinions on the ethical issues of applying robots to society. One of the researchers said that "Japan is one of the best countries for Robotics, but Japanese Robotics researchers do not have any sound opinions on the ethical issues of their own study. This is a lack in Japan."

I do not agree with his opinion that it is a lack in Japan. In this paper, I provide a feedback to him, raising the question; why are the ethical issues of Robotics so focused on in Western societies, and not in Japan? I have a strong opinion that it is not a lack in Japan but a social, cultural and industrial difference between Japan and the West. In order to approach this theme, I made two research limitations. First, I define the type of social robot to deal with, a Humanoid Robot. The reason for this decision is explained in the next section. Secondly, I am aware that American scholars' opinions on Roboethics are important, but in order to clarify my argument, I focus on the theories of European Roboethics, mainly Italian, French and German theories. In Section 2, I attempt to provide the key points in current research and the development of the Humanoid Robot. Then, in Section 3, I examine the reason for the rise of Roboethics and its theories in Europe. In Section 4, in contrast, the social and cultural acceptance of robots in Japan is explained from three aspects: historical, sub-cultural, and political aspects. Then, in Section 5, with the ontological approach to Japanese culture, I provide a theory of Japanese Roboethics. I conclude that it is natural for researchers dedicated to Humanoid Robots to face the gap in the understanding of the state of the robot. This is why it is essential to promote chances to dialogue on the ethical issues of robots, with attention to

socio-cultural differences, domestically and internationally.

2. Key points of the Current Research and Development of Humanoid Robots

Considering the use of robots in the future, we can see that there is the positive, challenging assumption that robots will be working directly alongside human beings in the near future. The robot industry is a broad-based futuristic sector concentrated across a series of advanced technologies and sciences. From the current state of Robotics research and development and the world robot industry, considering Humanoid Robots in discussing future robots is inevitable. However, with Humanoid Robotics, it expands the related subjects of study, because there are thousands of questions regarding Humanoids, technically, socially, and ethically. For example, as the most fundamental question, why is a social robot usually imagined or preferred to have an anthropomorphic form? Why have we, human beings, been attracted to making other human-like entities? Briefly, what is a Humanoid? Which is "more" Humanoid, a robot with human-like form and complete master-slave control, or a mere metallic computer with super-advanced artificial intelligence?[1] Although the definition of a Humanoid Robot is still unclear, research and development of Humanoid Robots is taking place at a fast pace and discussion on the effectiveness of Humanoid Robots in society is heating up. Considering the amount of research in Humanoid Robotics in many countries, the speed of scientific and technological development, and the interest in Humanoids, Humanoid Robots in human society are not just a fantasy but a reality.

As mentioned in Section 1, the Japanese government intends to position the robot industry as an important industrial sector in order to be internationally competitive in the 21st century. It has already launched a considerable amount of support both institutionally and financially. This stance of Japan towards the implementation of robots is gaining a lot of attention both domestically and internationally. Veruggio talks about Japanese Humanoid research and development [Veruggio 2004: 40-47] in which Japan has invested about 40 million dollars in only the Humanoid Robotics Project between 1999-2003, which stimulated research in a number of laboratories both in universities and in industry. The results of these projects are impressive, and have provided many open-source prototypes as well as put Humanoid Robots such as Sony's QRIO, Honda's ASIMO, and Kawada's HRP-2 on the market. On October 19th, 2004, Prof. Dario of Arts Lab of the Sant'Anna School of Advanced Studies organized a Videoconference between Japan and Italy to promote communication and to create industrial relationships between Italy and Japan, especially in high-tech industry. One of the Japanese speakers from a Japanese robot company said that the current Humanoid Robot market in Japan is mainly limited to the entertainment and education sectors. However, institutional and financial support from the Japanese government is increasing, and research and development on the Humanoid Robot in Japan will continue to advance. As Veruggio also foresees, personal entertainment robots such as the pet robot, 'AIBO,' can be expected in the near future. Moreover, the Japanese advanced research and development of the Humanoid Robot could accelerate the distribution of personal robots in many other countries because of the globalized market and distribution system, the international manufacturing structure, and marketing strategy by big transnational corporations like SONY.

The internationalization of the actual research and development process is also noteworthy. Research fields are becoming increasingly internationalized, and this is challenging next-generation technology. The rise and penetration of Information Technology reinforce the internationalization of the research and development process of robots. Several cross-national collaboration projects on Humanoids have already been launched, and this inclination will continue. One example is the ROBOCASA project between Takanishi Lab of Waseda University in Tokyo and Arts Lab of The Sant'Anna School of Advanced Studies in Pisa <*www.robocasa.org*>, a joint laboratory for research on Humanoid & Personal Robotics. Another example is the Joint Japanese French Robotics Laboratory, between the Intelligent Systems Institute of the National Institute of Advanced Industrial Science and Technology (AIST) and le Département des Sciences et Technologies de l'Information et de la Communication (DSTIC) of le Centre National de la Recherche Scientifique (CNRS) <*www.is.aist.go.jp/jrl/*>.

Finally, Humanoid Robotics involves a wide range of research disciplines, and the field is driven by

underlying collaborative efforts spanning mechanical, electrical and computer engineers, roboticists, computer scientists, artificial intelligence researchers, psychologists, physicists, biologists, cognitive scientists, neurobiologists, linguists, artists, and even philosophers. All contribute to social robot projects across the world. This aspect is especially strong in Humanoid Robot development. Some projects focus on the form and mechanical function of the human body such as perception, arms, legged locomotion, and self-generator function. Other projects emphasize psychological aspects, such as human-robot interaction and learning / adaptive behavior. In any case, the challenge of developing an automation machine with a human form and function is based on our own physical and mental studies, and in return, deepens these studies.

In summary, current world research and development of the Humanoid Robot have the following key points; the Japanese lead in Humanoid Robotics, a globalized market, the internationalization of Humanoid research and development, and the involvement of various studies. In the next section, I discuss Roboethics in Europe, a new academic topic arising from these current phenomena.

3. The rise of Roboethics in Europe

In January 2004, an international symposium was held in Sanremo, Italy, the "1st international symposium on Roboethics," offering the opportunity to discuss the future effects of current robots in society. The organizer was an Italian professor in the Robotics field, and the participating speakers were from Europe, the United States, and Japan with a range of subjects crossing Robotics, sociology, philosophy, anthropology, and history. Preceding this international symposium was also a workshop focusing on Humanoids by Japanese and Italian researchers, the Italy-Japan 2001 Workshop, "Humanoids, A Techno-ontological Approach" in Tokyo, Japan. The workshop was organized with several speakers from both Japan and Italy, as a starting point to comparing the differences and multi-faceted socio-cultural implications of Humanoid Robots. It is interesting that the debate on Roboethics is becoming more focused than ever. Since the industrial revolution in the 17th century, humans have been equipped with many technologies for various aspects of society. Automation, or robotization, is a 20th century phenomenon appearing particularly in industry. The research and development of advanced robots have been vigorously pursued after World War II. However, I feel that ethical issues regarding Robots have been discussed merely in terms of science fiction until now. It is quite recently that Roboethics has become an academic debate.

One reason for the current debate on Roboethics is that a society in which robots work alongside and coexist with human beings has become foreseeable. The attempt to have robots in domestic life, beyond industrial factories or special technical fields, requires that we prepare for a new phase of social structure, provoking ethical debate in the area of actual science, rather than in the area of science fiction.

The other answer is linked to Humanoid Robotics. The Roboethics dialogue should include all robots that work interactively with human beings, whether having human-like form or not. However, the forerunners of Humanoid Robots are already here, and further research and development on Humanoids will continue. Historically, mankind has been fascinated by the creation of automata. In Western history, the hero, Alexander, contracted statues, doors and small mechanical animals that could be animated by water, air and steam pressure. In Homer's Argosy, the bronze sentinel, Tales was created and animated by Daedalus to guard the island of Thera. In the Renaissance, Leonardo Da Vinci designed some automata, and demonstrated them in public. In the 17th century, there were automatic dolls playing the piano made in Switzerland. These episodes show that humans are attracted to replicating human motion, form and further, human beings themselves. Asimov attempted to explain this human fascination saying that "the creation of a robot, a pseudo-human being, by a human inventor is…. perceived as an imitation of the creation of humanity by God." [Schodt 1998: 199] Can this statement still explain current Humanoid development? Are Robotics researchers simply trying to mimic the creation of God? I disagree. The motivation of recent Humanoid development is no longer a pure interest in replication. Future robots will coexist alongside human beings, and human-robot interaction is an essential issue. Therefore, the goal is not to put machines in place of, or to replace, human begins. Rather, the goal is to create a new tool that is designed to work with humans with

any form yet seen. Some Robotics research focuses on this potential.

As we saw in Section 2, Humanoid Robotics is a cross-discipline, from the mechanical function of human movement and cognitive science to philosophy. Thus, Humanoid Robotics defines what it means to be human in combination with the self–other function. Through the challenge of developing an automation machine with the form and function of the human body, we can simultaneously reflect on ourselves and deepen our own physical and mental studies. We ask, "What and where is the line between a human being and a Humanoid Robot?" Cerqui reaches a similar question in her anthropological research on applying computer science to the human body. "What are human beings going to become in the era of human and computer hybridization? Where are the boundaries of humankind? Are there some ethical boundaries to be set? How far can we go?" [Cerqui 2002: 101-108] Defining "a Humanoid" thus also reflects a long-time question: "What is a human being?"

Galvan, a Catholic priest and researcher in philosophy, attempts to find an answer in his paper "On Technoethics." [Galvan 2004: 1ff] He argues how problematic ideas in technology arise, and tries to rediscover a positive view of technology when anthropologically relevant. Galvan's approach is based on the Catholic doctrine and aims for a wider theme to present a new concept of ethics called "Technoethics", defining it as "a sum total of ideas that bring into evidence a system of ethical reference to justify that profound dimension of technology as a central element in the attainment of 'finalized' perfection of man". [Galvan 2004: 2] According to Galvan, technology is not an addition to man but is, in fact, a way in which mankind distinguishes itself from the animal kingdom. With the examples of the myth of Prometheus, and Adam in the book of Genesis, he claims that human beings are forced to interact with the material cosmos, in other words, to use technology, because human beings are in an "unfinished condition." [Galvan 2004: 2] The interaction with the material cosmos must be guided by reason, and this makes the line between mankind and animals that use only instinct. Galvan continues that this positivism of technology from an anthropological viewpoint has gradually faded, and the rapport between mankind and technology has been replaced by the dominion of technology. This dominion results in the increase of those who reduce the whole matter to merely its function, thus enforcing the idea of the inferiority of human beings; at the functional level, the humans being is more disappointing than the machine. Intertwining this argument with the dominion of science that reduces the cosmos only to knowledge of physical law, Galvan warns that we must rediscover the true sense of technology through an interpretational and dialogical structure of mankind that was originally a social existence. He insists on rediscovering the anthropological positivism in terms of "artificiality," from the technical (machines) to the symbolic (language). In his debate on Humanoids, he avoids conclusion since his stance on Humanoids remains complex. However, he makes one point clear; the distinction between Humanoids and humans is "free will," since it is "a condition of man to transcend time and space," and "Humanoids can never substitute a specific human action, which has its genesis in free will." [Galvan 2004: 3]

Like Galvan, I presume that Roboethics in Europe tends to orient that advanced technology or Robotics may infringe on humanity, or the essence of human beings that exists within the world. Galvan's warning against the dominion of technology is also stated by Jonas, concerning biotechnology.[2] According to Jonas, in our epoch, the control of a big state with a large population is necessary, and it depends on advanced technology to unite such an enormous super-organism, and technology is needed to develop this centralization. He considers modern technology as a central and pressing problem for the existence of humankind on the earth. Thus, he claims that there must be a philosophy of technology, and attempts to provide it by adding a third theme to the old distinction of the world in the Western philosophy; "form," "material," and "ethics."

The debate on Roboethics, however, invites viewpoints from different backgrounds. Dario and Takanishi, the organizers of the workshop "Humanoids, A Techno-ontological Approach" in 2001, made an interesting approach to Humanoids, seeing the difference in research achievements and design approaches in the West and in the Far East. I, too, noticed that in Japan, the adaptation and implementation of robots, or of technology as a whole, differs from the West. In the following sections, I approach the question of what Japanese Roboethics can be.

4. Japan, Technology, and Robots

We have overlooked the Japanese positive and strategic stance towards Humanoid Robots. However, in the Japanese Robotics approach, I observe that it is little to see a consideration on ethical issues, as the Western researchers do. Hypothesizing that such an observation of Japan is actual, I attempt to raise an argument; is it because the Japanese disregard on the ethical problem? Or, are the Japanese ignorant on the ethical issue on robots? My opinion is that, on the contrary, the ethics on robots would not be problematized in the manner of the West. In order to make my argument, first I illustrate a few of important historical backgrounds about Japanese acceptance of the Western technology. Then next, I will examine the rapport between robot and the Japanese people from the aspect of the Japanese subculture. Then, I present the details of "the New-generation Robot" project by the METI. Based on such characteristics of the Japanese society, in the following section, I try to present a Japanese Roboethics on the dimension of ontological reality. I must note that my argumentation may seem to be rough since it is too wide and impossible to discuss "the whole" of Japan. Some may also criticize my approach to be weak because of not making a survey on the Japanese robotists' point of view for the Japanese Roboethics. However, in order to provide the framework of the actual Japanese society, I believe that I mention the core and crucial characteristics of Japan regarding on this subject.

4.1 The Historical Background on Acceptance of the Western Technology : *Bunmeikaika* and *Fukokukyohei*

In the Japanese history, the Western technology has hardly been positioned as an enemy to the humans like the Luddites in England. To the most in Japan, machines have brought good. For the civilization, which to Japan had the same meaning as the "westernization", Japan had to wait until the middle of 19th century because of the national isolation policy taken in 1639 by Tokugawa shogunate.[3] In the end of Tokugawa regime, many leaders in the regime had been aware of the threat of the West by the lost of China in the Opium War in 1839. The achievement of Western science and technology thus became on the critical and urgent needs.

The appearance of Commodore Perry not only brought the end of isolation but also, indirectly, resulted in the downfall f Tokugawa regime in 1868 by the Meiji Restoration, which pushed Japan into the modern world and shaped the major contours of the patterns of modernity developed in Japan. On the transition from Tokugawa to Meiji, there were two political slogans; *bunmeikaika* (enlightenment of civilization, namely, to Japan, westernization), and *fukokukyohei* (rich nation, strong military). In order to ensure Japan to find its place in the new international order, the technology gap was serious, which was a national humiliation to Japan and becoming a huge motivation for its modernization. By the effect of the *fukokukyohei* policy, especially military might, Meiji state succeeded in defending itself against colonialist powers of the West which led to the military's gain of control in Japan towards World War II. The acceptance of technology in Japan was occurred within about in 50 years, dislike the Western countries that experienced its own developing process.[4] Meiji Restoration, the complex of modernization, westernization, and civilization, simultaneously and revolutionarily provided Japan with the whole new social structure interwoven with the acquisition of science and technology with the understanding of them as "enlightenment". It probably has a great effect on the general characteristics of Japan to be resistible and affirmative to the new technology and robots.

4.2 The Japanese postwar period– the subculture and robots

However, it requires a further explanation because it was not only Japan that experienced the rapid process of modernization/westernization. It would be questioned why, then, Japan could attain the immense introduction of industrial robots which led Japan to the great economic success even after the World War II. The Japan's success in the rapid industrialization gained a high attention from the other countries, and flourished the Japanese studies both domestically and internationally. In his book of *Japanese Civilization*, Eisenstadt made a prominent and unique research on Japanese civilization, providing the synthesis of Japanese history, religion, culture, and social organization. He focuses on the discourse about Japan by the West, analyzing that Japanese economic success in the 50's and 60's

made a comprehension of Japan as a closest among the non-Western "others" in the structure of political system, legal system, and public sectors function. However, after the 70's when Japan kept its successful development against oil shock, the tone of the discourse in the West went to emphasize the difference of Japan, and specialize it as a highly complex country. The 70's in Japan were also a prominent decade in terms of robot application to the industry. Japan continued its successful development even in the 70's to the 80's, and the Japanese society was attained automation in many fragments. Industrial Automation and Office Automation have been prevailed in much high scale. Eisenstadt analyzes that the attention for the successful growth of the Japanese economy in those times was transformed into the discussions of characterization of the Japanese, such as "strong group commitment, loyalty, harmony, and consensus" as the keys of its process of successful modernization." [Eisenstadt 1996: 13] It was emphasized by comparing with the Western individualistic attitude. It is also very important to note that this kind of discourse has been narrated also in Japan, as the reflecting mirror of the West. To the sum, the Japanese pursuit of advanced technology including robots has been always related to the growth of the national economy, which has been narrated in both the Japanese culture and the Western culture as a uniqueness of Japan.

The Japanese subculture in the Post-War Period is also particular for having many popular robot characters. One of the most famous ones is *Tetsuwan Atom*, in English "Mighty Atom" in 1951 by Osamu Tezuka. It became animated on TV in 1963 for the first time. Mighty Atom is a hero that saves humans against the evils, and is positioned as "a child of science". Another successful character is *Doraemon*, created by a comic artist, Fujiko Fujio in 1970. Doraemon is a pet-robot, as well as the best friend of a human boy, Nobita. "Doraemon" has rooted as a household word as a dear character for children. There is also a series of giant warrior robots, such as Gundam. The particularity of the concept adhering to the worrier robots is the transformation or master-slave manipulation. Usually the main character of the story is a boy leading normal life. He heritages a giant worrier robot, joins the war, and saves the world at the end. Differing from robot characters by Capek or Asimov, all tones of such imaginations in Japan contain an affinitive rapport between robots and humans.

The media's power to familiarize robots from the childhood is very particular in Japan. Not only children but also all generations enjoy the cartoons movies, comics, and TV shows. One of the most famous female singers, Utada, used Sony's QRIO in one of her song-videos, which was on the TV repetitively. At the National Museum of Emerging Science and Innovation in Tokyo, visitors are freely able to touch and manipulate robots developed by experts. Numbers of robot contests are organized for open entries from a child to a senior. The robot exhibitions are usually organized not as technical forums for only specialists, but as a kind of entertainment shows, succeeding in obtaining a wide range of visitors, cross-gender and cross-generation. As a personal experience, in 2002 I was a member of the organizing committee of annual Robot Grand Prix. It was held as a part of ROBODEX 2002, one of the biggest robot exhibitions in Japan. The visitors for the ROBODEX and the audience of Robot Grand Prix were literally composed with generations, from the elementary school children to the retired people. During the weekdays, schools organized one-day trip to visit the exhibition. In the weekend, the place was fully covered by families, as children were dragging their parents or grandparents to see the robots. The one of the judges for the Grand Prix, invited from the United States, told me his amazement on the Japanese acceptance of robots that he had never seen such a place that robots were admired by generations, from the young to the old. In Japan, there are mountains of visual information available on real robots, influencing on attitudes to robots and technology in general.

4.3 "Next-generation Robot" Project of the METI

Following the World War II, in Japan, the manufacturing industry was the wellspring of the nations' economic strength. The particularity of the Japanese robot scene is resulted in million of industrial robots at work while the United States had 112.3 million. In Europe, Germany had, slightly more than the United States, 112.6 million, and Italy with 50.0 million. The ratio of occupancy of industrial robot of Japan of 2003 was 43.5 percent of the entire the outstanding figure of usage of industrial robot.[5] At the end of 2003, Japan had 348.7 population of robots in the world, and in 2002 it was over 50 percent, as shown in the Figure 1. At present, in Japan, robots are used extensively in manufacturing industries such as electrical appliances and automobiles industries, but are rarely

used in non-manufacturing industries.

However, Japan is now confronted with a sharp rise of the aging society, and a serious decline in the birthrate. Japan is forced in making a new step towards the future society, especially by the change of composition of the population. And, to respond such new social needs, Japan regards robots to be one of the important resources. Since the 80's, the Japanese government has been making various supports for advancing robot development.

Figure.1 Number of Operational Units of Multipurpose Industrial Robots

	2003 END	2000 END	1995 END	1990 END	1985 END
Japan	348,734	389,442	387,290	274,210	93,000
Rep. of Korea	47,845	37,987	18,149	3,020	
Singapore	5,273	5,370	3,275	1,389	200
Australia	3,571	2,833	1,840	1,430	
China-Taiwan	8730	6,942	3,849	1,290	227
USA	112,390	89,880	56,945	34,090	20,000
Benelux	9,052	8,211	5,086	2,422	604
Denmark	2,078	1,414	672	470	164
Finland	3,407	2,647	1,398	810	257
France	26,137	20,674	13,276	8,350	4,150
Germany	112,693	91,184	51,375	27,320	8,800
Italy	50,043	39,238	22,963	12,200	4,000
Norway	684	540	477	440	323
Sweden	6,959	6,276	4,459	3,340	2,046
Switzerland	3,480	3,743	2,672	1,510	290
United Kingdom	14,015	12,344	8,314	5,940	3,017
Spain	19,847	13,163	4,913	2,100	688
Portugal	1,367	1,080	306	56	
Austria	3,602	3,046	2,323	1,150	249
Hungary	216	261	236	200	67
Poland	584	474	493	520	
Russian Fed.	5,000	5,000	10,000	64,204	
Czech Rep.	1,445	915	375		
Slovakia			532		
Slovenia			238		
Other Countries	13,620	8,064	3,840	1,250	375
Total	800,772	750,728	605,296	447,711	138,457

Japan

('85)	93,000	67.2%
('90)	274,210	61.2%
('95)	387,290	64.0%
('00)	389,442	51.9%
('03)	348,734	43.5%

Asia. Oceania

('85)	93,427	67.5%
('90)	281,339	62.8%
('95)	414,403	68.5%
('00)	442,574	59.0%
('03)	414,153	51.7%

USA

('85)	20,000	14.4%
('90)	34,090	7.6%
('95)	56,945	9.4%
('00)	89,880	12.0%
('03)	112,390	14.0%

W. Europe

('85)	24,588	17.8%
('90)	66,108	14.8%
('95)	118,234	19.5%
('00)	203,560	27.1%
('03)	253,364	31.6%

E. Europe

('85)	67	0.0%
('90)	64,924	14.5%
('95)	11,874	2.0%
('00)	6,650	0.9%
('03)	7,245	0.9%

Other Countries

('00)	8,064	1.1%
('03)	13,620	1.7%

Total

('85)	138,457	100.0%
('90)	447,711	100.0%
('95)	605,296	100.0%
('00)	750,728	100.0%
('03)	800,772	100.0%

Source : International Federation of Robotics (IFR)

The Japanese Robot Association (JARA) supports such a governmental strategy for robot development. It made an analysis of the characteristics of the Japanese robot usage in manufacturing industry. JARA points out that robotics is "one of Japanese traditional areas of strength", but at the same time, "the United State and Europe boast advanced robot technology in non-manufacturing fields such as nuclear power, space, oceanic research, disaster prevention, and medical/welfare applications. Further more, while Japan can claim considerable expertise in basic areas such as manipulation and mobile function and lower-order controllers the United States is clearly superior in areas such as intelligent software and media and network tools". [JARA 2001: 2] JARA continues on the report, insisting the necessity of onset of technological strategy involving robots, beyond the manufacturing sector, in "bio-industries, public services, medical and welfare applications, and consumer applications" for the 21st century. In the future we will see robots in our daily life, involving with non-repetitive tasks, and working directly alongside humans. In order to represent the international competitiveness for the Japanese industry in the 21st century, JARA says, "Robot industry should be seen as an important aspect of industrial policy in Japan". [JARA 2001: 10]

Responding such social analyses, the METI has announced a new policy to enhance the Japanese robot industry with the cooperation of many public entities, such as The New Energy and Industrial Technology Organization (NEDO). The "Strategy for Creating New Industries" released in May 2004 by the METI positions robots as one of the seven most critical industrial fields, and declares the government's intention to provide a focused support for robot research and development. And, by the guidance of the METI and the NEDO, Japan has started a new robot development project called "Next-generation Robot", which cooperates with human begins and supports for the daily life.[6]

The details of aimed field of the next generation robots are, for instance, household chores such

as dishwashing, house clearing, and childcare. In medical/welfare services, robots would be seen in the scene of surgery, nursing, and rehabilitations. For public services, they would support rescue operations in accidents or disasters, or securities against crime or terrorism. Even outside of the projects, the Japanese high-tech companies are sensitively responding the high attention of the government and society, and creating a new market for personal robots, like a pet-robot or other entertainment robot that are already/will be soon on the market at the attainable price. The METI held an unofficial meeting in the spring of 2005, about the future robot in 2025. In the future, human life will be with robots. It is not any fantasy stories written by a science fiction writer. The concept of "Next-generation Robot" is not a mere idea that suddenly popped out. In Japan, there is a social, cultural, and industrial background to foster such a vision and keeps the relatively close and thick relationship with robots.

The image of robots to the Japanese are relatively intimate than that of the West, and this phenomenon can be reasoned by the encounters with the real robots in daily life, based on its peculiar history of application of technology. Now, let's go back to the questions. Are the Japanese disregarding on the Roboethics? Or, is it the socio-cultural and historical background that makes the Roboethics less outstanding in Japan?

5. The Roboethics in Japan?

I believe that, for most Japanese robotists, it would be difficult to dialogue on Roboethics in the tone of the West. By "in the tone of the West", I mean a characteristic of the West is to have a fear of robots rising in rebellion against humans. The rebellion of robots may result in our inferiority to robots and our loss of control over them.[7] I also see a kind of fearful bewilderment in creating new sorts of machine that have the potential to take over employment opportunities and thus worsen the unemployment situation that has appeared as a serious social problem in many countries.[8] Both aspects seem to be considerably rooted in Western cultures. Linguistically, for instance, the origin of the "robot" was created in the West, with a dark side, and it implies a certain amount of fear of humans against robots.[9] In *the Oxford English Dictionary Second Edition* published in 1989, "robot" is defined as

1. **a.** One of the mechanical men and women in Capek's play; hence a machine (sometimes resembling a human being in appearance) designed to function in place of a living agent. especially; one which carries out a variety of tasks automatically or with a minimum of external impulse. (underlined by the author) **b**. A person whose work or activities are entirely mechanical; an automaton. **c**. Chiefly S. Afr. An automatic traffic-signal. **d**. A robot bomb. temporary.
2. Attribute as robot army, robot astronaut, robot brain…

La Enciclpedia Italiana published in 1991 adds another definition to the meanings above, as "programmable electronics employed in industry, as a substitute for humans in executing automatically and autonomously repetitive, or complex, heavy and dangerous mechanical tasks and operations" (underlined by the author).

The images and definitions in the West adhere to the formula of "man makes robot, robot kills man," such as *R.U.R* of Capek and *I, Robot* of Asimov who is the inventor of the word "Robotics." Asimov called this Western tendency the "Frankenstein Complex," and through his science fiction novels, Asimov raised the issue of morality, or ethics, in the science of Robotics, which may lead to social problems, like the well-known three laws of Robotics presented in 1942.[10]

The linguistic definition in Japanese, “robotto” written with the phonetic script used for foreign words, is rather shorter and simpler. *Kojien* dictionary in 1989 defines “robotto” as

1. an artificial, automatic doll, made of complex, precision mechanisms; [*jinzo ningen*] an artificial man, an automaton
2. generally, machinery or devices capable of automatically performing designated operation or work [as in a robotic measuring device, or industrial robot]
3. a person who acts under someone’s control; a person with status, but no ability; a puppet.

In Japan, the robot, as an advanced technology, promises industrial development leading to social prosperity. Robots will be designed and implemented to support elderly people and women to obtain new employment opportunities. Robots will free human workers from the office, thus enhancing human quality of life. Thus, expected problems of application of robots to human society are more systematic than ethical. In fact, Takaki Tsujimoto, Industrials Machinery Division Assistant Director of the METI's Manufacturing Industries Bureau, indicates this problem in an interview. "Since the concept of next-generation robots is premised with close contact with humans, it is vital that human safety be ensured. Moreover, there is potential for system-related problems to occur, such as illegal accessing of personal data stored in Robotics or illicit remote manipulation of robots by persons other than the owner." [JETRO 2004: 14-15]

The Japanese economic acceleration to implement robots may be considered thoughtless or over-optimistic from the Western point of view.[11] However, there is a philosophical approach to Roboethics made by a Japanese scholar, Kurosaki. At a speech at a Humanoid workshop in 2001, he presented his observation on the Japanese robot boom caused by pet-robots and entertainment Humanoid Robots. By distinguishing humans’ emotional reactions towards these robots regarding intuitive instinctive feeling and intellectual understanding, he argues “a cast” by human nature.[12] According to him, when we see such robots, we have the same intuitive tender human feeling for such robots that we have for living animals, although it is self evident that there is no “robot mind.” He understands that it is merely a cast (“*hinein-legen*” in the Kantian terms he uses) by human nature, and the mind of the robot (“*focus imaginarius*” as he uses) naturally arises from human nature to give everything a meaning. [Kurosaki 2001: 31-34]

While Kurosaki understands this cast as something universal because it is human nature, there may be a greater tendency among the Japanese people to “cast” the “focus imaginarius (mind of the robot)” on these pet-robots and entertainment robots, perceiving friendliness with robots. In addition to the psychological effects of appealing to human emotion by its animal-like shape, it is possible to extend the argument to the Japanese conception of the ontological reality that Eisenstadt examines. [Eisenstadt 1996: 318-321] The ontological reality of Japan emphasizes the reality of something constructed or defined by relations among the semantic discourse. An example is the gods, sometimes mixed with the concept of spirit, appearing in material things, from natural objects to artificial devices, but not as the creator of the world. Immanence in Japan refers to things of everyday life, to ideas, and common attitudes, and is thus hardly spoken of. The sense of world appears as something contingent, but not as static matter that is possible to comprehend transcendentally that conspicuously appears in the Western thought. This ontological reality may give the lead to Japanese Roboethics. In Japan, at any stage of development, the robot will be considered a machine, hardly an evil entity. Of greater concern is the Japanese attitude concerning how to relate to the real world constructed by dialogue among human beings,

nature, and even robots. The Japanese sense the existence of some sort of spirit, but this differs from the "anima" in the Western concept, immanently in stones, mountains, and even working tools. It is explained as a reality in ontology, which has great importance in social activities in Japan. Sometimes a stone is worshiped as a god. Construction companies hold a Shinto ritual to pray for safety during the period of work for the "spirit" of the land and the construction tools. Similarly, robots are self evidently machines. However, when the people use these machines, a rapport is created between the robot and the person as a user. The issue of how to "see" them, or "feel" them leads to the question of the existence of spirit, as ontological reality shows. This rapport in Japan is on a subconscious dimension, naturally taken for granted, and therefore hardly narrated. The application of robots in daily life in Japan may be readily accepted because of this view of reality. For this reason, systematic and institutional problems appear more readily than do ethical issues.

6. Conclusion

It is not my intention to specialize Japan as a sort of mysterious country. However, probably, among the countries participating in the advanced robot research and development, Japan occupies a quite unique position. From the sociological point of view, culturally Japan positions as the "other" for the Western societies, or I should state that Japan has been concerned such a way by both Western and Japanese scholars. Meanwhile mechanical engineers from many countries started dealing with the same substantial subject, a robot. It is natural for these robotists to face the gap in the understanding of what robot means to human beings, or how the use of robots in the human societies should be, because the implementation of robots is related to the philosophical, sociological, and cultural fields. A robot is a machine from the substantial point of view but when it comes to the question of its usage, it raise several discussion topics, the study of technology in human societies, the study of mankind in biotechnology, the study of relationship between an individual person and societies, etc. Therefore, the debate of the Roboethics cannot be defined into an idea. Roboethics should be consist not of one unique idea but of various theories based on various backgrounds like culture, society, religion, and so on.

As I examine in this paper, there is a solid assumption for robots to play one of the main roles in the future society. Japanese government has already begun to propel the nation towards where robots will be the companions of human beings, assist humans both physically and physiologically, and keep the society safe and peaceful. The rise of Roboethics in Europe may become a good motivation for Japan to consider what Japanese Roboethics is, both from the technical point of view and from the socio-cultural point of view. As one of attempts, the International Robot Fair 2004 held in Fukuoka, Japan, started off with a declaration of "World Robot Declaration"[13]. It states three specific expectations that future robots must meet and declares five resolutions on what must be done to bring "Next-generation Robot" into existence. The declaration seems to be still a kind of guideline of future development of robots, but yet it can be evaluated as a positive step to approach to the ethical discussion in Japan. The Robotics research and development is now occurring all over the world, with the remarkable velocity. We need to be careful about what we hope to have from the implementation of robots. It is indeed crucial to promote the discussion on Roboethics with the cross-cultural dialogue, as many as possible, with great care of the socio-cultural differences.

NOTES

[1] An English researcher of Artificial Intelligence (AI), Boden defines about AI as "the study of how to build and/or program computers to enable them to do the sorts of things that minds can do." [Boden 1990: 1] She however denies that it does not mean the computer itself. According to Boden, AI is the science of intelligence in general, as the intellectual core of cognitive science. "Computers" will be filtered from the definition because AI is an area that must tell us whether intelligence is embodied or can be implemented in other than brain-like systems.

[2] Jonas explains the dominion of technology as the Occidental culture's character of "anima faustiana" discussed by Spengler; namely, the irrational urge towards infinite newness and towards incapable possibility. [Jonas 1985: 1ff]

[3] For almost two centuries of Tokugawa regime, the contact with the outside world was firmly sealed off, except a tiny amount of trade with the Dutch and the Chinese on the island in Nagasaki. In 1853, American Commodore Perry landed on Japan, demanding trading rights at the point of gun. In those times, Japan was a nation that highly attained the political centralization and legitimization, but entirely missed the industrial revolution occurred in the West, resulting to be devoid of civilized technologies and science.

[4] Schodt illustrates the astonishment of the West that "in 1905, only fifty-two years after Perry arrived in Japan, Japanese soldiers armed with the latest weaponry and Japanese sailors manning modern battleships trounced Imperial Russia in a modern war. The world, especially the European world, was stunned. Overnight it seemed a tiny feudal Asian land had become an industrialized nation, and had smashed the technological hegemony of the white colonialist powers." [Schodt 1988: 67]

[5] By the Japanese Industrial Standard (JIS), industrial robots are defined as "machines used in industry that have an automatically controlled functions for manipulation or mobility, and that can perform various tasks under automated control." In other words, they are the robots extensively used in the production lines of nearly all manufacturing industries, including automobiles, consumer electronics, plastics, and food products.

[6] The NEDO, an independent administrative institution that manages research and development related to the government's policies has been taking several efforts for robot developments. Since 1998, for instance, the NEDO has been sponsoring "21st Century Robot Challenge Program". This fiscal year, the NEDO launched the "'Next-generation Robot' Practical Development Project", and among the more than 250 proposals submitted for open call, the NEDO selected 70 development schemes to sponsor with the budgets of approximately three billion-yen. The accepted proposals include projects for developing visitor reception robots, children care robots, and commissions for prototype development of Humanoid Robots, and rescue support robots. The accepted proposals include projects for developing visitor reception robots, children care robots, and commissions for prototype development of Humanoid Robots, and rescue support robots.

[7] There are many examples indicating the fear for robot rebellion, from literature and the film industry. This was also noted as one of the questions of the International Roboethics Symposium in January 2004 by the organizer's statement.

[8] For instance, two Italian science magazines, Le Scienze and Quark had a special feature on Humanoids recently. Both articles have a positive stance towards Humanoid Robotics research and development, but also added the risk of raising unemployment because of Humanoid Robots.

[9] The word "robot" is from a 1920 play entitled R.U.R. by a Czech dramatist, Karel Capek. In the play, he called his mechanical men and women "robota," the Czech noun for "work." His play fed on the fears of industrial technology in Western civilization seen in the Luddite Movement in 1811. The "robota," artificial slaves of high intelligence, took over their work, and later started a war, in which their masters, human beings, are finally annihilated, instead of killing each other. Today's meaning of "robot" reflects this origin of "robota."

[10] Scohdt cites Asimov that "the creation of a robot, a pseudo-human being, by a human inventor is…. perceived as an imitation of the creation of humanity by God… in societies where God is accepted as the SOLE creator, as in the Judeo-Christian West, any attempt to imitate him cannot help but be considered blasphemous." [Schodt 1998: 198-199]

[11] The report of an unofficial meeting, mentioned in Section 1, indicates the expected application of robots to society such as the maintenance of man (robot)-power and the creation of new employment, support for healthcare demand, protection against disaster, provision of medical services, and making and enhancing free time, while presenting a marketing estimate of robot technology, analyzing current institutional and technological problems. The meeting was to discuss how to cultivate an affirmative, positive rapport between robots and human beings.

[12] In considering the future of robot development and the roles robots are expected to play in our daily lives, NEC and the Sakamoto Lab of Ochanomizu University have jointly conducted psychological research on how humans see robots during the "RoboFesta Kanagawa 2001 Yokohama Competition" held at Yokohama in November 2001. Their research deals with the construction of a scale for measuring our perception (images) of robots, and with a survey to examine how people perceive robots, comparing images of robots, people, animals, machines, and inanimate objects (i.e., rocks) on a six-point scale assessment. The result shows that people feel are "friendly" from personal pet robots like AIBO or QURIO. Further details on the research and results are available on the website of NEC Personal Robot Center <*http://www.incx.nec.co.jp/robot/english/univ/index_e.html*>.

[13] World Robot Declaration by World Robot Declaration from International Robot Fair 2004 Office; Confident of the future development of robot technology and of the numerous contributions that robots will make to Humankind, this World Robot Declaration is issued on February 25, 2004 from Fukuoka, Japan.

I. Expectations for next-generation robots
   1. Next-generation robots will be partners that coexist with human beings.
   2. Next-generation robots will assist human beings both physically and psychologically.
   3. Next-generation robots will contribute to the realization of a safe and peaceful society.

II. Toward the creation of new markets through next-generation robot technology
   1. Resolution of technical issues through the effective use of Special Zones for Robot Development and Test.
   2. Promotion of public acceptability of robots through the establishment of standards and upgrading of the environment.
   3. Stimulation of adoption through promotion of introduction of robots by public organizations.
   4. Dissemination of new technologies related to robots.
   5. Promotion of the development of robot technology by small enterprises, and their entry into the robot business. The government and academia shall provide active support for such efforts."

BIBILIOGRAPHY

1989. The Oxford English Dictionary Second Edition No.14. Oxford.

1991. Enciclopedia Italiana fondata da Giovanni Treccani. Roma.

1998. Kojien. Tokyo.

M. A. Boden 1990. Introduction – "The Philosophy of Artificial Intelligence edited by Margaret A. Boden". Oxford.

D. Cerqui 2002. The future of humankind in the ear of human and computer hybridization: An anthropological analysis – "Ethics and Information Technology No. 4". Netherlands.

S. N. Eisenstadt 1996. Japanese Civilization – A comparative view –. Chicago and London.

J. M. Galvan 2004. On Tecnoethics. http://www.pusc.it/html/php/galvan/TE%20definitivo.pdf.

H. Jonas 1985. Technik, Medizin und Ethik, Zur Praxis des Prinzips Verantwortung. Frankfurt/M

M. Kurosaki 2001. Proceedings of "Italy-Japan 2001 Workshop 'HUMANOIDS: A Techno-ontological Approach' ". Tokyo.

F. L. Schodt 1988. Inside the Robot Kingdom -Japan, Mechatronics, and the Coming Robotopia. Tokyo and New York.

The Japan External Trade Organization (JETRO) 2004. Japan's Next-generation Robot Industry Promises Growth – "Invest Japan No.5". Tokyo.

The Japan Robot Association (JARA) 2001. Summery Repot on Technology Strategy for Creating a "Robot Society" in the 21st Century. http://www.jara.jp/e/dl/report0105.pdf.

The Ministry of Economy, Trade and Industry in Japan (METI) 2004. 2025 nen no ningen to robot ga kyozon suru shakai ni mukete -jisedai robot vision kondankai houkokusho – "For the society in 2025 where robots coexist with humans - Report on unofficial meeting on next generation robot vision -". Tokyo.

- - 2004. Shin Sangyo Souzou Senryaku – "Strategy for Creating New Industries". Tokyo.

G. Veruggio 2004. Io, Robot - Per fronteggiare le sfide poste all'umanita' della rivoluzione robotica serve una <<roboetica>> che ispri lo svilppo l'impiego delle macchine intelligenti – "Le Scienze" No.434. Milan.