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The Eastern Construction of the Artificial Mind[1]

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Abstract

In this paper we will analyse the possible similarities and differences between scientists dealing with AI and robotics from the West and those from the East. Another question that arises is: is there such a thing as an AI & robotics paradigm specific to Eastern research? Through the analysis of cultural, philosophical and technical aspects, this research will show that there is no real Eastern model of the artificial mind, although their background ideas have influenced world-wide research in the field deeply.

Keywords: AI; robot; mind; Buddhism; emotions.

Resumen. *La construcción de la mente artificial desde Oriente*

En este artículo vamos a analizar las posibles semejanzas y diferencias entre los científicos que se ocupan de la IA y la robótica en Oriente y Occidente. La primera pregunta que surge es: ¿existe realmente un paradigma propio oriental para la IA y la robótica? A través del análisis de los aspectos culturales, filosóficos y técnicos, esta investigación mostrará que no hay un verdadero modelo oriental de mente artificial, aunque sus ideas filosóficas han influido profundamente a nivel mundial en esa investigación.

Palabras clave: inteligencia artificial; robots; mente; budismo; emociones.

Summary

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1. Introduction

Minor White, an American photographer (1908-1976), changed his photographic style when he became a follower of Zen Buddhism. Can our beliefs about the world change the viewpoint from which we perceive and reproduce it? Throughout history, Western philosophers and scientists have neglected the achievements of their Eastern counterparts. There was a gap between the two worlds of thought. The reasons for this gap were not only methodological but also the result of opposing religious, economic and political strategies. Moreover, a difficulty for Western intellectuals was one of access to the primary sources, because of their geographical remoteness and unfamiliar languages (Sanskrit, Chinese, Japanese...), and this made a meeting of minds a significantly complex task. Neither the mental attitudes involved, nor the physical constraints were ideal for the symbiosis of concepts and ideas. Nevertheless, there are authors who have devoted themselves to bridging the gap[2].

This stated, we can start our analysis of the common points and differences between Eastern and Western AI researchers by trying to elucidate the nature of AI research goals and attitudes towards them.

2. Things or Minds? The Revolution within Cognitive Sciences

First of all, we should undertake a short revision of some theories of mind, both from Eastern and Western perspectives. After this, we will have sufficient material to analyse current conceptions of artificial minds.

2.1. The Geography of Philosophy

Philosophy has been developed independently (but with plenty of historical feedback) by Eastern and Western specialists. Despite the hundreds of authors and detailed thought involved, it could be considered that, in the West, philosophical analysis of the mind has represented a continuum from Greek philosophy up to the present day. It is a dualist (body-soul/mind) approach that reached its highest peak with Descartes, but was revised with behaviourism and finally led to contemporary cognitive psychology, with the profound influence of the computational paradigm[3]. By contrast, in Eastern countries, and especially in Japan, there was no influential mind-body dualism. Instead, it has long been thought that the mind and the body are inseparable (Ishii, 2005). Nevertheless, if we consider that Buddhism views the body as an independent system from the real self, and that the body is impermanent, decaying and out of control, perhaps Buddhism is not so far from some kinds of Western dualism. And there are also dualists in Hindu philosophy, such as the

2. Needham (1954), is the best example. Tola & Dragonetti have written several books on the philosophical characteristics of Eastern thought.
3. We should include the crucial research results of some contemporary neurologists such as Rofolfo Llinás or Antonio Damasio.

Dvaita school. This is, in a nutshell, the basic geographical perspective regarding the functioning of the mind.

2.2. Cognitive Sciences

The Cognitive Sciences, as a field of research, have appeared relatively recently (1979, U.S. Cognitive Science Society; 1983 Japanese Cognitive Science Society,...). It is a multidisciplinary research field, embracing AI, psychology, neuroscience, philosophy and linguistics. Computer science has a deep influence at the metaphoric level ('brain as a computer', Von Neumann 1958) as well as at a practical level (computer simulations of mind, neural nets). Although the keystone of research within the cognitive sciences is an interest in the mind as a whole, the investigation of verbal/non-verbal thinking and metacognition (the ability to think about thought itself) are also interesting aspects of this field.

In an effort to be concise and clear, we can affirm that today there are three main theoretical approaches in cognitive science (according to Petitot et al. 2000):

Computational-symbolic: this approach analyses the mind in terms of computations and the (sequential) processing of information in the form of symbols according to identifiable (axiomated-deductive logical) rules.

Connectionist-dynamic: by contrast, the connectionist approach analyses the mind as a network which produces behavioural dynamics that are regular and definable. This is also a representation manipulation approach. Thus, connectionism models mental or behavioural phenomena as the emergent processes of *interconnected networks of simple units*. There are many forms of connectionism, but the most common forms use neural network models, and these are able to run parallel distributed processes.

Embodied-enactive: this approach understands cognition as emerging from the activity of embodied agents.

2.3. Cognition into AI

We can consider that behaviourism, the previous paradigm, is now obsolete and that the current co-existent approaches are the three mentioned above. In an attempt to relate mind studies with AI research I must now identify points of contact between them. As I have explained in detail elsewhere (Vallverdú, 2006), AI is a multidisciplinary activity that involves specialists from several fields such as neuroscience, psychology, linguistics, logic, robotics, computer sciences, mathematics, social sciences, biology, philosophy and software engineering. And it covers a number of areas of interest, such as intelligence, the representation of knowledge, creativity, robotics, language translation, domotics, emotions, data mining, intentionality, consciousness and learning. There are basically two main approaches to doing research on AI, which we can summarise as *top down* and *bottom up* approaches:

i. Top Down: symbol system hypothesis (Douglas Lenat, Herbert Simon). The *top down* approach constitutes the classical model. It works with symbol systems, which represent entities in the world. A reasoning engine operates in a domain independent way on the symbols. SHRDLU (Winograd), Cyc (Douglas Lenat) or expert systems are examples of it.
ii. Bottom Up: physical grounding hypothesis (situated activity, situated embodiment). This approach (led by Rodney Brooks), is based on the physical grounding hypothesis. Here, the system is connected to the world via a set of sensors and the engine extracts all its knowledge from these physical sensors. Brooks talks about «intelligence without representation»: complex intelligent systems will emerge as a result of complex interactive and independent machines.

Summarised in the following table, we can see that there are *basic* parallels between cognitive sciences, philosophical approaches and AI approaches:

Table 1. Cognitive Sciences and AI contacts

	Philosophy			
Paradigms	**Western**	**Eastern**	**Cognitive Sciences**	**AI**
	Wiener Kreis	Mohism	Computational-symbolic	Top Down
	Philosophy of mind	Buddhism	Connectionist-dynamic	Top Down
	Phenomenology	Buddishm	Embodied enactive	Bottom-Up

In any case, over recent years several authors interested in the relationships between theories of mind and Buddhist ideas have appeared (Watson, Batchelor & Claxton, 2000). One of the reasons is that Buddhism, like connectionism and related methods of cognition, does not see any central Self controlling the actions of the body, only the interaction of *khandas* or aggregates. The difference between connectionism and Buddhism is that the former sees mind as merely a bodily function, while the later has a wider idea of the mind (as a force).

Varela, Thompson & Rosch (1991) have based their radical view of the situated and fragmented *self* on their own mixture of connectionism, hermeneutics and Buddhism. The key idea is their theory of *enaction*. With this theory they try to solve several problems:

— The phenomenologist disembodied theories of mind.
— The cognitivist idea of an information-processing model of the mind.

With the idea of enaction, based on the hermeneutical praxis of 'bringing forth of meaning', they integrate the body-soul dualist Cartesianism, establishing an interdependence between the observer (man) and the observed (world). To be able to enact the world, we must be embodied in it. For this reason, the authors believe they have solved the (classic Western) conflict between experience and cognition. Unfortunately, they also affirm that the idea of meditation and groundlessness led Eastern philosophers to a spontaneous compassion, and not to the nihilist Western approaches. Following Aristotle (Physics, 191a28-29), we can state that «What is cannot come to be (since it already is), while nothing can come to be from what is not»; from this perspective, nothing can/must arise from groundlessness, neither nihilism, nor compassion. Groundlessness can only lead us to groundlessness. Emptiness cannot fill up the world with sense, any kind of sense. Nevertheless, Buddhism is a very attractive philosophy/religion because of its richer approach to the mind. Einstein argued that Buddhism was a superior and more scientific belief (Dukas & Hoffman, 1954)[4]. This positive attitude towards Eastern thinking can be found at the beginning of the 19th Century: transcendentalists such as Thoreau and Whitman wrote books including Eastern ideas. And William James, a seminal psychologist, was completely astonished and delighted when he heard the ideas of the Dharmapala. James even used terms such as 'stream of consciousness', a literal English translation of the Sanskrit *vinnana-sota* (a Buddhist metaphor for the impermanent nature of the mind) (James, 1902).

Returning to the idea of 'enaction', we can also observe that it is related to the autopoietic ideas of Humberto Maturana and we must also acknowledge that it draws on some of the phenomenological ideas of Maurice Merleau-Ponty (*Phenomenology of Perception*, 1945). Following on from Tola & Dragonetti (2009), who maintain that there is an essential identity between Indian and Western philosophies up until the sixteenth century, I strongly believe that Eastern and Western thoughts have more points in common than differences, if we are able to work with the extended corpus of both philosophical traditions. Perhaps there is a different philosophical mainstream in the two areas, but if we look into the detail and perhaps analyse the more extreme and radical authors (who tend to be freer) the differences are not so great. As in a game of chess, grammatical and semantic uses will often lead us to dead-ends. In this sense, there is no *Eastern thought* and *Western thought*, but merely Universal human thought.

After the initial psychological interest of James in Buddhism, there was no further major approach until the end on 20th Century. New non-invasive techniques on *in vivo* brain analysis (fMRI, EEG, MEG, NIR, PET,

4. The dilemma regarding the distance between subject and object has been shown to be insoluble from the quantum physics approach (particles with known position or velocity but never with both) as well as by way of philosophical ideas on the infradetermination of theories. There is no space for the debate about the isomorphism between the world and our ideas, because it is not real, being simply an operational fiction useful for the purposes of our survival.

SPECT...), with better sensitivity and resolution, allowed a renewed interest in Eastern meditation practices (as well as in studies of the mind). Some experts have claimed that it constitutes a new research field: **neurotheology**. This, also known as ***spiritual neuroscience***, is the study of correlations of neural phenomena with subjective experiences of spirituality, and hypotheses to explain these phenomena (Biello, 2007; Hayward & Varela 2001). The Naropa Institute (Boulder, Colorado) is entirely devoted to this type of study. Founded by Chögyam Trungpa Rinpoche in 1974, the Naropa Institute (later to become Naropa University) realised Trungpa's vision of creating a university that would combine contemplative studies with traditional Western scholastic and artistic disciplines. This research field covering cognition and spiritual beliefs/behaviours, is also called *neurophenomenology* (Watson, Batchelor & Claxton, 2000).

3. From cognitive sciences to AI

According to Pickering (1997), the interest in reducing mental life to computational procedures led experts to move from Cognitivism to Connectionism, opening the door to the fruitful interaction with Buddhism. Connectionism has some common points of view with Buddhism, such as the consideration of behaviour as resulting from connection or relationship, instead of the result of a biological processor that acts like a CPU.

A different point of view is that of *autopoietic* programming. Autopoietic computer programming is an AI area in which some of the ideas of autopoiesis and enaction are active. According to Wiedermann (2007), an autopoietic automaton can algorithmically generate an offspring controlled by a program which is a modification of its parent's program. Autopoietic automata offer a neat framework for investigating computational and complexity issues in the evolutionary self-reproducing processes. Wiedermann thinks that the computational power of lineages of autopoietic automata is equal to that of an interactive non-deterministic Turing machine, and that there exists an autopoietic automaton giving rise to an unlimited evolution, provided that suitable inputs are delivered to individual automata. In 2004, the journal *Artificial Life* dedicated a special number to «Thirty years of computational autopoiesis: a review», 10(3): 277-295.

Finally, we can also consider AI from a Buddhist perspective. Promta & Himma have very recently (2008) written a paper that is the first to clarify the Buddhist position on AI, and perhaps represents the first attempt to explore the relationships between any major religion and the AI agenda.

4. Eastern Attitudes towards Robots: friends or *boddhis?*

4.1. Historical precedents

At least in Japan, of all the Eastern countries, there is a tradition with automata: *karakuri ningyo*. Tea-carrying machines, dating from the 17th Century, are recognised as the first Japanese 'robots'. With the Western introduction of

clockwork technologies, karakuri became increasingly complex. Beyond the historical divergence of Eastern and Western marionette traditions (such as their means of operation: from above and in the darkness in the West but from beneath in the East), karakuri tried, from the beginning, to express several emotions. The interest in reproducing anthropomorphic movements is not the ultimate goal of these puppets, and karakuri are something akin to temples, being considered as *kami*. Let me introduce this concept in the next section.

4.2. Spiritual and philosophical trends

One of the most famous eastern roboticists who has written on the relationships between robotics and religion is Masahiro Mori. After writing a classic paper on the topic of human emotional responses to robots (1970, «Bukimi No Tani», translated as «The Uncanny Valley»), in 1974 he published *The Buddha in the Robot: a Robot Engineer's Thoughts on Science and Religion*, in which he discussed the Buddhist approach to robotics. In the first lines of this book he wrote: «I believe robots have the Buddha-nature within them —that is, the potential for attaining Buddhahood». How is this possible? The argument of Prof. Mori was: all things in the universe are related one to another, in a way that the whole can be seen in any part. Taking this further, belief in the discrete existence of beings and things, that is, between beings and their bodies, is totally flawed. The illusion of a discrete world populated by entities is simply that— an illusion. The basic life-force, called *kū*, forms and moves everything. In animist Japanese tradition this force is present in inanimate objects and is called *kami*. Kami is the fundamental unit of the sacred in Shinto. This life is in animals, people and rocks, trees, rivers and mountains too. Consequently, matter has the nature of Buddha. For this reason, he argued that the Buddha-nature must also be present in the machines and the robots that roboticists make. The truth of the universe is embodied in all its parts.

For this reason, the Dalai Lama expressed in Hayward & Varela (2001) the idea that a stream of consciousness could enter into a computer, and that a scientist, highly involved throughout his life in computer research, could be reborn in a computer. The idea being: possible reincarnation in a half-human/half-machine form, and a positive view regarding genuine life and mind in robots. For Mori, there exists an interdependency between humans and machines, a reciprocity in the relationship between humans and machines. They do not need to make the comparisons that some Western scientists do (from Julien Offray de La Mettrie, and his *Homme Machine* to Von Neumann's equiparation of brains with computers). Although we should not consider ourselves to be like the 'lifeless' machines of the typical Western conception of a machine, according to Mori this conception is flawed, since machines, like all entities, do in fact share with us the Buddha-nature. Japanese roboticists don't need to make a previous robotization of the human body to feel closer to their machines: they just feel that both, humans and robots, are sharing the same Buddha-nature (or Kami, for shintoists).

In 1970 Mori founded the Jizai Kenkyujo (Mukta Research Institute), a research group on Buddhism and robotics. They promote the fusing of Japanese thinking and technology with creative thinking (Pope & Metzler, 2008). Mori also found points of contact between the concept of cybernetics (created by Norbert Wiener in 1948, *Cybernetics: or the Control and Communication in the Animal and the Machine*, and Cambridge: The MIT Press) and the Buddhist idea of (self) control. Besides, machines are something created by man, they are the reflection of his will and extensions of his body. We cannot say that they are good or bad in essence, because existence is neutral. Therefore, machines have wide potentialities. With a healthy sense of humour there have even appeared some 'AI Koans', such as this one[5]:

> A student, in hopes of understanding the Lambda-nature, came to Greenblatt. As they spoke a Multics system hacker walked by. «Is it true», asked the student, «that PL-1 has many of the same data types as Lisp?» Almost before the student had finished his question, Greenblatt shouted, «FOO!», and hit the student with a stick.

Certainly, this is not a true koan, but a fake one, although it shows us the interest AI researchers have in Eastern ideas about the mind and their computational consequences.

4.3. Animism, Shintoism and machines

According to the Inglehart-Welzel Cultural Map of the World (Inglehart & Welzel, 2005) Japan is the most secular-rational country in the world. Despite this fact, Japanese society also has a great respect for traditional values and classic social structure. Although their citizens are not strong believers, most of the Japanese population is either Buddhist or Shintoist. These religions are the cultural background of their society, in the same way that Christian ideas are tacitly embedded in European societies, despite post-modern, atheistic or nihilist perspectives developed within them. This is important because, thanks to the main religious beliefs, we can easily recognise the underlying social attitudes towards robots and AI in Japan, and the roots of such attitudes. With a certain cultural eclecticism, it is sometimes said that the Japanese are born Shinto, marry Christian and are buried Buddhist.

For Shintoism, objects and natural events have their own spirits or gods. These ideas come from the early ancestors of Japanese citizens and are called 'animism'. For this reason, things, natural or artificial have the same ontological status as living entities. It is in this context that we can understand that the company Tmusk went to pray at Munataka Taisha Shrine for the safety and industrial success of their new robot Kiyomori. Shinto allows for the consideration of the sanctity of robots, as well as that of humans or other animals. At the beginning of the introduction of robots into industrial plants,

5. http://www.serve.com/cmtan/buddhism/Lighter/aikoans.html

workers named the robots. This is an obsolete practice nowadays because there are now too many to name (Geraci, 2006). There even exists a robot priest at the Central Cemetery at Yokohama; shaped like a human, the machines is lowered into the prayer hall every morning to chant Buddhist prayers on behalf of human beings.

There is also a robot monk at Oroku-ji, a temple in Kakogawa city. Fixed in a kneeling position, it features a smoothly shaven head and prominent ears, just like its human counterparts. Clad in priestly robes, it grasps a string of *juzu* (Buddhist prayer beads) in its left hand. This particular robot is the creation of Yoshihiro Motooka, a 65-year-old former railway technician. Most interesting is that the creator, in line with Buddhist precepts against wasteful excess, made the robot with discarded items, including parts from a bicycle, a cassette tape recorder, and a washing machine motor. Tools or *dōgu* are sanctified and it is generally accepted that recycling with due respect for the sanctity of objects is an important idea for the Japanese. There is also a robo-priest for funeral services, programmed to deliver word-perfect prayers according to the rites of seven different Buddhist sects, as well as Shinto and two Christian faiths. Robo-Priest is the centrepiece of a chapel built to the design of Mr Hideo Yoshino, 59, the head of a Yokohama construction company that decided last year to get into Japan's lucrative and highly competitive funeral industry. Robo-Priest was built to promote this automated necropolis. The date of a client's death is programmed into the computer, and every year the priest will descend hydraulically from his refuge in the roof and say sutras for the soul of the departed for half an hour. This is an automated version of the Western Perpetual Mass. Thus, technological objects have their own sacred life. Just as Shinto priests can officiate at the sanctification of industrial robots, Buddhist monks lead consecrations at the demise of everyday objects like discarded dolls or printing blocks.

The Japanese don't fear robots: their most recent incorporation into their society is SAYA. Saya is the result of 15 years of research and is being tested as a teacher after working as a receptionist, she —or it— is multilingual, can organize set tasks for pupils (**elementary-school students in Tokyo**), call the roll and get angry when the children misbehave. Saya is just one example of Japan's determination to put a robot in every home by 2015. They feel their robots are so human that they even created the Akazawa Robot Clinic (Osaka), explicitly avoiding the idea of a 'repair shop'. The 'head doctor', Kazuhiro Oono says that Japanese people don't want their robots repaired, they want them treated. Then there is *Geminoid* the twin robot of Prof. Hiroshi Ishiguro, uncannily realistic and the attempt of his creator to create a second identity for himself. Meanwhile the chatbot Buddhabots (www.buddhabots.com), an entertaining spiritual teacher for those who have time to chat, would scarcely be accepted in any Western version (such as 'Jesusbot.com'[6]) promoting auto-

6. Nevertheless, there does exist JesusBot.org. The JesusBot script is that of a general irc bot with the following features: multiple networks w/individual settings, preferred server &

matic on-line religion or metaphysics. However the Japanese accept robots for another (political) reason: their cultural reluctance to accept immigrant workers, a big problem (a threat, to be precise) when you consider the low birth rates in Japan.

4.4. Pop culture

The ideas of Mori about the Buddha-nature of robots had a great impact on both eastern and western societies. In the East, citizens have grown to love robots with the development of fiction about robots, from manga comics to TV cartoon series and films. The influence of manga is so great on Japanese children, that they even draw differently from children in other cultures (Wilson, 2002). Thus manga not only affects how children receive information about the word but also transforms the way in which they see and perceive the world.

In 1951 Osamu Tezuka created a comic figure called «Tetsuwan Atomu», known outside Japan as *Astro Boy* or *Mighty Atom*. His story was set in 2003, and Tetsuwan was a robot who resembled a young boy on the outside, but possessed superhuman powers, thanks to his advanced technology. After a successful manga comic reception, his audience increased even more at a national level when in 1963 Astro Boy was broadcast on Japanese television. Astro Boy, so his story goes, was created by a top scientist at the National Space agency to replace a son who died tragically. Nuclear-powered and with enormous strength, he was placed in a normal family environment (although with robot parents) and went to school with normal children. Through manga and anime, Astro Boy became a social reference for a generation of Japanese children (Krebs, 2006). This young robot created the robot-friendly attitude in Japan, by generating a positive image of robots. Even at an architectural level, there is a techno-orientalist approach that offers interesting robot shapes: the Bank of Asia in Bangkok uses mechanistic imagery, a round shaped toy robot.

This friendly attitude can be seen in Japanese workers: they raised few objections to the introduction of industrial robots into the workplace. This is a very different attitude from that of certain European 'Luddites'. Tetsuwan Atomu had ten ethical rules (rather than the three of in Asimov's literature) related to respect for human beings. After this new popular hero more robots arrived in anime: Doraemon, Mazinger Z, Arare (Dr. Slump), Ironman, Amuro Ray piloting Gundam, EVA Unit 01 (from Neon Genesis Evangelion or *Shin Seiki Ibangerion*)... and these days we in the West also have an Eastern offering in the form of the Transformers, warrior robots introduced (and re-branded) in the U.S. by the Japanese toy company Takara, under the license of Hasbro.

Doraemon, for example, has the appearance of the stereotypical *kawaii* formula (the Japanese notion of 'cuteness'): small, soft, mammalian and

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nick lists, chess with 25 good colour schemes & knows the rules, database of quotes with impressive adding/retrieval capabilities, and more.

extremely round. Like Astro Boy, Doraemon lives in a normal family environment with his friend Nobita and helps him with his various problems (Schodt, 1988). Intermediaries between science and imagination, these robots represent robots as close, benign and friendly beings. Acceptability also derives from religious and cultural contexts. For example, there is the idea of *Mottainai*, which can be translated in different ways but which expresses care for things based on the belief in the 'soul' or vital force inside things, even artificial entities such as robots. Semantically, Mottainai is a compound word: mottai+nai. Mottai (勿体) refers to the intrinsic dignity or sacredness of a material entity, while Nai (無い) indicates an absence or lack. For this reason, things cannot be treated as less worthy or more worthy. Artificial organs, for example are considered culturally by Japanese people to be good, reliable, trustworthy machines. They do not display the classic fear of the machine or of the creative capacity of human beings that we find in Western societies (Golem, Frankenstein, Hal-9000, Matrix....). Wilson's book (1991) is an example of this western fear. Even for sexual purposes (Sexdolls, Sexaroid...), there is a greater enthusiasm. The robot anthropologist Kathleen Richardson made an interesting contribution to this debate with her Ph.D. thesis *Annihilating Difference? Robots and Building Design at MIT*. As shown in the Aichi 2005 exhibition, the Japanese have robots for every aspect of life: child care (NEC's Papero), communication (Wakamaru) and therapy (AIST's Paro) robots, androids (Kokoro Actroid), cleaning (Matushita Electric, Fuji Heavy Industries) and security (Tmsuk) robots, as well as entertainment robots (AIST's dinosaurs, Toyota's humanoids).

Obviously, Eastern researchers see that Western society does not feel so close to robotics, at least to humanoid research. It is in this context that we can understand that in 1996, Katutoshi Tagami, then chief of Honda's Wako Research Center, travelled to the Vatican to consult the opinion of Christian rulers about humanoid robots, his main research (Geraci, 2006). The Vatican did not overtly criticise Honda's efforts, but this doesn't mean that Westerners (most of them culturally Christian) don't maintain a generally negative attitude towards humanoid robotics.

The only barrier to this closeness seems to be the so-called *Uncanny Valley*. The uncanny valley hypothesis holds that when robots and other facsimiles of humans look and act almost like actual humans, it causes a response of revulsion among human observers. The «valley» in question is a dip in a proposed graph of the positivity of human reaction as a function of a robot's lifelikeness. It was introduced in 1970 by Japanese roboticist Masahiro Mori (who we mentioned earlier), and has been linked to Ernst Jentsch's concept of «the uncanny» identified in a 1906 essay, «On the Psychology of the Uncanny». Jentsch's conception is famously elaborated upon by Sigmund Freud in a 1919 essay entitled «The Uncanny» («Das Unheimliche»).

We must also take into account the fact that Eastern societies have greater IT and robotics implementation and social integration than Western ones. For example, in 2007 Korea created the 'Robot Ethics Charter' (REC), the

first legal regulatory system for robots in the world. The reason of the REC is twofold: first, to prepare for the future establishment of ethical guidelines for the partnership between people and robots; second, to establish Korea as a test bed country for robots. But there is another reason, a deeper one: they *love* robots (they do not look upon them as competitors), and they wish to have robots in every stage and position in their lives. The social and consumer demand for robots is extremely high and thus they are preparing their laws for this situation.

The reasons of this social demands are multiple: headed towards an ageing society with low birth rates, Korea is facing the future prospect of difficulty in caring for the elderly with a reduced working population; meanwhile family robots (for fun or home activities such as cooking, cleaning...) are already in the market; they have a positive attitude towards robots, due to cultural-religious ideas and the mass-media bombardment of robot stories (comics, cinema, literature, television,...). In Europe debate has also begun around these topics, as shown by the EURON Roboethics Roadmap. In January 2004, the Scuola di Robotica (Genoa, Italy) organised the First International Symposium on Roboethics (www.roboethics.org).

The success and the important follow-ups of that event encouraged the proponents to design a more continuous and systematic approach: the Roboethics Atelier inside EURON. In June 2006 the Euron Roboethics Atelier Project came to a close. The result of the project was a Roboethics Roadmap, produced and reviewed by the Atelier participants. And responding to the Japanese government demand for robotics research (the Japanese Government declared the robotics industry to be one of the seven most critical industrial fields in its Strategy for Creating New Industry in May 2004), Fukuoka Prefecture has applied for and received the first nation-wide designation as a Special Zone for Development and Practical Experiment with Robotics, and promotes the research and development of next-generation robots that co-operate and coexist with humans. The development by Sony of a *useless robot*, like QRIO, is an example of this social interest in robotics. Perhaps it is unfair to call it 'useless', perhaps it should be called an 'entertainment robot'.

Conclusions

Despite the cultural differences between Eastern and Western researchers on AI and robotics, from a theoretical point of view most of them are functionalists[7]. Even in Japan, leading robotics professors (e.g. Hiroshi Ishiguro, Minoru Asada,...) are functionalists, considering some ideas of Buddhism expressed by Mori in relation to robots as mere superstition (MacDorman, Vasudevan & Ho, 2008). For this reason I cannot agree with Geraci (2006) when he says

7. Personal communication of Prof.Karl F. MacDorman. I recommend his excellent writings on human-computer relationships.

that AI research paradigms in Japan and the U.S. are different. Slight differences (such as more interest in humanoid robots in Japan as opposed to disembodied AI and task-specific robots in the U.S. and Europe) cannot support the argument that the two approaches, Eastern and Western, are different in essence.

Another different question is how the lay populations of their respective countries see and support both research fields. Public perception of science is not only a question of interest for sociologists but also the key to understanding the public and private investment in these areas of knowledge. Thus we could consider that some elements of Buddhism could be interpreted in certain ways that are compatible with functionalism (that is, the belief that everything arises owing to causes and conditions).

From the material analysed we can conclude that:

> Buddhism has an important influence on sciences of the mind from the second half of the 20th Century until today. This implies an influence on the approach to the creation and simulation of artificial minds (AI).

There is no unified Eastern approach to robotics or AI, although there are different views, goals and ideas within these fields, which have contributed to Eastern countries being at a more advanced stage of AI & robotics research.

The Eastern population is robot-friendly, for religious and social (manga, tv, anime) reasons. The Western population takes a contrary view (at least for humanoid robots). Nevertheless, first cross-cultural studies show us that there are more striking similarities in attitudes towards robots than differences between Eastern and Western populations (MacDorman, Vasudevan & Ho, 2008). The way in which robots or humans are presented (as weapons, personal care, human substitution, real things or anime fantasies,...) is the key to the analysis of people's real attitudes.

Western and Eastern AI research are not intrinsically different.

Leading research and implementation on robotics is mainly run in Japan, the so-called robot kingdom, or «robotto okoku».

This friendly attitude is beginning to increase in Western countries as is demonstrated by the new research into artificial emotions (affective computing, social robots, synthetic emotions). The new journal, released by the author as Editor-in-Chief at the end of 2009, the *International Journal of Synthetic Emotions* is the first step in this direction[8].

What is viewed with optimism and a friendly attitude in Eastern countries, that is, the creation of more powerful robots, or even cyborgs, is called in Western ones 'apocalyptic AI' (Geraci, 2008). Robots are only robots, and it is us who decide on the wishes or fears we have of them, at least at this point in robotics research.

8. http://www.igi-global.com/journals/details.asp?ID=33374.

Resources

BIELLO, David (2007). «Searching for God in the Brain». *Scientific American Mind*. October.

DUKAS, Helen and HOFFMAN, Banesh (1954). *Albert Einstein, The Human Side*. USA: Princeton University Press.

GERACI, Robert M. (2006). «Spiritual Robots: Religion and Our Scientific View of the Natural World». *Theology and Science*, 4 (3), 229-246.

— (2008). «Apocalyptic AI: Religion and the Promise of Artificial Intelligence», *Journal of the American Academy of Religion*, 76 (1), 138-166.

HAYWARD, Jeremy W. and VARELA, Francisco, J. (2001). *Gentle Bridges; Conversations with the Dalai Lama on the Sciences of Mind*. USA: Shambhala.

INGLEHART, Ronald and WELZEL, Christian (2005). *Modernization, Cultural Change and Democracy*. New York: Cambridge University Press, 64.

ISHII, Kayoko (2005). «Cognitive Sciences as Science of the Mind». *Quarterly Review*, 14, 13-25.

JAMES, William (1902). *The Varieties of Religious Experience. A Study in Human Nature*.

KREBS, Stefan (2006). «On the Anticipation of Ethical Conflicts Between Humans and Robots in Japanese mangas». *International Review of Information Ethics* 6 (12), 64-68.

MACDORMAN, Karl F.; VASUDEVAN, Sandosh K. and HO, Ching-Chang (2008). «Does Japan really have robot mania? Comparing attitudes by implicit and explicit measures», *AI & Society* 23 (4), 485-510.

MORI, Masahiro (1974). *The Buddha in the Robot. A Robot Engineer's Thoughts on Science and Religion*. Tokyo: Kosei Publishing Company.

NEEDHAM, Joseph (1954). *Science and Civilisation in China*. Oxford: OUP. 27 vol.

PETITOT, Jean; VARELA, Francisco J.; PACHOUD, Bernard and ROY, Jean-Michel (2000). *Naturalizing Phenomenology: Issues in Contemporary Phenomenology and Cognitive Science*. USA: Stanford University Press.

PICKERING, John (ed.) (1997). *The Authority of Experience: Essays on Buddhism and Psychology*. London: Curzon Press.

POPE, Linda C. and METZLER, Ted (2008). «Has a Robotic Dog the Budha-Nature? Mu!». *Association for the Advancement of Artificial Inteligence*, 23-26.

PROMTA, Somparn and HIMMA, Kenneth E. (2008). «Artificial intelligence in Buddhist perspective», *Journal of Information, Communication and Ethics in Society*, 6 (2), 172-187.

SCHODT, Frederick L. (1988). *Inside the Robot Kingdom: Japan, Mechatronics and Coming Robotopia*. NY: Kodansha International.

TOLA, Fernando and DRAGONETTI, Carmen Leonor (2008). *Filosofia De La India: Del Veda Al Vedanta: El Sistema Samkhya*. Barcelona: Kairós.

VALLVERDÚ, Jordi (2006). «Choosing between different AI approaches? The scientific benefits of the confrontation, and the new collaborative era between humans and machines», *TripleC* (Special Issue about E-CAP 2005 Congress), 4 (2), 209-216.

VARELA, Francisco J.; THOMPSON, Evan; ROSCH, Eleanor (1991). *The Embodied Mind: Cognitive Science and Human Experience*. Cambridge, MA: The MIT Press.

VON NEUMANN, John (1958). *The Computer and the Brain*. New Haven/London: Yale University Press.

WATSON, G.; BATCHELOR,G. and CLAXTON, G. (eds.) (2000). *The Psychology of Awakening: Buddhism, Science and Our Day-to-day Lives*. London: Rider.
WIEDERMANN, Jiří (2007). «Autopoietic automata: Complexity issues in offspring-producing evolving processes». *Theoretical Computer Science* 383 (2-3), 260-269.
WILSON, Brent (2002). «Becoming Japanese: manga, Children's drawings, and the construction of national character». In: RESLER, L. and THOMPSON, C.M. (eds). *The Arts in Children's Lives*. The Netherlands: Kluwer Academic Press, 43-55.
WILSON, Daniel (1991). *How to Survive a Robot Uprising: Tips on Defending Yourself Against the Coming Rebellion*. NY: Bloomsbury.