Mapping the Legal Framework for the introduction into Society of Robots as Autonomous Intelligent Systems

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Aimec 3-robot, built by Tony and Judie Ellis.
Via http://www.robotliving.com/robot-news/inventor-creates-robot-companion/

1. Introduction

Autonomous Intelligent Systems (AIS) are the next step in the development of a more sustainable information society. This is acknowledged in European policy documents on sustainable innovation. Horizon 2020 provides the Framework Programme for Research and Innovation under the Europe 2020-strategy.[1] One of the indicated challenges is: "cognitive systems and robotics", initiating an agenda for research and innovation which aims to develop "artificial systems that operate in dynamic real life environments, reaching new levels of autonomy and adaptability",[2] for "(t)here is a strong focus on advanced robotic systems, given their potential to underpin the competitiveness of key manufacturing sectors in Europe and a wide range of innovative products and services across the economy, from home appliances to

[1] Communication […] 'Horizon 2020 - The Framework Programme for Research and Innovation', SEC(2011) 1427 & 1428 final, COM(2012) 808 final (Horizon 2020).
[2] See forthcoming Annex 7 to the Decision, 'Work Programme 2013, Cooperation Theme 3, ICT[…]', EC C(2012) , draft available via http://cordis.europa.eu/fp7/ict/docs/draft-wp2013.doc (last accessed on 9 july 2012) (Work Programme).p. 9.

health, security, space and leisure".[3] Target is to produce "systems that can operate autonomously in the real world through e.g. scene and context understanding, anticipation and reaction/adaptation to changes, manipulation and navigation, as well as symbiotic human-machine relations".[4] Initiated in 2012, the European FET-Flagship Candidate Robot Companions for Citizens aims to provide innovative solutions to societal changes. Envisioned AIS are soft bodied, sentient and intelligent machines that are able to understand and communicate with humans and each other, equipped with predictive and decisional capacities, based on their own experience, being energy efficient and sustainable, in order to a.o. provide personal companionship and care assistance for the rapidly ageing EU-society.[5] In industry we can already see an increasing focus on robotics that are more or less autonomous. The global market for industrial robots was calculated in 2011 to comprise $12 billion,[6] and industrial robot sales increased with 18% that year.[7] Russian entrepreneur Dmitry Grishin has recently announced to invest millions in the development of Robotics in New York.[8] The South Korean Government aims at a market share of 13% in personal robotics to be achieved by 2013 and 20% by 2018 and has therefore drafted the Robot Special Act, calling for large investments in robotics R&D.[9] Corporations in for instance Japan are known for their R&D in the field of Robotics: Honda has been developing their humanoid robot ASIMO from 2000 onwards[10] and predicts to sell as many robots as cars by 2020.[11] Sony developed humanoid QRIO[12] and the four legged commercial dog-robot AIBO.[13]

Unique opportunity for law

The realization of Autonomous Intelligent Systems in the forthcoming years will offer a unique opportunity to study the legal consequences and implications of the introduction of truly new phenomena into society. The fact is that autonomous systems are unknown entities in the current (European) legal and normative framework. This creates uncertainty on issues such as free-will, liability, privacy and consumer protection as well as ownership of (intellectual)

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[3] Work Programme, (draft), p. 9.
[4] Work Programme, (draft). P. 33-34.
[5] See for the general outline the website www.robotcompanions.eu. (checked 13 June 2012). See also CA-RoboCom D.2.4: Robot Companions: Ethical, Legal and Societal Issues, 10 May 2012, p. 3-4 and the Manifesto 'More than Future, Robot Companions for Citizens: Enabling Technology for Sustainable Welfare", available via http://robotcompanions.eu/system/files/page-files/RoboCom%20OVERVIEW%20.zip, checked: 13 June 2012.
[6] See the Final Report *Robotics and Autonomous Systems Industry*, The Industrial college of the Armed Forces, National Defense University, Washington D.C., spring 2011, p. 3, referring to "Who we are: IFR Statistical Departments: Welcome to IFRStat – WorldRobotics" http://www.worldrobotics.org, accessed on 10 July 2012.
[7] IFR Statistical Department, 'IFR: All-time-high for industrial robots', 1 September 2011, via http://www.worldrobotics.org/index.php?id=123&news_id=259, accessed on 10 July 2012.
[8] T. Geron, 'Not Science Fiction Anymore: Mail.ru Dmitry Grishin Launches $25M Robotics Fund', *Forbes*, 15 June 2012, available via http://www.forbes.com/sites/tomiogeron/2012/06/15/not-science-fiction-anymore-mail-rus-dmitry-grishin-launches-25m-robotics-fund/, last checked 10 July 2012.
[9] 'South Korea aims to boost robotics', *UPI*, 17 april 2009, available via http://www.upi.com/Science_News/2009/04/17/South-Korea-aims-to-boost-robotics/UPI-83381240007065/, last checked on 10 July 2012.
[10] See f.i. http://en.wikipedia.org/wiki/ASIMO, last checked on 10 July 2012.
[11] See Calo 2011, p.1, referring to J. Ainoa e.a., 'The Digital Evolution – From impossible to Spectacular' in: Y. Neuvo & S. Ylönen (eds.), *Bit Bang: Rays to the Future*, Helsinki: Helsinki University Print 2009, p. 8, 31.
[12] http://en.wikipedia.org/wiki/QRIO, last checked on 10 July 2012.
[13] http://en.wikipedia.org/wiki/AIBO, last checked on 10 July 2012.

property rights. These are challenges that will have to be met in order to realize the access to and the acceptance of AIS technology in society.

The development of AIS will result in 'new entities' that are able to make autonomous decisions. This will lead to changes in the legal order and may even lead to the hypothesis that the development of AIS shall result in a partial paradigmatic shift in thinking about law.[14]

After having given a definition of Autonomous Intelligent Systems, six scenarios will be presented in this contribution on the impact of the development of AIS on our society, which have been developed by our Utrecht University Centre for Access to and Acceptance of Artificial Autonomous Intelligence (CAAAi). These scenarios shall be key to the research into the legal and normative framework which will be developed by the CAAAi in the coming years.

Defining Autonomous Intelligent Systems

Autonomous Intelligent Systems consist of two elements: First: Autonomy, which relates to the level of human intervention. It can be seen as a 'spectrum',[15] "in which the capacity of decision making by the system correlates with a proportional lessening of the degree of human intervention or interaction".[16] According to Chopra & White, the most important abilities of autonomous agents are to operate without direct human intervention, the social ability to interact with humans or other autonomous agents and the pro-active ability to "initiate goal-directed behaviour".[17] Less human intervention in the behaviour of a system implicates a higher level of autonomy. The second element of AIS is Intelligence, or the ability to 'think'. Intelligence can be described as "the ability to adapt one's behaviour to fit new circumstances [which] encompasses […] the ability to learn, to reason, of problem solving, perception and language understanding".[18] Intelligent agents are held to be able to collect and select information from whatever source, to make recommendations based on own calculations, and to make and implement decisions without being instructed to do so.[19] For this contribution Autonomous Intelligent Systems are therefore defined as non-human entities that are capable of perceiving information delivered as language or otherwise, that are able to learn, reason and make decisions based on their 'experience', without direct human intervention or

[14] This is not a radical insight: From the very beginnings of Computer Science, philosophers, computer scientists, lawyers, ethicists and economists have been imposing questions concerning the 'legal personhood' of AIS. The first to ask whether or not machines could 'think' was Alan Turing in 1950, who developed a test to assess a machine's intelligence. In 1992 Lawrence B. Solum wrote an essay revolving around the question "Could an artificial intelligence become a legal person?" (Solum 1992, p. 1231), leading to an extensive body of literature around this subject, see for instance Boyle 2011, Davies 2011 and Chopra & White 2011.

[15] Peter Asaro distinguishes 'tele-operated, semi-autonomous and fully autonomous robotic devices' (Asaro 2011, p. 169), The Report Autonomous Systems 2009 describes on p. 2 the spectrum between 'controlled, supervised, automatic and autonomous systems'.

[16] See the report of the Royal Academy of Engineering 'Autonomous Systems: Social, Legal and Ethical Issues', London: Royal Academy of Engineering 2009, p. 2. Also Chopra & White 2011, p. 9.

[17] Chopra & White 2011, p. 10. See also Pagallo 2011, p. 349; Calverley 2008, p. 532.

[18] Davies 2011, p. 603, paraphrasing Jack Copeland 2000, via the Turing Archive. See also Solum 1992, p. 1234-1238.

[19] See Karnow 1996, p. 3, referring to M. Caudill & J. Butler, *Naturally Intelligent Systems*, Cambridge (MA): A Bradford Book (MIT Press) 1990, p. 152-153.

instruction. 'AIS' and 'autonomous robots' are used as interchangeable terms in this contribution.

2. AIS in Society in Six Scenarios

From a practical perspective: the development and deployment of autonomous robots leads to questions regarding the normative framework for access to AIS-technology and the acceptance of the deployment of autonomous robots in daily life. Issues regarding the development of AIS are closely related to a normative framework that provides regulations for standardisation in the production of material elements, which provide legal certainty in view of technology transfer and that regulate an international regime of IP-rights that are elementary in order to provide sufficient incentives for innovation and market access. The deployment of AIS may for instance lead to legal questions concerning acceptance of AIS-technology in society,[20] a.o.: whether or not AIS may enter into contracts in a way that is legally valid,[21] and who may be held liable in case AIS inflict damage to people or property.[22] Other indicated issues relate to the protection of private data collected by AIS, standardisation of AIS-technology and products, and the possibilities for IP-protection of AIS-generated works or inventions.[23] These issues have future relevance upon the deployment of AIS in society, and are at the same time rather important for the development process itself. It can be argued that for instance legal uncertainty concerning risk allocation and liability for damages inflicted by AIS, as well as legal uncertainty concerning rules for standards, consumer protection and privacy may have slowing effects on innovation in this field, [24] whereas one of the objectives of European policy is to stimulate innovation. These issues form the basis for the six scenario's for AIS in society, some of which are well known in the field of law whereas others seem rather futuristic now but shall not be in the near AIS-future...

2.1 Scenario Access: Standardization

Although not futuristic, but a well known issue in the field of innovation, the first first scenario is of great importance to the potential successful development and deployment of AIS in society:

British manufacturer S supplies lower leg parts for certain autonomous robots. These are shaped by melting metal alloys into a mould. S has agreed to deliver an X amount of lower leg parts to Dutch producer T, who assembles these into complete robot-legs. When S's

[20] See Report Autonomous Systems 2009, p. 3.
[21] See Chopra & White 2011, Chapter 2 & 5; Solum 1992, p. 1240-1255
[22] Report Autonomous Systems 2009, p. 3; Asaro 2011; Chopra & White 2011, chapter 4; Karnow 1996;
[23] See Davies 2011.
[24] See Askland 2011, p. xvi: "It will be easier for law to accommodate applied science if it closely tracks theoretical science […] An earlier familiarity with the blossoming technology might affect the course of its development so that it is more readily accepted and approved at its introduction" and p. xiix "Thus, both legal and ethical frameworks and systems must keep pace with rapidly evolving science and technologies"; Calo 2011, p. 105: "additional hurdle: the potential crippling legal liability, which may lead to entrepreneurs and investors to abandon open robots in favor of robots with more limited functionality"

mould cracks due to structural overuse he decides to buy a more robust matrix from a Japanese manufacturer. His new template however does not have the exact same curve as the broken matrix, which makes the lower leg parts unusable for producer T, who rescinds his contract with S and starts the search for a new supplier of compatible parts. Unfortunately, this leads to a temporary shortage of legs and therefore an undersupply of the specific robot.

If the large majority of products or services in a particular business or industry sector conform to international standards, a state of industry-wide standardization exists.[25] This is currently certainly not the case for most AIS–technology.[26] International standards safeguard consumers and users of products and services. Clarity on the quality of products and services that is created by conforming to international standards is not only beneficial to consumers, but also to all producers and manufacturers of AIS (parts). Standardization is voluntary and not legally binding unless national governments decide to incorporate the standards into their domestic legislation. Certain provisions in the (Intellectual Property) laws, such as fair use and interoperability provisions for software allow (research into) the production of products that comply with (technological) standards. Discussions may arise as to whether such exemptions to IP rights should be stretched further or whether this would deter the leading producers of the standard technology too much.

2.2 Scenario Access: Intellectual Property Incentive

A Dutch University's research centre closely collaborates with a major Dutch private corporation on the development of 'walking' robots. Two post-doc researchers in the group are programming the steering software. They exchange information with Italian computer scientists who have reached great results in programming the movement of joints in the feet of the robot. The corporate entity is eager to have access to this particular technology to apply it in their other production lines (on adaptable wheelchairs in China). At the same time, another partner in the Dutch research centre is working together with British robot-designers and a team of academic psychologists, conducting research on the social functioning of robots and the effects of their appearance on humans. The work on the walking robot of the Dutch researchers is funded under the FP7 scheme of the European Union, which has specific rules on the open dissemination of research results.

All research described above uses and produces information that may be protected by intellectual property rights. Robots are not only highly complex machines; they also are a large collection of intellectual property rights. The fundamental reason for protecting intellectual property is to create optimal conditions for innovation and creativity by

[25] International standards are developed by the international non-governmental organization ISO, which has 162 national members in different countries around the world. See: http://www.iso.org/iso/about/discover-iso_what-international-standardization-means.htm (August 2011).
[26] For instance: in the USA the national member is ANSI, in the Netherlands NEN and in Japan JISC. For a complete list of all member bodies see: http://www.iso.org/iso/about/iso_members.htm (August 2011).

safeguarding the exclusive exploitation thereof. Intellectual property protection implicates the creation of a temporary monopoly on the use of protected information, which means, by the same token, that this protection creates a limitation of access and use of this information, which in turn may become an impediment to innovation. A second issue is that a significant part of this information is developed by publicly funded academic research centres, co-operating with private corporate entities. Most software is furthermore developed under open access models, whilst other software may be subject to patent rights. It is likely that the private corporations involved in research and development of software are eager to make the newly developed software they have contributed to profitable and would therefore not be keen to disclose the software (as research results) under open access conditions, which is likely to be required by public (co-) funding institutions.

2.3 Scenario Acceptance: Legal capacity?

Elderly mr. X has poor health. His autonomous robot interacts in society and concludes simple agreements on his behalf. Mr. X instructs his AIS to purchase food or to buy his daily medicine.

To function in society, fully Autonomous Intelligent Systems should be able to enter into some legal transactions. Law attributes legal capacity only to natural and legal persons.[27] International instruments do not include provisions deciding who is rendered legally capable.[28] Because AIS are legally defined as neither natural- nor legal persons, agreements that AIS would be party to would be null and void. Legal certainty could be achieved through conferring some kind of legal capacity to AIS, which is a big step to take. However, alternatives need to be considered and evaluated to indicate whether or not legal capacity is indeed required. Should AIS be granted legal capacity, the impact on society would be radical, since AIS would become an active, participating object in (commercial) society. One alternative to full legal capacity might be to consider AIS to be mandated by its owner for the conclusion of (certain) legal transactions. This alternative would imply that the owner of an autonomous robot, who instructs his AIS to conclude an agreement on his behalf, is solely responsible for his transaction. Another alternative could be to follow the rules for minors, which implies allowing AIS to conclude certain transactions that are 'common' for minors (read: AIS), such as the purchase of groceries, music, DVD's etc. This would exclude the capacity to buy other goods (luxury yachts, cars, houses and the like).

[27] This is the case in, for instance, the Netherlands (art. 2:5 and art. 3:32 of the Civil Code), Germany (§11 (1)(1) of the Social Code X and §11 (1)(3) of the Social Code X) and Russia (art,17 and 49 in conjunction with 51 of the Russian Civil Code).

[28] For example: the UNIDROIT principles of international commercial contracts of 2010, the Principles of European Contract Law of 2002, the Principles, Definitions and Model Rules of European Private Law Draft Common Frame of Reference (DCFR) of 2009 and the United Nations Convention on Contracts for the International Sale of Goods (CISG) of 1980 do all not cover the matter of legal capacity.

In any case, when performing legal actions AIS should be built to also have (basic) knowledge with regard to the legal, economic and social rules and behavioural norms that apply when performing legal actions (i.e. concluding (purchase) agreements). The legal and economic knowledge AIS are provided with can be tailored to the agreements that specific AIS will be making. AIS should furthermore be aware of the position they fulfil when concluding agreements (an intermediate, agent, etc.).

Conferring legal capacity on AIS brings other questions into play, for instance as to possible responsibilities that tie in with capacity, such as liability.

2.4 Scenario Acceptance: Liability

For the acceptance of AIS in society, allocation of liability is crucial. Should damage be caused to a person or an object through or by an autonomous robot, rules on liability should indicate who is to provide monetary security. Several currently existing liability rules could apply in case of AIS. The most relevant kinds of liability will be outlined below, accompanied by a short corresponding scenario.

An elderly robot-owner instructs her AIS to vacuum her living room. Whilst vacuuming, the autonomous robot suddenly stagnates, turns around five times and begins to move uncontrollably for a few seconds; long enough to knock over a Ming vase on the windowsill.

According to current European *Product Liability Law,* the producer may be held liable for the damage to the vase. The Product Liability Directive decides that all producers involved in the production process can be addressed for compensation in so far as their finished product, component part or any raw material supplied by them was defective.[29]

The housecleaning AIS described above wrongly calculates the weight of the vase and the force needed to lift it, causing the AIS to shatter it.

The damage may be attributed to an imperfection in the AIS software programme. There seems to be no technical impairment to the AIS, nor has the AIS-owner given an erroneous instruction. The damage is a consequence of a miscalculation of the AIS, generated by its self-learning software programme. With regard to *strict liability*-rules, AIS-owners need to be well informed of AIS's 'imperfections' and limitations. The liability for damages that are not the result of a defect in AIS can then be allocated. To this end, insurance by AIS-owners can be considered. Thus, allocation of liability and possibilities for new insurance systems are issues that need to be explored.

[29] Council Directive 85/374/EEC of 25 July 1985 on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products (Product Liability Directive), article 3(3).

An AIS is going down the street while carrying a large bag of groceries. As it turns a corner it collides with a woman on a bicycle. The woman is injured and the bicycle damaged.

Should the AIS be considered a legal entity, the autonomous robot can also be held liable according to rules of *fault liability* (negligence). Otherwise the owner will be liable, as a consequence of the strict-liability rules.

General rules on tort law, dealing with strict liabilities and fault liability outside the realm of product liability are not harmonized (yet) in the European Union. Therefore, the specific features of tort law differ largely between countries.[30] Because of the great diversity in tort law, it should be considered whether or not it is desirable that certain actions of AIS are classified as a tort.

Product liability and strict liability pose no specific requirements to the functionality of AIS. It is however important that every AIS that is distributed is accompanied by a user manual in which the limitations of AIS are explicitly mentioned and warnings are issued. It is also necessary that the AIS's log can be reviewed in order to trace technical errors and to recover the instructions that AIS have received.

2.5 Scenario Acceptance: Privacy

Mrs. A takes her AIS to a technical engineer for a periodic check-up. Besides checking the hardware, the engineer also checks the AIS software for inconsistencies and irregularities. During these activities, the engineer stumbles upon information that is stored on the AIS' memory. Amongst this information are Mrs. A's medical files, bank account number and her pin-code as well as her GPS-location information over the past 6 months.

Personal information of AIS-owners and/or third parties will be saved in the memory of AIS software. In principle, this information should be accessible only to the person the data relate to. Effective security measures for the access of the data (for instance by putting in place login codes) can possibly form a first practical solution to this problem. However, it can for example be useful to extract medical data from the AIS memory by medical professionals. For such uses of stored personal data advanced tools based upon and aligned with (at least) the European Data protection Directive (95/46/EC) should be in place. Should there be transatlantic use of personal data from the USA, the safe harbour principles[31] are leading. AIS should in any case be equipped with a technique that safeguards personal data stored in AIS memory against use (and abuse) of personal data without the unambiguous consent of the

[30] See for examples of research on (comparative) tort law Smits 2006, pp. 234-231; Van Dam 2007;
[31] 2000/520/EC: Commission Decision of 26 July 2000 pursuant to Directive 95/46/EC of the European Parliament and of the Council on the adequacy of the protection provided by the safe harbour privacy principles and related frequently asked questions issued by the US Department of Commerce (notified under document number C(2000) 2441) Official Journal L 215 , 25/08/2000 P. 0007 - 0047

'data subjects' (the owner of the robot and other people that have encountered the AIS) or without application of any of the other legitimate data processing criteria.[32]

The risk of abuse of private information stored in AIS software is an issue that can potentially harm the acceptance and use of AIS in society. Securing personal information that is stored in AIS software can form a (partial) solution to this issue.

2.6 Scenario Acceptance: AIS-generated works

As an autonomous, sentient and learning system the AIS is involved in the creation of works of art, inventions or can be co-authors of miscellaneous designs:

The owner of an autonomous robot is a retired artist. His AIS is equipped with tailor-made software allowing him to create works of art together with his robot. The artistic output is partially dependent on the information (algorithm and database) the AIS-manufacturer has implemented into the robot. However, the AIS as a learning and sentient machine, is able to build upon this information through the experience that came from the instructions and examples the artist has confronted him during their twenty years of cooperation. The AIS may therefore create new and marvellous works of art miscellaneous but original of character[33].

Substantial investment or a certain amount of originality[34] can give rise to intellectual property protection to creative and innovative output. The copyright works created by or with the (autonomous or semi- autonomous) aid of the AIS are referred to as AIS-generated works. Copyright is granted under the (implicit) assumption that the work is the expression of human creativity. Therefore utilisation of AIS in the creation process confronts copyright with new challenges. In the United Kingdom a specific regulation has been introduced for works created by computers under such circumstances that no human author can be designated.[35] No other country has similar provisions in place. However, the necessity for specific regulation has not yet become evident. This will however change in the future when actual or partial autonomous creation by AIS will take place. [36]

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[32] Such as the processing of data necessary for the execution of a contract to which a data subject is party; in order to comply with legal obligations; in order to protect vital interests of the data subject; for purposes of performing tasks in the public interests or for purposes of other legitimate interests, balanced with fundamental rights of the data subject. See articles 7 and 8 Data Protection Directive.

[33] This implicates a 'giant leap' compared to the capabilities of creative cybernetics as for instance AARON, which were developed in the past century: see in this respect De Cock Buning 1998, Chapter VI.

[34] Whether copyright is granted or denied depends on the applicable copyright regime. Copyright protection applies to works that are "original". In a Common law country such as the UK there is a relativly low threshold for protection. A work is considered to be original if its creation required sufficient "skill, judgment and labour". A work thus requires a certain amount of creative intellectual activity and a certain amount of effort. This requirement is modest when compared to the thresholds in the Civil law countries such as France, Germany and The Netherlands, which all require creativity and individuality.

[35] Art. 178 and art 9.3 Copyright Design and Patent Act.

[36] Already in the last century claims were made that creativity machines were principally able to create works of art autonomously e.g. Thaler 1995, pp. 55-65; Critical: Verschure 1997, p. 133-188. One of the most well known examples Aaron was however completely instructed by its manufacturer.

Depending on the extent of human-machine interaction AIS-assisted or AIS-generated works will be independently created. The more autonomous the creation,- which implicates the least human intervention - the more difficult it will be to find a form of (investment) protection for the works created in current legal systems. This scenario involves defining notions such as AIS-created art, creation in itself, and the anthropocentical requirement[37] in copyright, the mind-brain dilemma et cetera.

3. Conclusions

Summarising: When AIS become active in our personal and social spaces, their acts will have legal impact. For an AIS to fulfill its function as a companion for European citizens it may need to enter into valid legal transactions, such as purchase agreements. Therefore it can be expected that some legal capacity will be required. On the other hand, if in the course of their activities material or personal damages occur, the question of who would be liable implies a range of potential candidates from computer programmers, manufacturers involved in the production of AIS to the user of the AIS. At the same time, AIS with some self-awareness cannot be treated simply as things. Sentience, autonomy and the possible ability to experience frustration, or even suffering, raise issues of legal categorisation. The question arises as to whether and how degrees of sentience, autonomy and capacity for feeling could be assessed as a basis for assigning legal capacity to AIS. Another issue that will have to be addressed is the AIS in its capacity for creating and inventing robot-generated works or patentable inventions. This raises fundamental questions with regard to the objects of intellectual property rights, and to the ownership in general.

Therefore, there are significant legal issues that need to be addressed if AIS are to be deployed in European society including our personal and public spaces. In international literature there is call for sui-generis regulation to avoid hurdles in the development of AIS.[38] The first initiatives are already taken: A proposal for an EC-directive is now being prepared.[39]

Effectiveness of sui-generis/technology specific regulations is however questionable, due to the unpredictable nature of technological development.[40] Also legal history shows that hasty measures may be counterproductive. In this we can learn from the principle of subsidiarity as advocated by the European Union, for it would be wise to demonstrate restraint in developing a specific legal framework regarding robots. At the same time, new rules and norms should be subject to the principle of sustainability, and take the interests of all stakeholders into

[37] A human should be a creator of a work, before a copyright can be granted.
[38] See Nagenborg e.a. 2007, p. 350, referring to D. Levy, *Robots Unlimited*, Wellesley: A K Peters Ltd 2006, p 393-423.
[39] E.g. http://www.europeanrobotics12.eu/news/robot-in-our-lives-presentation-of-the- green-paper-on-robotics-and-law.aspx
[40] See De Cock Buning 1998, p. 238-240; Askland 2011, p. xxii-xxiii referring to Bennett Moses 2011 (same volume), p. 90. See for alternatives Rappert 2011 (Codes of Conduct), Abbott 2011 (International Framework Agreement on Scientific and Technological Innovation and Regulation); Carter & Marchant 2011 (Principles-Based Regulation); See further Nagenborg e.a. 2007.

account, with an emphasis on the longer-term interests. Whilst AIS are unique in some respects it is also important to recognize that many of the potential legal issues surrounding robots are already addressed in existing legislation. For instance, regulations surrounding corporate entities, ICT systems, motor vehicles, or even domestic animals could be relevant to evaluating the legal status of AIS. Therefore it needs to be identified how and where AIS fit into existing legal and normative frameworks and where such frameworks will need to be extended to take account of AIS. At the same time, the potential of self-regulatory mechanisms need to be involved. By doing this, one should seek to develop appropriate legal instruments to both protect consumer interests (privacy, safety regulations) and to contribute to the innovation and acceptance of AIS technology in society by finding a balance between protection, security and innovation.

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