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State-of-the art on legal issues





Introduction: Relations between

ethics and law in the context of autonomous robots.

1. Autonomous agents, autonomous robots: wording clarification in a legal perspective

From a legal point of view, the definition of an "autonomous agent" is challenging, as this term is almost non-existent in doctrinal debates. Nevertheless, the terms "robot" or "autonomous robot" are frequently used and they seem to be close to the meaning of "autonomous agent". But once more, there is no consensus in the legal literature on what an autonomous robot is. However there are a few invariant: the ability to interact with the environment, capacity to take autonomous decisions, learning abilities and some mobility. The literature also insists that autonomy is likely to vary, a robot may be more or less autonomous.

In the following development, the term "autonomous robot" will be used for consistency with the legal considerations underway.

2. Taking law into account in the field of ethics and autonomous robots

According to Asaro legal issues are an excellent starting point for studying the issues related to ethic and robotic¹. Indeed there is no single accepted moral theory, and only a few accepted moral norms. And while there are divergent legal interpretations of cases and of legal opinions among judges or scholars, the legal system is considered pretty efficient at settling norms involving accepted ethical aspects e.g. human rights, responsibility, personhood, punishment etc. Through many legal tools (case law, legislative development,

¹ P.M. Asaro, What Should We Want From a Robot Ethic?, International Review of Information Ethics, 2006, Vol 6, p. 13

custom, legal practices), law is a pragmatic mean to understand and resolve ethical conflicts in an evolving social environment.

Moreover, as noted by Asaro, it is likely that legal norms will be the system defining how engineers will be compelled to design ethical robots. In consequence, the legal framework should be the basis that will structure the development of the robot technology, including in the area of ethics.

Secondly, law needs to be taken into account because every time one think, “*about new technologies in legal terms, the metaphors we use to understand them are crucially important*”². The legal reasoning is based on the intellectual representation of facts, which constitutes a sort of metaphor. How autonomous robots will be regulated will broadly depend on the metaphor used to define them and so, if the metaphor is wrong, it could result in bad economic and social consequences. Ethical considerations on autonomous robots certainly participate to the construction of the metaphor, which defines those autonomous robots. Therefore any ethical studies in this area should bear in mind legal implications of its conclusions. As such, some elements of law could be helpful to draw a framework for ethics and autonomous robots.

3. Brief overview of legal issues related to ethics and autonomous robots

Autonomous robots will very likely perform a wide variety of task, in various context and area, both public and private. Therefore, many branches of law are at stake: liability, contract, consumer law, fundamental concept of civil law as personhood or things and property... criminal law, intellectual property, administrative law, fundamental rights, constitutional law³... Thus, it is difficult to inventory all legal aspects that are systematically involved in ethic and autonomous robots⁴.

² Neil M Richards and William Smart, How Should the Law Think About Robots?, 2013, p.3 and p.15 to 22 ;

³ Neil M Richards and William Smart, How Should the Law Think About Robots?, 2013 ; Suggestion for a green paper on legal issues in robotics, euRobotics The European Robotics Coordination Action, décembre 2012

⁴ Besides, there is no literature that attempt to study law and robotics in a systematic way as noted by Rchiard and Smart, Neil M Richards and William Smart, How Should the Law Think About Robots? 2013

Nonetheless, there is a clear tendency in the legal literature to focus researches on specific branches of law that should be concerned by the increasing autonomy of future robot. The fundamental right to privacy and data protection is probably the most discussed issue as it covers all type of robots regardless of the application. The fundamental right to dignity is also studied because of its implication for the development of medical and assistance robots. Privacy and dignity are two fundamental rights that reflect fundamental ethical norms. As such they could be representative of how autonomous robots should take into account fundamental ethical norms. Legal liability and the legal status for robot are the others area of law that are the most studied in the context of autonomous robot.

4. Scope of this work

Part 1 will be dedicated to the legal initiatives in the field of ethics and autonomous robots. **Part 2** will take us to consider **issues on the legal status and personhood** of robots as we found relevant to start by introducing what is basically a robot in the eyes of the law and what it could become in the near future. **Part 3** will study **legal responsibility**, which is another body of significant legal rules in the field of robotics, directly related to legal personhood. Part 4 will focus on **data protection and privacy** and **part 5** on **dignity**. These two themes are undoubtedly at the heart of ethical conflicts that Ethicaa project seeks to apprehend. Furthermore, rules on data protection, privacy and dignity are more operational and could be applied relatively quickly given the few legislative changes and / or case. Finally, **part 6** will be a **case studies divided into three topics: Civil drones, autonomous car and High Frequency Trading**. These areas are interesting because they are complex technologies that should be close to autonomous robots in terms of legal implications.

The themes of autonomous robots, ethics and the law are largely made of on-going statements due to the absence of specific cases, the lack of detailed on the technology and the huge amount of legal fields that are at stake. So, we will mainly work with hypothesis and assumptions as legal doctrine does now.

Part 1: Initiatives to specifically regulate robotics

Few policy and legal initiative have been launched in the area of ethic and autonomous robots. The main French, European and International global initiatives will be described in the present part.

1. French initiatives

France has started to launch some global initiatives on robots, which include few legal considerations. The first one is a report on “The future industrial development of personal robotic and service robotic in France” from the Prospective study of the Interdepartmental Centre of foresight and anticipation of economic change (PIPAME) and the Directorate of the competitiveness of industry and services (DGCIS) (2012)⁵. The report explains that ethical issues should arise only in specific fields of health, safety, or in the long term, with massive public dissemination of autonomous robots. These ethical issues are mainly related to human dignity, privacy, confidentiality, freedom, social responsibility and equality in the access to technology. With regard to law, the report also raises issues such as data protection and liability framework. The latter is a central issue as the development of robotic depends on a clear legal liability framework⁶. Noteworthy in the report, is the assertion that liability issues will be largely solved by case law.

“France Robot initiative” is the last public report (2013) published by the French government. This report also emphasizes the necessity to start a reflexion on ethics and fundamental rights such as human dignity, data protection and privacy in the context of robotic. It announces that this reflexion will lead to an ethical charter as the one that was published in the security area

⁵ These two bodies are connected with the ministry of Economy

⁶ The liability issue will be further develop in another part

in 2012⁷. A working Group "Ethical, Legal, Regulatory & Standards" in the Committee for robotics industry was also created.

2. European Union initiatives

Robotics development was a European Union priority during the 7th framework program (ended in 2013) and is still so with the new framework program "horizon 2020".

In this context, the platform euRobotics AISBL (Association Internationale sans but lucratif)⁸ works together with the European Commission to develop a strategy and a roadmap in the robotics area. This partnership has already led to the publication of several reports that include reflexions on robotics, ethics and law: EURON, Roboethics Roadmap, 2006; Robotics 2020 strategic research agenda for Robotics in Europe, euRobotics aisbl, 2013; Suggestion for a green paper on legal issues in robotics, euRobotics, 2012. This last report is obviously the most important from an ethics and legal perspective. It includes a comprehensive review and a discussion of legal issues related to robotics. It should also pave the way to further initiatives in the EU: green papers are usually the first step of the EU legislative process. Finally, in early June 2014 the EU has launched a research and innovation programme in robotics called SPARC. This initiative is a part of EU industrial strategy to strengthen Europe's position in the robotics market⁹.

It must also be noted that the Directorate General Connect of the European Commission has a special unit working on robotics (Unit A.2). This unit studies among others ethical, legal and societal issues.

3. Others countries noteworthy initiatives

⁷ Décret n° 2012-870 du 10 juillet 2012 relatif au code de déontologie des personnes physiques ou morales exerçant des activités privées de sécurité

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⁹ EU launches world's largest civilian robotics programme – 240,000 new jobs expected, Press release, 3 june 2014, availabl at: http://europa.eu/rapid/press-release_IP-14-619_en.htm

The main legal initiative in the field of robotics is the South Korean ethical draft charter (2007) not far from Asimov's law¹⁰. The charter is still however at the draft stage. It intends to rule interaction between Human being and robots.

Contents of the South Korean robot ethic charter

The First part of the charter is dedicated to manufacturing standard¹¹:

- Robot manufacturers must ensure that the autonomy of the robots they design is limited; in the event that it becomes necessary, it must always be possible for a human being to assume control over a robot.
- Robot manufacturers must respect strict standards of quality control, taking all reasonable steps to ensure that the user's risk of death or injury is minimized, and the safety of the community guaranteed.
- Robot manufacturers must take steps to ensure that the risk of psychological harm to users is minimized by reducing any likelihood for the robot to induce antisocial or sociopathic behaviors, depression or anxiety, stress, and particularly addictions (such as gambling addiction).
- Robot manufacturers must ensure their product is clearly identifiable, and that this identification is protected from alteration.
- Robots must be designed so as to protect personal data, through means of encryption and secure storage.
- Robots must be designed so that their actions (online as well as real-world) are traceable at all times.
- Robot design must be ecologically sensitive and sustainable.

The second part of the Charter is built upon the User's Rights and Responsibilities¹²:

- User's rights are: the right to take control over robot without risk or fear of physical or psychological harm. Users have the right to expect a robot to perform any task for which it has been explicitly designed. Finally, they have the right security of their personal details and other sensitive information.
- User's rights are recognised by the Charter so long as this use is in accordance with the law. The user must not use a robot to commit an illegal act. A user must not use a robot in a way that may be analysed as causing physical or psychological harm to an individual. The owner must take 'reasonable

10 Alain Benssousan, Le droit des robots: la charte coréenne, Planète Robot n°25, 2014

11 Ibidem

12 Ibidem

precaution' to ensure that his robot does not pose a threat to the safety and well-being of individuals or their property.

- The Charter recalls acts that are in offense with Korean law: deliberately damage or destroy ; through negligence to let robot to come to harm ; to treat a robot in a way which may be analyse as deliberately and inordinately abusive.

The last part is about the robot rights and responsibilities (clearly based on Asimov's laws):

- On robots responsibilities: robot must not injure a human being or, through inaction, allow a human being to come to harm; A robot must obey any orders given to it by human beings, except where such orders would harm a human beings; a robot must not mislead a human being.
- On robots rights: the right to exist without fear death or injury; the right to exist without fearing systematic abuses.

In the United Kingdom, experts, including professors of law, have initiated reflexions on ethical robotic. Two public bodies, one in engineering and physical science and the other in humanities, have drafted ethical principles for robots during a workshop in 2010. They are also similar to Asimov's law¹³.

English ethical principles for robot

Robots should not be designed solely or primarily to kill or harm humans.

Humans, not robots, are responsible agents. Robots are tools designed to achieve human goals.

Robots should be designed in ways that assure their safety and security.

Robots are artefacts; they should not be designed to exploit vulnerable users by evoking an emotional, response or dependency. It should always be possible to tell a robot from a human.

5. It should always be possible to find out who is legally responsible for a robot.

Conclusion: Legal initiatives in the field of Ethics and robotics are at their beginning in

¹³<http://www.epsrc.ac.uk/research/ourportfolio/themes/engineering/activities/Pages/principlesofrobotics.aspx>

France while European Union seems to be active on it. Further development of the autonomous robot technology should go with deeper and more comprehensive initiative.

Part 2. Legal status of robots

1. Introduction

It must be made clear that currently robot have neither specific legal status nor legal personhood. But the issue of the robots legal status is one of the most discussed on and controversial in the relevant literature¹⁴.

Previously, we made a short presentation of the robot liability issues. Traditionally, any kind of liability both civil and criminal is related to legal persons. Thus, any possible future robot liability will likely require a kind of legal status or maybe personhood. In the same sense, most of everyday life actions imply legal personhood, as in the case of the execution of a contract e.g. buy food, take a delivery, rent a car.

Autonomous robots will need rights, legal capacities to perform these actions and thus probably a legal status. In any case, increasing development in the field of autonomous robots will require legal categorization. Studies have been initiated to determine whether a specific legal status should be given to robots.

2. No specific legal status for autonomous robots: robots as goods

¹⁴ See for example Suggestion for a green paper on legal issues in robotics, euRobotics The European Robotics Coordination Action, décembre 2012 ; Xavier Bioy, « Chapitre 7. Vers un statut juridique des androïdes ? », *Journal International de Bioéthique*, 2013/4 Vol. 33, p. 85-98 ; Lilian Edwards, Alan Winfield, Regulating robots : Re-writing Asimov's law for the real world, 2011 ; Philippe Veber : DROIT & ROBOTIQUE : Le choix du pragmatisme et du réalisme ; Lawrence B Solum., Legal Personhood for Artificial Intelligences. North Carolina Law Review, Vol. 70, p. 1231, 1992 ; P.M. Asaro, What Should We Want From a Robot Ethic?, *International Review of Information Ethics*, 2006, Vol 6

Currently it is clear that the law considers the robot like goods, as opposed to a legal person. Goods are objects of rights. In French law, it is defined as something capable of appropriation. For basic distinctions, it can be movable or immovable, tangible or intangible. Legal persons are physical persons i.e. human being from birth to death when he was born alive and viable or moral persons i.e. corporations by the creation of the law. Legal persons are subjects of rights. In deed, legal personality is a legal fiction, which confers the ability to have rights and duties.

Currently, robots, including autonomous robots, could not meet the criteria for legal personality. They must be considered as goods, partly tangible (sensitive materials or sensitive elements) and partly intangible (no perceptible reality but an economic value: software, copyright on the design of the robot).

In the future, the first hypothesis is that autonomous robots won't need a legal status. Issues arising from robots autonomy will be solved with particular solutions, depending of the area in which the autonomous robots will evolve¹⁵. Autonomous robots will be programmed to respect specific rules for a limited task e.g. take care of children, autonomous car, do shopping or being a medical assistant. Robots should have very limited rights and duty depending on the task. Specific system of insurance and liability will be sufficient to solve any problem. In consequence, autonomous robots will remain things/objects, legally speaking, just as machines are at the time of writing. But this hypothesis assumes that autonomous robot will perform limited and categorized task, which largely reduce the benefit of autonomy.

Secondly, it is argued that autonomous robots could be seen as special tools depending on specific rules, as are more or less software agents¹⁶. Software agents are defined as *“computer program that can take over a task for its user, having a certain amount of artificial intelligence to perform this task partly autonomously and an ability to interact with its environment in a reasonable way. In this respect, Software agents are able to act as a representative of the user”*. According to this definition, in a conclusion of a contract software

¹⁵ Suggestion for a green paper on legal issues in robotics, euRobotics The European Robotics Coordination Action, décembre 2012, p.63

¹⁶ Ibid, p.58

agents could be legally seen as a tool or a kind of agent/messenger, which acts on the behalf of the user/owner. Thus, software agents are evaluated by the literature as a tool¹⁷: a human uses the software agent as a tool to create a statement that could be use by the software agent in the conclusion contract. Software agents can be traced back and attributed to a user that makes the latter liable.

According to the relevant literature, software agents embodied a strong level of complexity that makes them hardly foreseeable just as autonomous robots are¹⁸. That is why software agents constitute an inspiration to properly categorize autonomous robots. But the legal framework for software agents still remains broadly uncertain due to their level of complexity that make them different from others statement tools e.g. computer statements.¹⁹

Therefore, specific legal statuses are also considered for software agents as they are for robots.

3. Possible statuses for autonomous robots

Different kinds of statuses are being discussed: the model of legal personhood, agency or ancient slavery under Roman law

3.1 The model of legal personhood for corporations

It must be clear that no one is pretending that robots need at that time a legal personhood, as they are not autonomous. Nevertheless, some authors anticipate that in the near future robot should have rights and duties, which will be embedded in a personhood. The most discussed possibility is that robot should have a personhood similar to personhood for corporations.²⁰

17 Ibid

18 Ibid, p.59

19 Ibid

20 Alain Benssousan, *Le droit des robots : un droit en devenir*, Planète Robot n°22, 2013 ; Suggestion for a green paper on legal issues in robotics, euRobotics The European Robotics Coordination Action, décembre 2012 ; Lilian Edwards, Alan Winfield, *Regulating robots : Re-writing Asimov's law for the real world*, 2011

The rationale behind this idea is that: 1) Legal personhood for corporations means rights and responsibilities; they experience the same treatment as humans in many way whereas they do not have the same legal status in other respect. Finally, they are artificial creation by law as some corporations are given a legal status whereas others are not. The same reasoning could be apply to autonomous robots 2) Autonomous robot are capable of decision making, they could have a certain personality and interest just as a corporation. 3) A legal personhood would be the bundling of rights and duties i.e. system of liabilities for every stakeholders and contract capacities. 4) In practice, autonomous robots could get their personhood after being registered in a public register with a specific ID. A kind of patrimony would be given to the robot on the basis of its autonomy, area of application and capabilities. It could be use as an asset if the autonomous robot is found guilty of damages. Producers and/or users would supply this financial fund. All these information on the autonomous robots would be available from the register to anyone wishing to interact with the robot, for example in the context of a contract.

3.2 Agency for robots

A step further would be to consider robot as an agent of a human principal²¹ under the law of agency²². Depending on the situation, the agent or the principal, should be liable for the actions performed under agency. If the agent acts without or outside the authority given by the principal, it should be liable to the other contracting party.

The agency could give rise to a legal status for robots. It owns the advantage to clearly identify legal relationships between robots and human being, the level of liability and the level of action of each stakeholder including the autonomous robots. But a personhood is required for both the agent and the principal and so, the law of agency is not applicable as such to robot.

²¹ Suggestion for a green paper on legal issues in robotics, euRobotics The European Robotics Coordination Action, décembre 2012, p. 59 ; P.M. Asaro, What Should We Want From a Robot Ethic?, International Review of Information Ethics, 2006, Vol 6

²² Law of agency is the legal relationship that involve a person named the agent, that is authorized by another person, made the principal, to act in its behalf to set legal relation with a third party. Agency is known in french law as mandate.

3.3 Slave in *ius civile* for robots

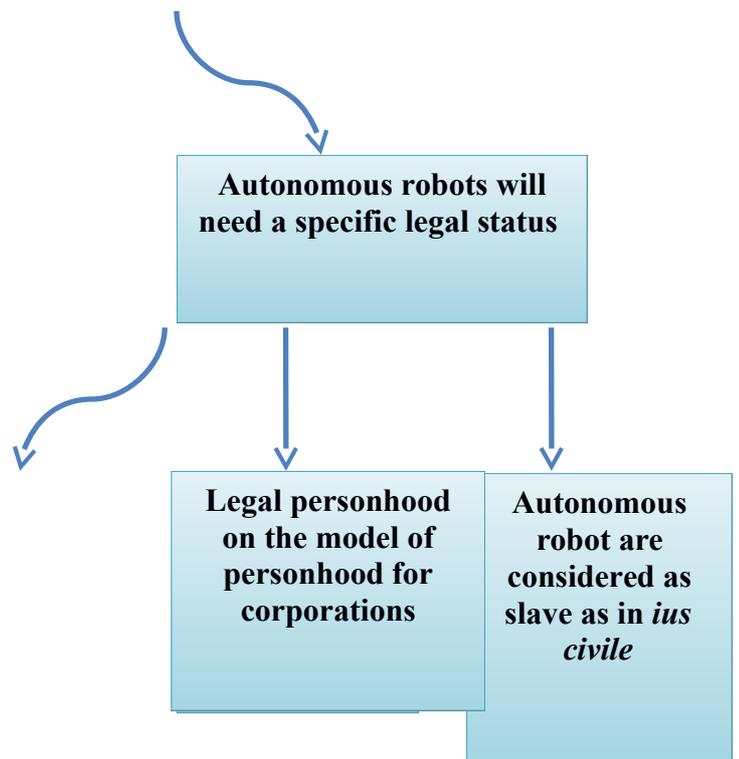
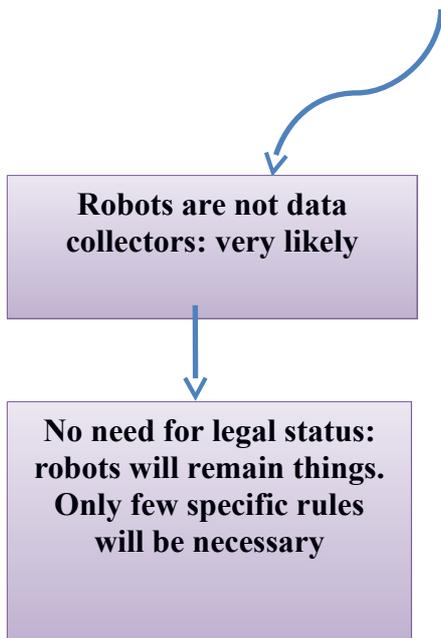
Slave in *ius civile* under ancient Roman law is an alternative to give a limited legal status to robots²³. Whereas this solution seems a bit minor, it is conceptually attracting. Under Roman law, in principle slaves had no rights, no obligations and no legal capacities while acting for itself under its own name. However, a slave could have legal relationship with a third person on the behalf of and under the authority of its master who was attributed the action of the slave. Moreover slaves were legally assimilated to things. This scheme would be interesting in the case of robot as it could be helpful to give robots only very limited legal capacities to act on its own name whereas they could act on the behalf of the user. It has also the advantage to maintain robots as specific things, which would be paradoxical in the context of personhood because personhood is the opposite of things, legally speaking.

Conclusion: The issue of legal personhood is an open one. Indeed, currently robots are not autonomous enough to require a specific legal status. They remain goods in the eyes of the law. But a specific legal status for robots seems unavoidable in the case of an increasing autonomy for robots.

Figure 6: Legal status for robot

Do autonomous robots need a specific legal status?

²³ Suggestion for a green paper on Robotics and AI, European Commission, European Robotics Coordination Action, décembre 2012, p. 60 ;



Part 3. Legal liability

1. Introduction

In a legal approach, autonomous robots imply to consider legal liability (or legal responsibility). Responsibility raises crucial financial issues for robots producers. They need to know what will be the financial consequences of damages caused by robots and in which cases law will frame these damages. Development and investment in the field of robotic depend on clear legal liability rules. This is why there is a lot of legal literature on this subject that is perceived by scholars and professionals as one of the biggest issue regarding robotics and law²⁴.

Indeed, insofar as robots become autonomous, they will be difficult to control and owners may not be able to manage and plan all their actions. Liability for autonomous robots faces complex situations: who should be responsible, if an autonomous robot causes damages? Is it the users who did not use the robot with respect to the producer instructions and with due care? Is it the manufacturer who did not respect safety requirement? Or should it be the robot itself?

2. Basic rules on liability and their implication in the case of autonomous robots

There is no specific legal framework for robots, including autonomous one but there are scattered provisions that apply to robots under French law on liability. Several provisions could apply to autonomous robots. But it is not sure if they would be relevant in every situation because it is a real challenge to frame non-human autonomy. In any case these provisions are a good starting point: liability for defective products, liability for actions of things, liability for action of animals and vicarious liability are very likely to serve as a basis to a future liability regime for autonomous robot and will be presented in the following development.

²⁴ Alain Benssousan, Les robots sont-ils responsables de leurs actes ?, Planète Robot n°20, 2013; P.M. Asaro, Robots and Responsibility from a Legal Perspective ; Suggestion for a green paper on legal issues in robotics, euRobotics The European Robotics Coordination Action, décembre 2012, A. Santosuosso, C. Boscarato, F. Caroleo, R. Labruto, C. Leroux, Robots, market and civil liability: a European perspective The 21st IEEE International Symposium on Robot and Human Interactive Communication, 2012; Le développement industriel futur de la robotique personnelle et de service en France, Étude prospective du Pôle interministériel de prospective et d'anticipation des mutations économiques et de la DGCIS, avril 2012.

2.1 Liability for defective products

This specific responsibility is the situation in which a producer is liable for a security breach of any of its products or services resulting in injury to a person. This is a responsibility without fault that comes from European law (The Product liability Directive 85/374). It could be a joint responsibility if more than one person (manufacturer, importer, designer etc.) is liable for the damage.

We may consider that a damage caused by an autonomous robot is in fact necessarily a failure from the producer that did not plan safety measures to control the robot autonomy nor warn the user of the relevant danger arising from the (in such case the question of the proof would surely be a very complex one). But this view seems a little weak. Increasing autonomy implies that the producers necessarily loose control over autonomous robots, especially by learning. In this perspective, the producer's liability is weakened in its very nature: the failure comes from the autonomy, which is the rational behind the autonomous robot. That is why the producers' liability may not be adequate in any circumstances to solve damages caused by autonomous robots²⁵.

Specific liability for medical robots

Marguerite Brac de La Perrière proposes good explanations on liability for medical robot (currently not autonomous) under current law^{26,27}. If a patient suffers from a damage caused by an act in which a robot is involved, it is primarily the liability of the user who will be engaged. Then, The liability regime will depend both on its classification and the author of an action for damages.

If the robot is a health product and more particularly a medical device, assuming that it is "intended by the manufacturer to be used on humans for medical purposes", the responsibility of the manufacturer may be engaged on the basis of the liability for defective products; the responsibility of the health professional or the

²⁵ Anthony Bem, Les robots pourraient-ils être responsables de leurs actes, quelle responsabilité pour les robots ?,

²⁶ Marguerite Brac de La Perrière , Les robots, de futurs acteurs de télésanté ?, Lexing Droit Santé Numérique

²⁷ For further details, see Isabelle Poirot-Mazères, « Chapitre 8. Robotique et médecine : quelle(s) responsabilité(s) ? », *Journal International de Bioéthique*, 2013/4 Vol. 33,

owner/user of the robot could also be engaged without fault if a damage is caused by an action of the robot.

If the robot is not a health product but electronic equipment and if it is used for telemedicine or telehealth, the producer could be held liable on the basis of liability for defective products by the patient. The user and / or owner of the robot would be responsible vis-à-vis the victim on the basis of the liability for action of things.

If the robot would have any autonomous capacities, current law does not seem to be relevant

2.2 Liability for action of things

The article 1384 of the civil code states that a person is liable for things that are in his/her custody. Case law defined the custody as the use, the management and the control of the thing. This liability could be helpful when the damage caused by the robot is not due to a defect.

Under current law, autonomous robots are certainly things as they are not legal persons. This liability could allow finding a person liable for damages caused by an autonomous robot that is under the person custody. The user or maybe the manufacturer could be seen as persons having the use, the management and the control of the robot.

But it is not sure whether the use, the management and the control are compatible with growing autonomy of robots. An autonomous robot may not be used, managed and controlled things.

2.3 Vicarious liability

Under the article 1384 of the civil code, a person is also liable for the damage, which is caused by the people for whom this person is responsible: parents for children, principals for agents, masters and servants, craftsmen and apprentices, teachers and pupils.

Among these, the liability of the principal for the agent could be inspirational for robots (as mentioned in the case of personhood). Basically, this liability relies on a servant relationship, which is a relationship of authority between two people: the principal and the agent. It means that the principle is able to give orders to the agent, who obeys him. This link may be of fact or in law. Broadly speaking, the agent must commit a fault (but a fault of the principal is not required) within the functions for which he is employed to engage

the liability of the principle. If the fault is committed outside of these functions, the principle cannot be fund liable.

When causing damages, a robot could be seen as the agent of a human principal as there should be a relation of authority between the human and the robot, which must obey the human as its servant. But a problem remains because this liability requires two persons what a robot isn't. Liability for actions of things would certainly be of better inspiration unless robots get some kind of personhood that make him a particular legal person.

2.4 Liability for damages caused by animals

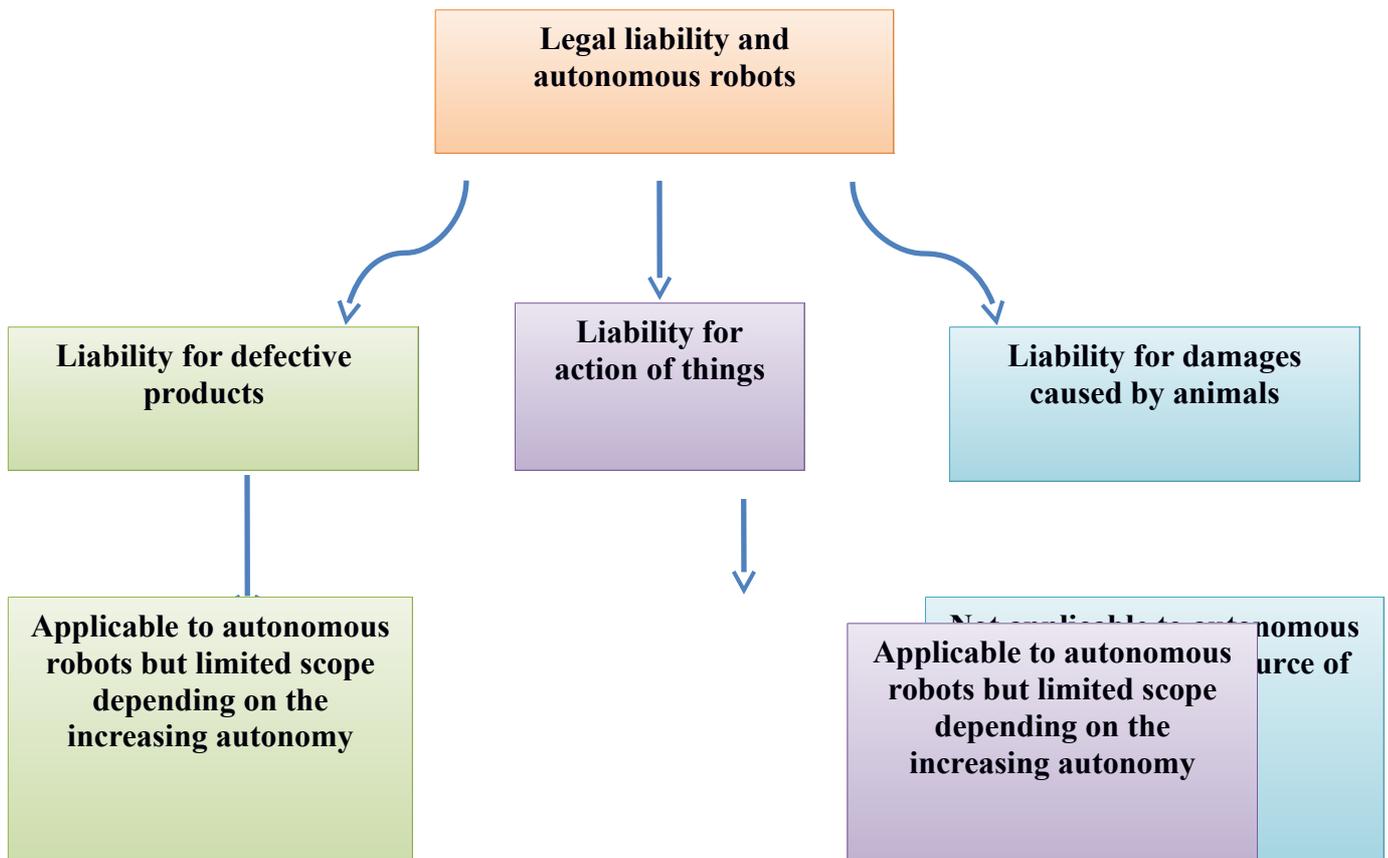
Last relevant specific liability relies on the article 1385 of the civil code. It states that a person is liable for the damage caused by an animal, whether the animal was under his custody, or it had strayed or escaped. The person must ensure the damage caused by the animal under his/her control whatsoever this person did something wrong. The involvement of the animal in the damage is the only condition for the liability

Legally speaking, it is clear that autonomous robot are not animals and thus, do not fall within the wording of article 1385 of the civil code (but what about the robot with the appearance of an animal and programmed to adopt certain behavioural characteristics?). Nevertheless a helpful parallel can be drawn between animals and autonomous robots²⁸. There is a seducing conception to consider: The only involvement of the robot in the damage could initiate the liability as for animals, whatsoever the circumstances and whatsoever the person does something wrong.

Conclusion: Several liabilities could concern autonomous robots. In a certain extent, liabilities for defective products and for the action of things are directly applicable to robots as they remain goods according to the law. Liability for animals or vicarious liability are an inspiration for a future liability of autonomous robots.

28 Philippe Veber : DROIT & ROBOTIQUE : Le choix du pragmatisme et du réalisme

Figure 4: Current rules on liability that concern robots



3. The possibility of a *sui generis* liability

Legal liability is the proper of the legal person. It means the ability to have rights and duties. An object cannot be legally liable. Depending on the creation of a robotic personhood, some authors, as Anthony Bem and Alain Benssoussan in France²⁹, find that existing liability rules does not perfectly fit within the likely characteristics of autonomous robots. Thus, they advocate the creation of a *sui generis* responsibility for robots;

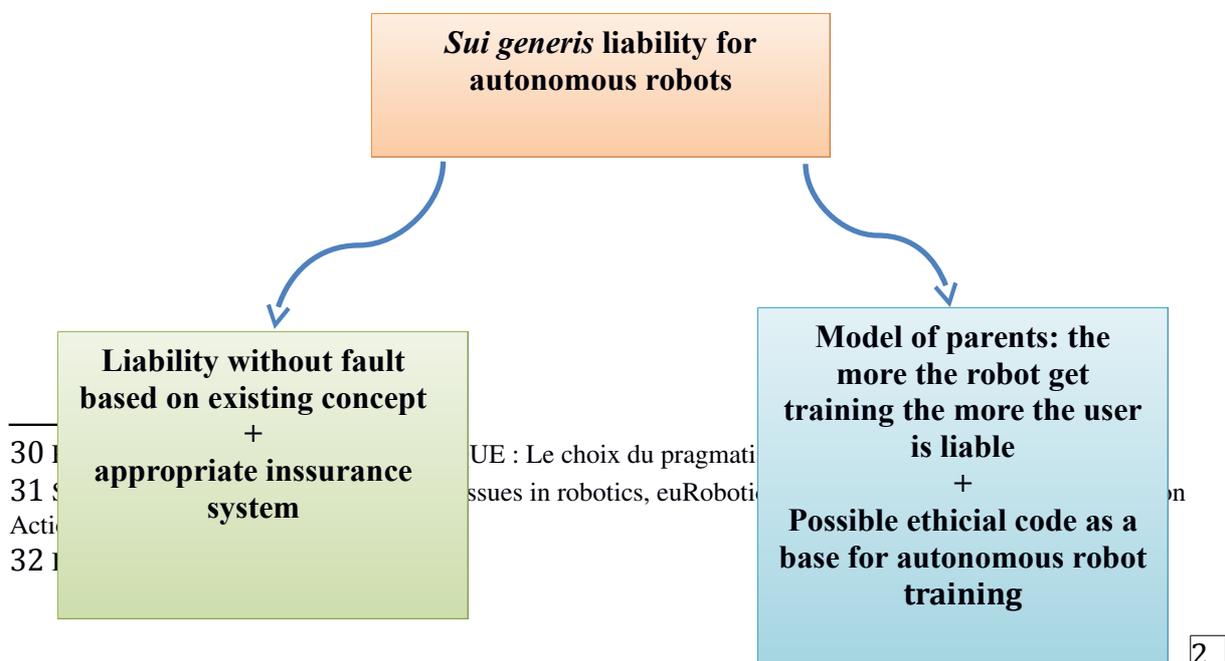
Alain Benssoussan thinks that a compensation fund for victims of damages caused by robots will be necessary. Subsequently, he must estimate that a specific liability without fault related to autonomous robots should be created. Philippe Veber is in favour of a similar solution. He estimates that existing liability system should inspire liability for robot while taking into account autonomous robots peculiarities. He proposes to make compulsory the guarantee of

²⁹ Alain Benssoussan, Les robots sont-ils responsables de leurs actes ?, Planète Robot n°20, 2013 ; Anthony Bem, Les robots pourraient-ils être responsables de leurs actes, quelle responsabilité pour les robots

any risks related to autonomous robots for insurance companies³⁰.

The suggestion for a green paper on legal issues in robotics unveiled a more original proposal³¹. Authors of this paper argue that the parental model for liability (which is a kind of vicarious liability) could be adequate by assimilating autonomous robots having learning capabilities to children during their growth. Parents educate children, as autonomous robots should learn their behaviour from users taught or choice of application. In this case producer's or user's liability could depend on criteria such as the level of instruction given to the robots: the longer the education of the robot, the greater the liability of the teacher/owner. Equipping the robot with an ethical code could complete this kind of liability³². This code would be made of a learning algorithm that let the robot learn through "example based learning" to understand which behaviour is right or wrong according to set of value embedded in the robot. But the parents' model seems to have its own limit. Parents cannot be held liable once children become an adult. How to consider this in the case of autonomous robots?

Figure 5: *sui generis* liability



Conclusion: A *sui generis* liability would be possible depending on the creation of a personhood for robots. Only the premises of such a liability have been thought by the relevant literature and so, it remains an open question.

Part 4: Privacy

1. Introduction:

Autonomous robots will collect a lot of personal data in order to act, react, learn and then, make optimal decisions in a given context. This observation arises with even more sharpness

if the autonomous robot must make decisions incorporating a moral dimension. Such decisions will require a dynamic, precise and fine analysis of the environment in which the robot evolves. It follows that autonomous robots will have to store and analyse private and sensitive elements of people's lives but also lifestyles and patterns of daily activities.

By nature, such robots will be equipped with sensors and multiple environmental recorders: microphone, camera, motion detector, voicemail system and facial recognition ... They will also probably require updates and incorporate guidance systems, geolocation systems, tracking in real time system as well as audio and video recording time system.

Equipped with such a technological kit, these robots will most likely developed high capacity for the acquisition, the recording, the crossover information analysis and finally the data processing. Probably always connected to the Internet, these robots will also process to massive data transmissions.

In addition, autonomous robots should be able to act with precision and endurance in private spaces, which traditionally escaped the data monitoring and data collection. As noted by Ryan Calo, these robots will create "new access points" to privacy in the collection of personal data. For example, medical robots and assistance robots for elderly or disabled people will necessarily collect a considerable amount of information on the health and lives of people in their homes.

There is therefore a strong legal challenge in terms of protection of privacy according to the relevant literature. Privacy is often perceived as encompassing data protection as both areas intend to protect certain personal information. But there are differences between these notions that do not always overlap. Data protection concerns information that allow

identifying directly or indirectly persons while privacy, in its narrow meaning, aims at preventing invasion of intimacy through the protection of intimate information such as religious or political opinions, nudity or genetic characteristics.

Rules on privacy, strictly speaking will be studied first in order to proceed from the general to the particular. These rules are general rules that must ensure the protection of a broad scope of intimate information. Data protection will be study in a second place because it gathers more specific rules that could certainly apply to robots according to the relevant literature³³.

2. Protection of privacy

We will successively present the main legal sources concerning privacy and basic rules regarding ethics and autonomous robot.

2.1 Legal sources

The article 12 of the 1948 Universal Declaration of Human Rights and the article 17 of the 1966 International Covenant on Civil and Political Rights are the main provisions protecting privacy at the International level.

In Europe, privacy is protected by the article 8 of the European Convention on Human Rights and by the article 7 of the European Charter of Fundamental Rights. For example, the latter states broadly *“Everyone has the right to respect for his or her private and family life, home and communications”*.

In France privacy is mainly protected through article 9 of the civil code and articles 226-1 to 226-9 of the criminal code. Furthermore the French constitutional council case law

³³ Anthony Bem, Droit des robots : la nécessité d’une protection des données personnelles collectées par des robots, 2013, disponible à : <http://www.legavox.fr/blog/maitre-anthony-bem/droit-robots-necessite-protection-donnees-12577.pdf>; Alberto Sanfeliu, Maria Rosa Llacer, Maria Dolors Gramunt, Albert Punsola and Yuji Yoshimura, Analysis of the Legal Challenges required for the Deployment of Network Robot Systems in European Urban Areas, Institute of Electrical and Electronics Engineers, ICRA Workshop on Network Robot Systems, 2009, disponible à : <http://digital.csic.es/handle/10261/30138>; Suggestion for a green paper on legal issues in robotics, euRobotics The European Robotics Coordination Action, décembre 2012 ; Le développement industriel futur de la robotique personnelle et de service en France, Étude prospective du Pôle interministériel de prospective et d'anticipation des mutations économiques et de la DGCIS, avril 2012

established that the right to privacy is related to the article 2 of the French Declaration of the Rights of Man and Citizen³⁴.

3.2. Basic rules on general privacy in the context of autonomous robots

Rules on privacy are wording in general terms. In France, article 9 of the civil code simply states, “*Everyone has the right to respect for his/her private life*”. As a result of the general wording of this rule, it is necessary for the case law to precise its meaning depending on the context.

In brief, the ECHR, the European Union Court of Justice and French Courts held the confidentiality and the protection by privacy rules of several areas of people’s³⁵:

- Confidentiality of political, philosophical and religious opinion;
- Confidentiality of nudity, genetic information and health;
- Confidentiality and right to the one’s image, confidentiality of private speech
- Confidentiality of the state of mind
- Confidentiality of love and sexual relationship, confidentiality of the sexual orientation
- Confidentiality of the internal layout of private home

Privacy generally finds its limit in the consent of the person or its willingness to make public information originally confidential. In such case, case law may consider that the person accept to set aside its right to confidentiality.

As privacy is broadly based on case law, it is difficult to clearly assess what would be the interaction with autonomous robots. Nevertheless we could presume that an autonomous robot that would collect information on political, philosophical and religious opinion, nudity, health, sexual etc. should keep it confidential. In theory and regardless many exceptions, these informations could not be transmitted nor made public by any means i.e. through the transmission to physical persons or others robots.

3. Data protection of personal data in the context of autonomous robots

³⁴ Cons. const., déc. n° 94-352 DC, 18 janv. 1995, loi de programmation et d'orientation relative à la sécurité

³⁵ Diane Roman, Fasc. 640 : Droit au respect de la vie privée, du domicile et de la correspondance, JurisClasseur Libertés, 2007

After a brief presentation on the main legal sources, relevant rules on data protection in the context of autonomous robots will be studied. Then, several issues that seem crucial will be raised and developed as follows: the inclusion of protection rules on personal data in autonomous robots as a prerequisite to their legality, Privacy by Design in relation with autonomous robots and the security of personal data collected by robots.

3.1 Legal sources

Rules on data protection became increasingly significant in the past years and are still a matter of legislative initiatives.

In Europe, Article 8 of the Charter of fundamental rights of the European Union establishes a right to the protection of personal data. This fundamental right is completed by secondary legislation on data protection through Data Protection Directive 95/46/EC on the protection of individuals with regard to the processing of personal data and on the free movement of such data, the directive 2002/58/EC related to questions of electronic communications, directive 2006/24/EC on data retention, directive 2009/136/EC on the right to privacy and the right to confidentiality. Also noteworthy is a draft regulation that is currently being adopted and aiming at updating the EU framework on data protection. The draft regulation should include rules on privacy by design i.e. taking into account privacy values during the whole engineering process. Privacy by design is certainly an interesting legal concept in the context of the ETHICAA project.

Finally in France, Data Protection Act that mostly incorporates rules from the European Data Protection Directive 95/46/EC rules data protection.

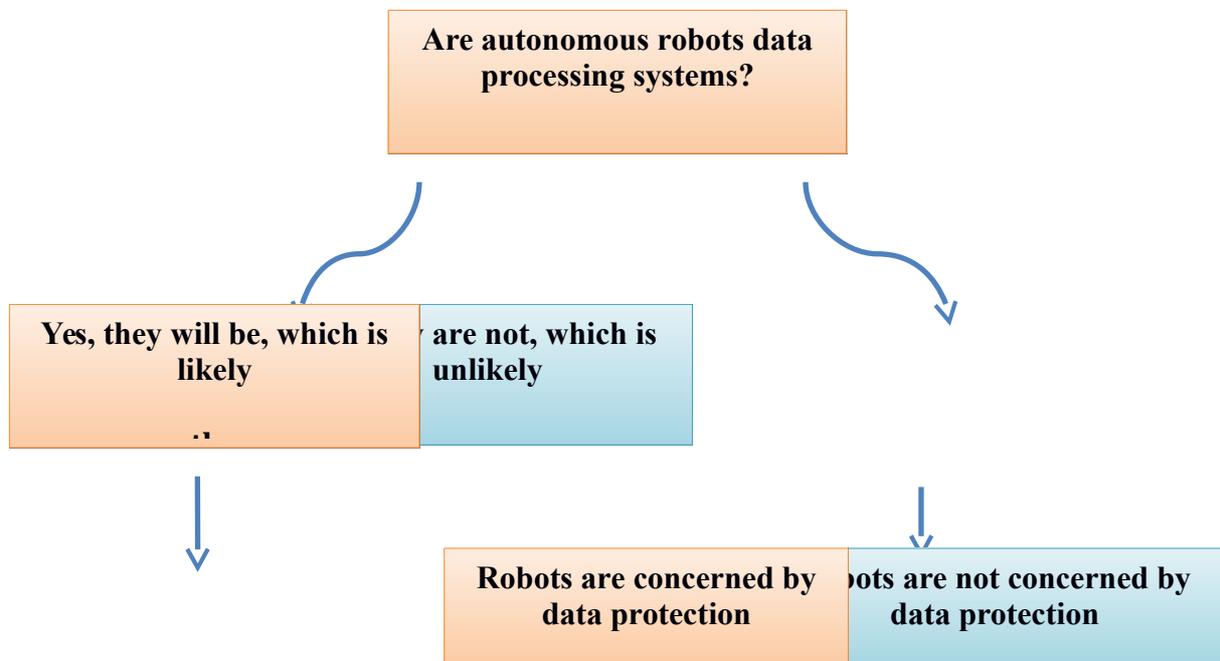
Unfortunately, none of those laws integrate ethic rules that are addressed specifically to autonomous robots. They are general rules that apply to any data controller and whose object are data processing systems what most of autonomous robots will certainly be in the eye of the law (see the following insert for more details). As a result, the legal literature is studying in which way autonomous robot could be concerned by data protection.

Autonomous robots as system of data processing

According to the law, processing of data includes any operation or set of operations on such data, regardless of the method used. The relevant law also states that the collection, recording, organization, storage, adaptation or alteration, retrieval, consultation, use, disclosure by transmission, dissemination or otherwise making available, alignment or combination, blocking, erasure or destruction of data are a set of not limited examples of processing of data.

It is clear that the purpose of the French Data protection act and the Directive aims for the treatment of any operation performed on personal data. Thus, according to the description we made of autonomous robots, they should be a system of data processing under current law for any of them collecting personal data e.g. most of them. Actually, we found that only high frequency trading robots would have no need to collect personal data.

Figure 1: autonomous as data processing systems



3.2 Basic rules on data protection

Some basic rules on data protection can be found in the Data Protection Directive 95/46/EC that was transposed in French legislation through the Data Protection Act, which is the core of privacy laws. These rules are the following:

- Data must be collected lawfully and fairly;
- Data must be collected for specified, explicit and legitimate purposes and not further processed in way incompatible with those purposes as originally defined;
- Data must be accurate, kept complete and if necessary kept up to date;
- The data process must be proportional i.e. adequate, relevant and not excessive regard the purposes that were originally defined;
- Data must be kept no longer than necessary regarding the purposes for which they were collected;
- Data must be kept confidential: the data collected must not be distorted, damaged and unauthorized third parties must not have access to such data;
- In theory, the person whose data are collected must give a specific, well-informed and free consent; in the case of sensible data i.e. related to racial or ethnic origin, political opinions, religious or philosophical or trade union membership of persons, or which relate to the health or sex life, in theory the collect is prohibited unless the consent is intentionally given³⁶. The concept of consent appears to be a central one in the privacy framework, especially in the context of autonomous robot. It means that « *the subject of data processing must be informed of all the issues in the process in advance*³⁷ ».

Furthermore, persons whose data are collected also have a right to access data that are collected, a right of opposition, a right of deletion and a right of correction of those data.

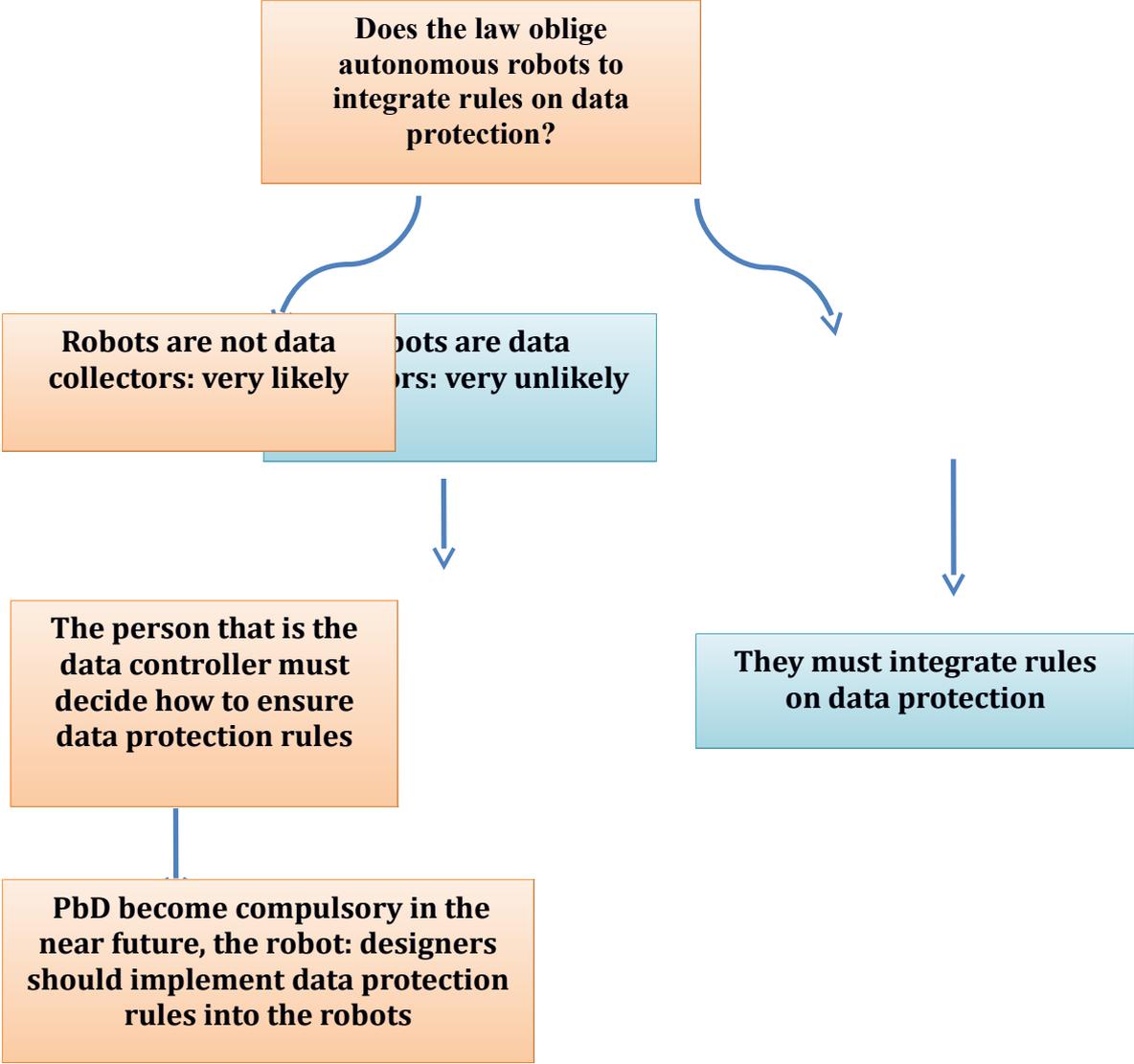
³⁶ In some very specific cases, the consent is not necessary : compliance with a legal obligation, protection of human life, execution of a contrat such as banking contract...

³⁷ Suggestion for a green paper on legal issues in robotics, euRobotics The European Robotics Coordination Action, décembre 2012

3.3 Is the inclusion of protection rules on personal data in autonomous robots a prerequisite to their legality?

According to the current legal framework the answer must be negative. It is the data controller that must respect data protection rules and that bears civil liability and criminal responsibility. Yet, the law states that the data controller must be the person, the public authority, the agency or the body, which determines the purposes and means of the data collection, which are the prerogative of natural or legal person. As a robot is neither a legal person nor one of the bodies aimed by the law, it must not directly integrate the relevant provisions as a prerequisite to its legality. In theory, the data controller must respect the obligations related to data protection and the robot should not. For instance, the designer, the seller of the robot or any other persons that collect and process data through the robot must respect the legal framework on data protection. Implementing this legal framework in the autonomous robot can help the data controller to respect its obligations but this is by no means a prerequisite from a legal point of view. Nevertheless, this could change with the new EU draft regulation on data protection because it includes strong provisions on privacy by design.

Figure 5: the implementation of data protection rules into autonomous robots



2.4. Privacy by design: a matter of interest in the context of ethic and autonomous robots

Privacy by design could become an essential principle for EU data protection rules if the draft regulation on data protection is adopted. Privacy by design means that data protection safeguards should be built into products and services from the earliest stage of development. The draft regulation as amended by the European Parliament on first reading includes a provision that makes privacy by design compulsory to the data controller. It states

inter alia that principles such as loyalty, legality, consent, limitation of purposes, exactitude, confidentiality of collected data obligations that should be built into products processing data such as robots from the earliest stage of development. As a consequence robot makers and sellers should build autonomous robots to respect data protection principles if such provisions would enter into force. It could mean that they will need to integrate ethical rules that allow the autonomous machine to respect data protection principles such as consent, limited and specified purposes of data collection etc

In any case, privacy by design could be a necessary tool for data controllers with regard to the consent rule. As autonomous robots will certainly process personal data constantly to perform a wide variety of evolving tasks, it won't meet properly the condition of the user consent for data collection as this consent is given for limited purposes under law. A general consent for data collection - e.g. at the time of purchasing the robot - could be in breach with current data protection law. Thus, the only realistic solution to allow autonomous robots to perform a huge amount of not predefined task would be to program autonomous robots to require the user consent³⁸ before starting a new task that implies a new kind of data collection.

Nevertheless, it must be noted that according to some authors the privacy by design concept is not the panacea. Rallet et Rochelandet emphasize that the exact meaning of the concept of privacy by design, its effectiveness, its cost, its legal implementation and the methodology that would make possible its integration in concrete technology systems as well as the individual and societal consequences are not yet clearly addressed. According to us, part of these is reflected in the vague wording methodology of the provision on privacy by design in the current draft regulation³⁹.

2.5 Security of personal data collected by autonomous robots

³⁸ In some cases, data protection law provides exemptions to the consent rule, such as the preservation of human life or the compliance with a legal obligation.

³⁹ Alain Rallet et Fabrice Rochelandet, « La régulation des données personnelles face au web relationnel : une voie sans issue ? », *Réseaux*, 2011/3 n° 167, p. 17-47

Collection of personal data by robots also raises the question of the security of data against malicious third parties who wish to access or hack these data.

In France, any access, maintenance, otherwise handling or misuse by fraud of data situated in an automated data processing system is punishable under the Law 88-19 of 5 January 1988 on computer fraud so called “Loi Godfrain”. This law was integrated into the criminal code in from the article 321-1. It is applicable to personal data but also to data in general as long as they are situated in automated data processing system. However, it is not sure whether or not a robot is an automated data processing system regarding the criminal code that does not defined this notion while case law has a broad understanding of it.

Conclusion: There is already an extensive framework on privacy and personal data protection which could be applied to autonomous robots depending on few legislative and case law precision. The development of the concept of privacy by design could make compulsory the respect of privacy by embodying these rules in the robot. General rules on privacy are also relevant while less clear and so, will require case law to be applicable to robots.

Part 5: Human dignity

1. Introduction:

The report on “The future industrial development of personal robotic and service robotic in France” from the PIPAME and the DGCIS (2012)⁴⁰ underlines that human dignity is a major ethical and legal issue, particularly in the context of robotic applications for elderly or disable people. Medical robots, assistance robots and surveillance robots will help users and share and long time of their lives. These robots could influence the activities and choices of those people for reasons of efficiency because the robot sees its mission as a priority vis-à-vis users opinion. This could constrain the way in which users intend to live their life, and thus, their autonomy and dignity.

2. Legal sources

At the international level, there are several sources including the Preamble to the Charter of the United Nations (1945) in which the signatories proclaimed their faith in fundamental human rights and the value of the dignity of the human person.

In Europe, the European Court of Human Rights stated that dignity and human freedom are the essence of the Convention. Article 2 of the Treaty on the EU enshrined dignity by stating that “*The Union is founded on the values of respect for human dignity,*” and The EU Charter on fundamental rights dedicates an entire part on dignity. Article 1 of this Charter set out that “*Human dignity is inviolable. It must be respected and protected*”.

⁴⁰ These two bodies are connected with the ministry of Economy

In France, the article 16 of the civil code says: *"The law ensures the primacy of the person, prohibits the any offense to the dignity of this person and guarantees the respect of the human being from the beginning of⁴¹life."*

3. The relationships between dignity and autonomous robot

The legal Literature has started to set dignity as one of the fundamental rights that could be threatened by the development of medical robot, assistance robot or surveillance robot⁴². Also notable is the meaning of the article 16 of the civil code, which is very similar to Asimov's first two rules.

Nevertheless, specific literature⁴³ on dignity underlines the vagueness and the abstraction of the concept, which clearly reflected by the general wording of rules on dignity. In law, dignity is often used without being defined with an instinctive understanding of what it covers. Therefore, the concept of dignity can be understood variously and contradictorily: regarding assisted suicide, the respect of human dignity can be used to require to keep alive the people but also as a rationale for putting an end to suffering.

Thus, in the context of autonomous robots, it is yet unclear how the right to dignity could apply. But according to fundamental rights and case law, this concept possibly covers the non-discrimination principle. For instance, article 21 of the EU Charter on fundamental right prohibits discrimination based sex, race, colour, ethnic or social origin, genetic features, language, religion or belief, political or any other opinion, membership of a national minority, property, birth, disability, age or sexual orientation. With regard to this provision, an autonomous surveillance robot could not base its decision on ethnic or social origin. The EU Charter also recognizes specific rights to dignity for elderly and disabled people. These rights certainly require the assistance or medical robot to obtain the informed consent of the person

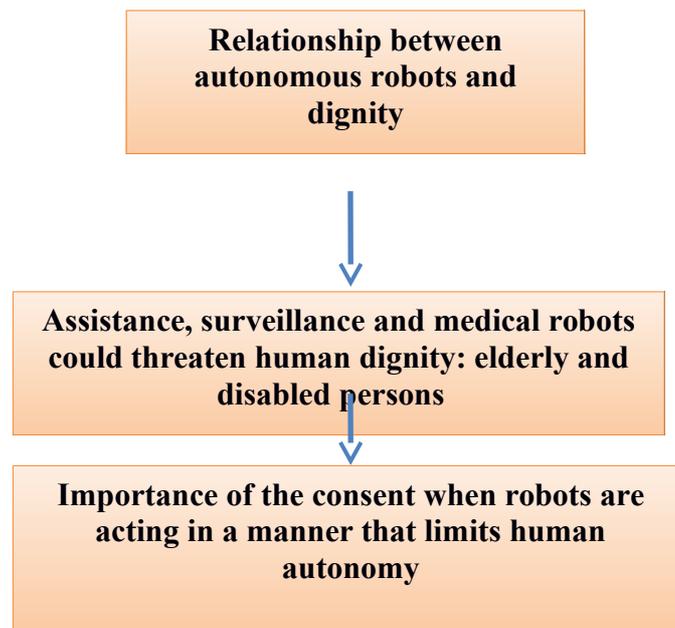
41 Noteworthy is the proximity of this civil code article with Asimov's first rule on robotic

42 Alain Benssousan, *Le plan robotique et la question du droit*, Planète Robot n°21, 2013 ; Isabelle Poirot-Mazères, « Chapitre 8. Robotique et médecine : quelle(s) responsabilité(s) ? », *Journal International de Bioéthique*, 2013/4 Vol. 33, p. 116 ; Christophe Leroux (CEA LIST) Roberto Labruto (ALENIA AERMACCHI), *euRobotics D3.2.1 Ethical Legal and Societal issues in robotics*, 2012

43 Véronique Champeil-Desplats : Fasc. 540 : dignité de la personne, JurisClassseur, 2011, p.18

while proceeding to an action limiting the autonomy of users e.g. if the robot is a using "manual" or recall with voice command for medication⁴⁴.

Figure 3: dignity



Conclusion:

Dignity is an ambivalent but relevant legal principle in the context of autonomous robots. In the absence of regulatory or legislative work, its application will depend on the direction chosen by case law.

44 Ibidem

Part 6: case studies on civil drone, autonomous car and high frequency trading

1. Civil drone⁴⁵

A drone is an unmanned air vehicle, narrowly speaking. It is generally remotely controlled by a human operator with a various degree of autonomy for the drone.

The drone is usually equipped with various sensors such as mobile camera, a video camera, a microphone, sound or thermal sensors drones. Thus, most of drones are devices able to observe, to acquire, to analyze and to transmit data, and so they can potentially undermine the privacy and the rights and freedoms of individuals. In the civil sphere usages can be multiple: surveillance, civil security, police activities, administrative activities, photography, journalism, entertainment⁴⁶...Drones own peculiar characteristic that make them the perfect “cold incarnation of surveillance” according to Ryan Calo⁴⁷. In addition of their various sensors drones are pretty invisible and it could give the feeling that we are constantly observed: they can be very intrusive because they can access normally inaccessible place i.e. windows, gardens, doors of private accommodations, they caon operate mass surveillance by covering huge areas, they can watch with endurance and finally they have the ability to track a target.

45 CNIL, La lettre innovation et prospective de la CNIL, Drones, innovations, vie privée et libertés individuelles, n°6, décembre 2013 ; Alain Benssousan, Le droit des robots : les drones devant les tribunaux, Planète Robot n°27, 2014 ; Alain Benssousan, Le droit des robots : les drones légaux : le début de l’usage civil, Planète Robot n°26

46 CNIL, La lettre innovation et prospective de la CNIL, Drones, innovations, vie privée et libertés individuelles, n°6, décembre 2013

47 Ibid, p. 3

But drones can create others risks because they can eventually cause damage to persons and goods (including others air vehicles) if the operator lose control or if the drone have a failure.

Therefore, drones raise complex and huge ethical issues in terms of privacy and/or dignity and have the potential to cause damages to individuals.

France has set up rules regulating the use of civilian drones. This regulation resulted in two Orders of 11 April 2012 defining the requirements for certain uses of drones applicable to "*aircraft operating without anyone on board*" and their drivers⁴⁸. These two orders respectively concern the design of civil aircraft, the using requirements and the required capabilities and secondly, the use of the airspace by these aircraft. Civil rones are classified trough 7 categories (A to G) corresponding to a certain weigh and to a certain use. Their aerial activities are classified in four scenarios of predefined flight. These provisions aim at providing security to third parties.

The first order on the design and the use of drones defines four operational scenarios based on the category of drones. Each scenario corresponds to requirements to perform specific activities with a drone. Leisure drones (category A et B) are drones that are not equipped with a camera or a video camera. Rules for these drones are relatively permissive (no need for authorization if the drone flight under 150 meters) but the drones must remain in direct view and must not risk to cause damages.

If drones are equipped with camera or video camera they are no more considered as leisure drones but as machine performing specific activities (category C and G). A specific formation is required for the operator. For these categories, the order requires the possession of

⁴⁸ Arrêté du 11 avril 2012 relatif à « la conception des aéronefs civils qui circulent sans aucune personne à bord, aux conditions de leur emploi et sur les capacités requises des personnes qui les utilisent », (NOR : DEVA1206042A) Arrêté du 11 avril 2012 relatif à « l'utilisation de l'espace aérien par les aéronefs qui circulent sans personne à bord », (NOR: DEVA1207595A)

airworthiness approvals and the compliance with certain rules on air traffic such as the flying height not to exceed if the drones weigh more than 25 Kg (categories F and G).

When this kind of drone flight over urban areas or near people or animals (scenario 3 which could be the most common scenario), the order requires that the drone remains in direct view (visual) and at a maximum horizontal distance of 100 meters from its driver. Furthermore, in case of a crash accident, this drone must not deliver more than 69 joules of energy. Finally the drone must not fly at altitudes above 150 meters. Above 150 meters, the flight requires a special authorization with a flight plan and it must be proven that the drone encompass safety requirements.

Moreover, whatever the scenario, a minimum horizontal distance of 30 meters should be maintained at any time during flight with persons not related to the particular activity⁴⁹.

In case of damages cause by a drone, there is a particular liability. Article L6131-2, paragraph 1, of the Transport Code provides that the operator of an aircraft is automatically liable for damages caused to persons and property on by the aircraft or by objects that are detached.

On privacy, drones equipped with a camera and/or video sensor must be in accordance with the French data protection act as studied before⁵⁰. Noteworthy is the prohibition to target homes and house entrances. Such drones must only be use to shoot outdoor areas except if they used automatic blurring of individuals data (faces, license plate...). In addition, the aerial photography is governed by the articles D133-10 and D133-14 of the civil aviation code. According to thses articles aerial photography must repect strict rules and be authorized by the State with exception for military drones and drones of the geographic and forest public authorities. It must also be noted this topic, the CNIL and the European Commission have initiated reflexions to adapt rules on privacy to the use of civil drones.

⁴⁹ <http://www.developpement-durable.gouv.fr/Effectuer-des-activites>

⁵⁰ CNIL, Usages des drones et protection des données personnelles, 2012

Specific case of military drones or drones used by public authorities: order of 24

December 2013 on military drones and drones used by customs authorities, public safety and civil security services circulating without any person on board⁵¹

The order on military drones and drones used by states could be of particular interest for the Ethicaa project as it is related to the example the conflicting unmanned air vehicle. An aptitude document is necessary. It is provided by a technical authority. This document notably includes elements related to the risk of failures equip the drone, breakdowns can lead to a crash, the case of controlled and uncontrolled crash, the surface of the lethal drone, alarms and instructions for the operator...

In addition, the conditions of use and licensing flying for military drones in areas with high population density appear more restrictive although no limitation is imposed *a priori*.

Conclusion: France has started to set up rules framing the use of drones. It is one of the first countries to do so. Legal initiatives have just started and are susceptible to evolve depending on usages of drones.

2. Autonomous cars

Autonomous cars, which could be defined as ground vehicles controlled by an artificial agent raises important legal issues strongly linked to ethical issues. The most frequently encountered problem is the following; Let us consider an autonomous car that is able to minimize loss and damages. In case of an emergency, should this autonomous car always protect lives of its passengers or should it choose the less deadly solution even if it implies the death of its passengers? There are others problems: should the car always respect the Highway Code even in a case of emergency? How should the autonomous car and the driver

⁵¹ Arrêté du 24 décembre 2013 fixant les règles relatives à la conception et aux conditions d'utilisation des aéronefs militaires et des aéronefs appartenant à l'Etat et utilisés par les services de douanes, de sécurité publique et de sécurité civile qui circulent sans aucune personne à bord (NOR : DEFD1329241A) ;

interact? Could the autonomous car prevent the driver from regaining control on the car in certain circumstances? If the autonomous car could collect personal data, how should it be managed? There are also big issues on liability. Who will be liable for a damage caused by an accident? Should it be the driver or the producer?

These are many questions but unfortunately, few have been done yet, in France and in the European Union, to regulate autonomous cars in the near future even if some EU countries have started to evaluate changes in their law is required⁵². For example in France, as a part of the 34 industrial policy priorities, the French government stated that France must become a pioneer in the autonomous car industry, including by removing regulatory barriers to its development. Nevertheless, we could ask ourselves how current law applies to autonomous car and how it is susceptible to evolve.

First, are autonomous cars allowed under current law? The recent amendment of the article 8 of the Vienna Convention on Road Traffic, to whom certain EU countries are signatories, makes us think that it would be possible. In the recent past, the article 8 provided that every moving vehicle shall have a driver and every driver shall at all time be able to control his vehicle. Autonomous cars were clearly forbidden. But the article 8 was amending in order to allow driverless vehicles. Henceforth, it states that a car can drive itself as long as the system can be overridden or switch off by the driver who must be present and able to drive at any time. This should allow European countries, including France, to launch specific legal initiatives to set up a legal framework for autonomous cars. In this context, the French government intends to authorize test for autonomous cars on public roads in 2015.

Secondly, how to consider liability for damages caused by autonomous cars⁵³? Under civil law, victims of road accident are strongly protected. Victims must be compensate for physical damages and financial consequences whatsoever the victims commit a fault excepting if the victim made a particularly serious and inexcusable fault that directly caused

52 K.Kim Moo, Heled Yaniv, Asher Isaac, Thompson Miles, Comparative analysis of laws on autonomous robots in the U.S and Europe, p.7

53 See Morvan Anne-Sophie, Voiture au Volant,le droit au tournant ? Jurisnet.com, available at : <http://juriscom.net/2014/06/voiture-au-volant-le-droit-au-tournant/>

the accident. The goal of the law is the protection of victims regarding serious wounds generally caused by road accident.

Autonomous cars should not necessitate big changes in the law as the goal would be the same: the compensation for victims. As the compensation is necessarily paid by insurance companies, they could engage the liability of the producers if the accident was caused by a failure of the autonomous cars (see the liability for defective products).

Under criminal law, things may be different as the article L.121-1 of the criminal code states that the drivers of a vehicle is criminally responsible for offences committed while driving the vehicle (for examples: manslaughter, driving while drunk, driving under the influence of drugs...). How this provision could apply to drivers who are not driving anymore while knowing that the criminal law states that one is criminally responsible for his own act? It will depend on the role that will be assigned to the driver while he is in the autonomous car. If lawmakers would decide that the driver could remain passive in his car, it would be impossible to punish the drivers through criminal law. On the contrary, if the lawmaker would decide to give an active role to the driver i.e. be able to drive in case of failure of the autonomous system, the driver could be criminally liable for an accident.

Conclusion: Autonomous cars will probably be able to enter the market in around 10 years. A lot of regulatory barriers need to be removed notably concerning criminal law and ethical issues such as the behavior of the car in front of human life.

3. High frequency Trading

On 6 May 2010, a crash of a high frequency robot resulted in a sale of 4 billion dollar by error. Other machines reacted very quickly, about a few seconds, which caused such a crash. The Chicago Stock exchange had to stop quotes for 5 seconds in order to stop this crash.

But what is exactly a high frequency trading robot? According to the European Security and Market Authority (ESMA), high frequency covers: *“trading activities that employ a*

*sophisticated, algorithmic technology to interpret signals from the market and, in response, implement trading strategies that generally the high frequency generation of orders and a low latency transmission of these orders to the market⁵⁴. Related trading strategies mostly consist of either quasi market making or arbitraging within very short time horizon. They usually involve trading for own account (rather than for a client) and position usually closed out at the end of the session”.*⁵⁵

These activities are carried out by robots but are they autonomous? The answer is shaded. On the one hand, they are designed to perform a specific task and they do not currently have extended learning abilities. On the other hand, the high complexity of t high frequency trading robots and their speed leave them a part from human analysis and so, any effective monitoring of their activity seems impossible just as for autonomous robots. Thus, the Ethicaa project considers them as an example of autonomous robots.

Why is high frequency trading ethically and legally problematic? This is because it involves risks of more or less malignant market manipulation and speculation as highlighted by the French market authority⁵⁶. The market manipulation is unethical and illegal as such because it distorts rules of the market game by misleading others market players. These risks are mainly the following:

- “*Quote stuffing*”: It saturates a stock exchange quotation with unnecessary orders to force the competitors to analyze these orders to slow them down⁵⁷.
- “*Spoofing*”: The robot unbalances the order book by its orders, to carry out a reverse transaction⁵⁸. It consist in “submitting multiple orders at different prices on one side of the order book slightly away from the touch, submitting an order to the other side of

54 Usually few microseconds

55 ESMA, Consultation paper, « Guidelines on systems and controls in a highly automated trading environment for trading platforms, investments firms and competent authorities », p.10

56 Arnaud Oseredczuck, Le trading haute fréquence vu de l’AMF, 11e journée des RCCI et des RCS, p. 10

57 Chambre des représentants de Belgique, Proposition de loi visant à instaurer une taxe sur les opérations de haute fréquence, DOC 53 3396/00, 24 février 2014, p. 4

58 Arnaud Oseredczuck, Le trading haute fréquence vu de l’AMF, 11e journée des RCCI et des RCS, p.10

the order book (which reflects the true intention of the trade) and, following the execution of the latter, rapidly removing the initial orders from the book⁵⁹.

- “*Momentum ignition*”: It consists in “*the execution of transactions and / or orders to the market in a single direction, to attract and encourage others to do the same and cause directional price movement. The strategy ends when untying the initial transaction by a transaction in the opposite direction to take advantage of the dynamic artificially created*”⁶⁰. This technique is effective because the algorithm can analyze the market very quickly and thoroughly to determine with great accuracy the trends.

These practices are only possible because of the speed with which the robots can issue orders. It makes any fraud hard to detect because of the amount of orders delivered within a short time.

In theory, current legal texts are able to regulate these practices that fall within the market abuse definition and that is sanctioned by the market regulation authorities⁶¹. The problem comes from the technology behind high frequency trading: the speed and lack of transparency make extremely difficult to control such activities and to prove manipulations under rules on market abuse.

Nevertheless, new legal instruments have been created to specifically take into account high frequency trading excesses. Since 2012, the AMF has decided to apply the guidelines established by ESMA on the implementation of European directives MiFID (Market and Financial Instrument Directive) and MAD (Market Abuse Directive) related to automated trading. Under these guidelines, the companies involved in high-frequency trading should:

- Have governance procedures, including compliance and risk management principles, dealing with responsibilities, disclosure and initial authorizations for the deployment of electronic trading systems;

⁵⁹ ESMA, Consultation paper, « Guidelines on systems and controls in a highly automated trading environment for trading platforms, investments firms and competent authorities », 2011,p. 27

⁶⁰ Ibid

⁶¹ Article L 465-2 alinéa 1 of the french « code monétaire et financier »: It is punished for any person to exercise or attempt to exercise, directly or through an intermediary, an action aimed to hinder the regular functioning of a regulated market or a multilateral trading system in misleading others.

- Test and monitor all electronic trading systems before their implementation and proceed to regular checks to ensure the system efficiency;
- Establish mechanisms and rules to prevent excessive flood of orders. These mechanisms can integrate automatic rejection of orders that do not meet certain parameters of volume and price;
- Enable traceability of delivered orders as well as information of the authorities;
- Are held liable for acts performed by those who benefit from direct and automated access to the market⁶².

In addition, since the Act of 26 July 2013 on banking separation and regulation, there are:

- Obligation for any person to notify the AMF for using automated processing devices of orders related to financial securities of French companies;
- Obligation to register, for a period of 5 years, orders sent to the market and the algorithms used;
- Transmission of the algorithms used in the AMF when requested;
- Establish internal procedures to ensure compliance of the internal organization of the obligation of traceability⁶³;

At the level of the European Union, the revision of the Market and Financial Instrument Directive (MIFI) allowed the Union to introduce rules to regulate high frequency trading for the first time. The Directive provides a definition of high frequency trading which must be further investigated by ESMA. Then, the Directive provides that any company involved in high-frequency trading must set up control procedures, such as "circuit breakers" to stop financial transactions if the price volatility is too high. In addition, in order to limit systemic risk, the algorithms will be tested and approved by regulators. The records of all orders and cancelled orders must be stored and made available to the relevant authority if the latter requests it.

The ESMA is currently working further on high frequency trading at the request of the European Commission to better understand high frequency trading under the new directive MIFI. But as far as we know, there is no intention to make legally compulsory the

⁶² William Bourdon, Trading haute fréquence et délits financiers

⁶³ AMF, 14^{ème} journée de formation des RCCI et des RCSI

implementation of ethical rules directly into high frequency trading robot to limit the risk of abuse.

Global Conclusion: Legal reflexions on autonomous robots and ethics largely rely on prospective considerations. The master / slave relationship of *ius civile* is a perfect example. Most of the scenarios or assumptions made in this work are open questions. Legal analyses will be more precise as the technology will further develop which will allow lawyers to reason about concrete cases, which make their work more efficient.

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