The future of Heritage Science and Technologies from a legal point of view

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Abstract. The development and the prospect of future cultural heritage should certainly be confronted with the development of new technologies applied to the arts which, from a legal point of view, implies mainly three important aspects.

1. Copyrights for software: this seems to be the least interesting for the jurists as many aspects have already been addressed and solved, and therefore on will just quickly list some of them. In fact the copyright explicitly protects the software as work of wit and consequently it is clear that the author is the dominus of his creation in the sense that he is the only person who can decide how to allow other people use his software. So e.g. the relationship between the copyright legislation and open source is actually less difficult than it maybe thought. In addition open source use is fully regulated by Law no. 633/1941 (so called “legge sul diritto d’autore”) which guarantees its proper use.

2. Legal issues related to the so-called BIM technology: Building Information Modelling (BIM) is a software for planning and implementing building projects based on 3D modeling of buildings or structures models. The BIM has already been adopted internationally for the realization of major project and one of the most exciting challenges for a lawyer is to develop a specific BIM contract for the particular field of art and cultural heritage.

3. Legal issues related to artificial intelligence: this certainly represents a field yet to be discovered by jurists and here I will present a series of legal concerns that will engage jurists in the coming years. Such as responsibility and ethics of artificial intelligence. For the above-mentioned considerations, the European Parliament’s Legal Affairs Committee approved a report calling on the European Commission to introduce a set of regulations on robotics.

1. Introduction
First of all, it’s necessary to stress in which ground has been grown up the matching between the development of new technologies and arts. It all started with some interesting informations regarding robotics applied to the arts.

So if a robot can replace an orchestra conductor as it actually does in some places in South Asia, why does not it consider that the same thing can be done in the restoration field in the short run? Very soon the BIM technology is likely to be engaged to restore large archaeological sites (and to tell the truth I’m quite surprised this hasn’t happened yet). At the hearth of all these future applications, there is the software and its legal problems, which unlike those of BIM and artificial intelligence, are now completely resolved.
However, it can be easily noticed that there are no references available regarding this specific topic, so the only way to proceed is by proposing some general ideas which represent the first step to be taken. For this reason, the paper lacks of scientific approach but it hopes to give a serious contribution over time by research and collecting evidence.

2. Copyrights for software
So this first concern represents a sort of “past” in this presentation and many of its important aspects have already been addressed and solved, therefore on will briefly list some of them.

Computer software is generally copyrighted just as a book is. Unlike a book, it is difficult to use just a small portion of it and call it fair use. Computer software can be sold, licensed or freely distributed. Just because software might be free, does not mean it is not copyrighted or that there is no license dictating terms of use.

A license is a legal agreement between you and your software publisher. The license spells out what you can and cannot do with the software. It might specify the number of computers on which the software may be installed or address resale rights. Software may include a validation feature as a check on proper use.

There are several categories of software and licenses:
Shared source - Microsoft developed “shared source.” There is not one standard license for shared source, there are several. When using this software, read the accompanying restrictions on use.

Shareware is proprietary software that is distributed freely or at low cost as a way for users to test drive copyrighted software, they are interested in purchasing. Shareware will usually come with a license and registration. Shareware often distinguishes between commercial and non-commercial use.

Freeware – Although free, this software is copyrighted. It may have proprietary code or it may be open source software. It could even be in the public domain. Look for possible restrictions on use.

Open Source (OS) software is copyrighted, but the copyright holder ascribes to the OS license principles. OS comes with a license that uses special criteria known as Open Source Definition (OSD) established by the Open Source Initiative. See OSD for the ten principles. This is non-proprietary software. It can be downloaded, modified and redistributed. Commonly known OS software examples include Apache and Mozilla.

Implied License - This sort of license may appear on the box or in the printed information that comes with purchased software. There will be wording that states that your use of the software implies consent to the terms of use.

Shrink Wrap Licenses- These licenses are found after the buyer tears off the shrink wrap and opens the box. While “shrink wrap” licenses have been found to be unenforceable in some cases, one cannot assume this is will always be true.

Click Wrap License- Also known as “click through,” this is similar to a Shrink Wrap license, but we find these all over the web or on CDs. The user is required to agree to terms before using the service.

Copyleft License - This liberal license retains copyright for the creator, but allows the user to modify and distribute the software with the understanding that “downstream” users will be equally generous.

GNU (General Public License) is a copyleft type of license.
Public Domain software – this is software that has no copyright restricting its use, no license, it’s free for you to use any way you wish. The purchaser of an original copy of a computer program may “make or authorize the making of another copy or adaptation of the computer program provided: (1) that the new copy or adaptation is created as an essential step in using the program on one’s computer [an ephemeral copy] and that it is used in no other manner, or (2) that such new copy or adaptation is for archival purposes only and that all archival copies are destroyed in the event that continued possession of the computer program should cease to be rightful”.

The making of an archival copy permitted under this section of the law does not apply to software that is licensed unless the license allows it.
If a computer needs maintenance or repair, allows the owner or lessee of the computer to make a copy of a computer program in order to make the repair. This extra copy made in order to repair the computer must be destroyed immediately after the repair is made.

Original copies of software and copies made from originals may be “leased, sold or otherwise transferred…only as part of the lease, sale or other transfer of all rights in the program.” Adaptations “may be transferred only with the authorization of the copyright owner.” However, if your license speaks to the lease, sale or transfer of software, you must abide by those stated restrictions.

3. Legal issues related to the so-called BIM technology

This second concern looks at the “present”, because the so called BIM, which has recently been received a first regulation in Italy as well, it’s largely used and on can suppose it will be use soon also to restoration of large archaeological sites.

However many legal aspects have to be solved.

First of all, let’s consider the meaning of BIM: acronym for Building Information Modelling is a software for planning and implementing building projects based on 3D modeling of buildings or structures models.

Building Information Modelling is a set of technologies, processes and standards that allow many stakeholders to design, build and manage a structure in a collaborative way, within a virtual space. BIM is a methodology, a process of planning, planning, realization and maintenance that manages all the phases of life of the building, from the idea to the demolition. Also managing the 4D and 5D, times and costs All this is done by channeling all the disciplines into one model. In the traditional design we imagined a 3D object and represented through 2D and 3D elaborations with lines and volumes that were conventionally associated with objects.

Now, with the BIM methodology one imagines an object in 3D and through paramentamental objects a virtual 3D model is created from which all the documents and the documentation necessary for its presentation will be extrapolated.

The objects that make up the model are intelligent quinids, constructed using geometric parameters and technical information The model therefore has 3 characteristics: Parametric, since the aspects of the object are managed by parameters Informative, as it contains all the information on the technical data sheets Collaborative, because all the disciplines share all the information in a single model unlike the traditional design in which there was a file exchange intertwined with the consequent possibility of loss of data and errors. Nowadays, compared to BIM's level of maturity we find ourselves at Level 2 in which each discipline works on its model and then share the geometric information and not in a single federated model and updated in real time. One day we hope to get to the Shared BIM where all the disciplines work on a single model. The workflow according to the BIM methodology requires a high amount of work in the initial phases of the project for the organization of the successive phases during which the work will be halved.

In traditional design, on the other hand, it involves a lower initial commitment that substantially increases in the production phases of the works. A conscious adoption requires: Availability to invest in process innovation to be competitive in the market that requires it. Human resources specialized in the approach to the new methodology. Increase workload in the early stages and awareness of the advantages in the subsequent phases continuing with the BIM. In fact, changing methodology during construction would lead to a significant increase in work, time and therefore costs. The use of the methodology therefore brings important advantages: The disciplines convey in a single source from which all the graphic and non-graphic elaborations will be extrapolated. The model consists of intelligent objects that contain all the information of the real object allowing the study of interference and thus reducing the variations during construction.

Moreover, when present, the variants will be managed with great ease since updating the model will be updated simultaneously all the processed From the model it will be possible to extrapolate also the metric calculations, which will therefore be automatic and dynamic as they are synchronized with the model In support of the BIM methodology, the most used tool is Autodesk's Revit software, which will
help in the construction of a parametric model that can be shared in real time. For better interoperability we use the ifc export format supported by most of the software on the market. In conclusion, using the BIM methodology saves time and costs, reduces errors and simplifies management.

In Italy, a BIM Decree has been signed on last December 13, providing for the progressive introduction of digital information management models in the construction processes of buildings and civil engineering works. The obligation to use will start from 1 January 2019 for contracts for an amount equal to or greater than 100 million euro. Then there will be a progressive adjustment (year by year) up to the mandatory implementation of the BIM also for contracts of less than 1 million since 2025. The decree defines the methods and timing for the introduction of the compulsory electronic modeling methods and tools for building and infrastructure in the contracting stations and for the rationalization of the design activities and the related checks.

This is a useful intervention in the pursuit of a better quality of projects and works, as, through the digitization of the construction sector, benefits are made to public spending and real estate or infrastructure products and the work of insiders.

This of course doesn’t consider all problems, and in my opinion the biggest challenge for a jurist is to imagine and build the perfect BIM international contract.

4. Legal issues related to artificial intelligence.

This last aspect represents a field yet to be discovered by both jurists and technologies experts and the day a robot will be able to replace a restorer is no doubt closer than we expect.

The history of Artificial Intelligence (hence A.I.) can be divided into three phases. The first sees the development of intelligent systems in the field of computation. The second is characterized by the imitation of problem solving processes and human reasoning. The third, finally, is distinguishes for the creation of “expert” systems and cc.dd. "connectionists” (Warwick 2012). More recently, with the progressive attention paid by legislators and policymakers to the phenomenon of industry 4.0, we begin to talk about A.I. even outside the laboratories where it had long been confined. It enters so silently, almost unnoticed, in the daily life of people, to mold, tame and often dull their minds, in the total absence of self-awareness and legal regulation.

First of all, a necessary clarification is necessary. A.I. in a broad sense it forms a circle within which numerous applications can be included (1). One thinks, above all, of the branch of cybernetics or that of robotics, which constitutes a sub-branch of the former and deals with those intelligent algorithms that operate in an external environment. Therefore, each approach to the topic must not fall into the error of confusing a part with the whole. A.I. in the strict sense it consists of three elements: one of the machine, one external to it and, finally, one indifferently internal or external to the machine. They are the algorithm, the information and the memory. This is true with reference to any type of intelligent application and is reflected in the most widespread definitions of A.I., which however do not always take into account all three elements (2).

In fact, from an empirical point of view, the A.I. it is the product of an algorithm able to process and synthesize a certain amount of data in a time inversely proportional to the computing power of the machine itself. Each algorithm of A.I. it is then designed to perform a certain function, to achieve a certain output pre-established by the programmer. However, the algorithm - rectius the language string that makes up the algorithm - constitutes only one component, perhaps the most important one, of A.I. The second component is given by the information processed. Needless to say, in fact, that the greater the amount of information processed, more refined and, one might say, 'intelligent', will be the answer that the machine will give to a specific external stimulus.

Thus, the solution given by an intelligent machine to a certain problem will be, in probabilistic terms, the more exact the information on which this solution is based. Finally, the third element is given by the memory, which allows the storage of information. This element should not be underestimated in the analysis of the phenomenon, since the greater the information to be processed, the greater will be the physical or virtual space to be engaged. The algorithm, under a legal profile, constitutes an invention, a work of ingenuity and, as such, subject to intellectual protection as an intangible asset.
On this point, legal science, even in the divergence of views about the type of protection to be granted to software, seems to be in agreement. Information in the broader sense, on the other hand, appears difficult to frame within a single legal definition. This is due to the composite nature of a term that includes data, public or private (sometimes even personal or sensitive), bilateral or plurilateral facts and interactions. Furthermore, it was stressed that the concept of information should not be confused with that of data. Data in itself is meaningless: they only assume it as processed by the algorithm (3).

Finally, the memory is neither more nor less than a warehouse, a place to record information. A place that, like any space (physical or virtual), lends itself to being illegally violated or altered. This circumstance is firmly rooted in the traditional problems that the nascent line of studies in the field of cyber security has been working for a few years now on the most careful doctrine. When the intelligent machine is equipped with a physical substrate, which allows it to move and interact with the outside world, a further element is added to the three that make up artificial intelligence. This further element is the body of the machine, which, in its four components, is thus defined as a robot.

The body of the machine, from a legal point of view, is on two levels: on the one hand, it extends the effects of the machine's actions in the external world; on the other, it allows the interaction of the machine with man and with phenomenal reality and above all, by virtue of this interaction, where the algorithm is so programmed, learning. In this last regard, it must also be taken into consideration the current tendency of the philosophy of science to broaden the research towards the c.d. IT'S AT. (Artificial Empathy), that is that area of robotics research engaged in the construction of synthetic agents with affective skills (4).

Balking (5) says: «when I was a boy, I read all of Isaac Asimov’s stories about robotics. In Asimov’s world, robots were gradually integrated into every aspect of society. They had various degrees of similarity to humans, but as the stories and novels progressed, the most advanced robots were very human in appearance and form.

The most famous feature of these robot stories is Asimov’s three laws of robotics (6) that were to be built into every robot’s positronic brain. The three laws are:

First Law: “a robot may not injure a human being or, through inaction, allow a human being to come to harm”; second Law: “a robot must obey orders given it by human beings except where such orders would conflict with the First Law”; third Law: “a robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.”

These three laws have been very influential, and even today people imagine what it would be like — or whether it would be even possible — to build them into robots, for example, into self-driving cars» (7).

But then, Balkin goes on, we are rapidly moving from the age of the Internet to the Algorithmic society.

On will diverge from Asimov at this point. Instead of focusing on laws directed at robots (or algorithms), I focus on laws directed at the people who program and use robots, A.I. agents, and algorithms. That is because what we need in the emerging Algorithm Society are not laws of robotics, but laws of robot operators.

The conceit of the Algorithmic Society is the harnessing of data and algorithms to govern society and make society better. The ambition of the Algorithmic Society is that of omniscience—to know all and to predict all—an ambition as old as humanity itself, but now seemingly ever closer to being within our grasp.

In the Algorithmic Society, the central problem of regulation is not the algorithms but the human beings who use them, and who allow themselves to be governed by them. Algorithmic governance is the governance of humans by humans using a particular technology of analysis and decisionmaking. Hence our need is not for robot-directed laws like Asimov’s three laws of robotics, but laws directed at those who use robots to analyze, control, and exercise power over other human beings.
5. Conclusions
As asserts also by the most important living cosmologist, Martin Rees, baron of Ludlow, former Dean of Trinity College, the future commitment of mankind – and the same applies to jurists - is to work very close to the machines, watching over them, and mostly knowing that it is is more the individual or the small group that, by mistake of project or management, can cause a planetary disaster.

In such an interconnected global village, technology has become so effective that the action of the “village idiot” can have a global effect.

Over the last fifty years, we have had machines that are able to deal better than us.

Thanks to Moore’s law (every two years the number of transistors of an integrated circuit doubles), there are machines that can learn by themselves to play chess and to recognize the human face. In some jobs which need to handle a huge amount of information - from traffic management to forecasting stock market trends - machines already work better than us. Luckily, there is still a gap between what machines can do and the versatility necessary to make them genuinely human reasoning. The computer that beats the Go world champion uses hundreds of kilowatts of energy. The human competitor only needs of 30 watts, the equivalent of a light bulb, and in the meantime he can do a lot of other things besides playing Go.

But even if the machines are still clumsy, they can already interact and damage our world through “Internet of things”, with unintended but disastrous consequences.

The real challenge will be to instil ethics and common sense in machines and – for jurists – in the regulations behind them. In other words, it shouldn’t be a real contrast between men and machines, but men ought to be the programmers, day by day, of their technological assistants, considering all side effects and implications from the legal point of view.

References
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[2] Report of the European Parliament, containing Recommendations to the Commission concerning rules of civil law on robotics, doc. A8-0005 / 2017, 27 January 2017, p. 22, which however only deals with 'smart robots', according to which: "It is appropriate to establish a common European definition of intelligent autonomous robot, possibly including the definitions of its sub-categories, taking into account the following characteristics: - the ability to acquire autonomy thanks to sensors and / or through the exchange of data with your environment (interconnectivity) and the analysis of such data - the ability to learn through experience and interaction - the shape of the robot's physical support - the ability to adapt its behavior and its actions to the environment ". See also, Executive Office of the President, National Science and Technology Council Committee on Technology, Preparing for the future of Artificial Intelligence, October 2016, p. 6, where it is highlighted that: "There is no single definition of AI that is universally accepted by practitioners. Some define AI loosely as a computerized system that exhibits behavior that is commonly thought of as requiring intelligence. Others define AI as a system capable of rationally solving complex problems or taking appropriate actions to achieve its goals in whatever real world circumstances it encounters ". See also the recent discussion paper of the British Government's Information Commissioner's Office, Big Data, artificial intelligence, machine learning.
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