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FULL PAPER

Technoscience, Art-Robotics and Intellectual Property : Towards an Ethics of Robotics

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ABSTRACT:

This research explores the documentation and preservation of the historical building "Al-Ghulitha outpost" using engineering software. The study emphasizes the significance of integrating engineering methodologies with cultural heritage conservation. The documentation process involved collecting historical information and site surveys for data gathering and applying AutoCAD and SketchUp software to create the 2D site plan and 3D model precisely. Moreover, using engineering software such as Lumion has enhanced visualizations of what a building might have looked like earlier. Based on these visualizations, it is possible to know the damages to which the building's structure has been exposed, determine their locations, and clarify the potential maintenance effects. As a result, these results were adopted as a basis for damage diagnosis and the provision of an initial conservation plan.

The study demonstrates the importance of documenting and preserving Al Ghulitha as a model of late Ottoman architecture and stresses the importance of integrating engineering techniques with elements of culture and history. The study achieved high accuracy in documenting the case study using engineering software and illustrated the importance of this balance in enhancing conservation efforts and ensuring the continuity of heritage. Moreover, this research also saves time and effort in identifying damages in historical buildings before maintaining them. The results indicate the need to spread cultural awareness and include the local community in interacting with cultural activities and planning for future maintenance. The research draws attention to the importance of historical buildings and indicates the need to take the necessary measures to protect them, including funding and legislation, within the framework of integrated cooperation between heritage preservation experts and engineers.

Keywords: Al-Ghulitha Outpost, heritage preservation, engineering software, AutoCAD, Sketchup, Lumion**.**

1) **A new conception of Science :**

Distinction between Science and non-Science: Judgement of Reality and Judgement of Value. In his speech entitled Moralité complexe et le problème des valeurs aux XXI siècle (Complex morality and the problem of values in the 21st century), Edgard Morin revealed that in the past the problem of the relationship between scientific knowledge and morality had not arisen, precisely because modern Western science had evolved, rejecting any intervention by politics, religion or morality, and because the aim of science was to achieve knowledge whatever the results. It follows, then, that the separation of the two domains did not result from the fact that science alone had a monopoly on judgements of reality, and from the fact that morality contained and reserved for itself judgements of values, but was due to the fact that, in the scientific domain, the judgement of reality was considered to be a supreme value. It should be noted here that this separation did not pose any problem in the 20th century. Positivist philosophy had in fact asserted that science is neutral and that it had nothing to do with ideology or with problems of meaning and value[1]. This explains why it aimed to achieve two goals: knowledge and efficiency. Auguste Comte predicted this when he said: "To know in order to foresee, and to foresee in order to be able"[2].

In this sense, we understand that science was a purely theoretical activity, and that it did not approach the realm of values. In this sense, it was natural for science to distinguish between scientific judgements of reality, which were concerned with quantity, and judgements of value, which were concerned with meaning and therefore quality.

In the early modern era, however, Edgard Morin informed us of the fall of the old ideal of knowledge for knowledge's sake, and the emergence of a new conception of science that had been centred on the idea of power and the effectiveness of manipulation and decision-making. This means that we can no longer think after Einstein in the same way that we thought before him, because the conception of science has changed.

Today, a number of thinkers have raised questions about the consequences of scientific discoveries and their effects on nature and human life. They have also raised the problem of the use of science, and the interests and purposes that science should serve. In this sense, it was clear that the

[1] Value: (n.f.) A value, what is true, beautiful, good, according to a personal judgement more or less in line with that of the society of the time, moral, social, aesthetic values. Le petit robert, dictionnaire alphabétique et analogique de la langue française, Collectif, Alain Rey, Edition 1994, p2735..

[2] Auguste, C. Les portraits du Fayoum. Retrieved from http://www.meublepeint.com/fayoum-portraits.htm (no date). .

increasing use of modelling[3],justifies the position of the problem of responsibility by the fact that it has an immediate relationship with the problems of life, such as pollution, food shortages, hunger and thirst, which determine the destiny of humanity, and is situated at the frontiers that link science and technology with morality and values.

Modelling is at the crossroads of several sciences and requires a multidisciplinary approach to problems. Today it is complemented by digital simulation and the systematic use of computer-generated images. "The computer explosion and the new scientific paradigms brought about by systems theory, catastrophe theory, fractal theory and chaos theory have led to a proliferation of models for analysing complex systems, whether physical (dynamic systems) or human (mechanisms of economic and cultural development, etc.)»[4]

The boundaries between scientific specialities and their aspects used to be clear, but today there is a trend towards a field of knowledge that intermingles and penetrates each other, like blood vessels, Cybernetics[5] (the science of encounters) is a good example of this, because many new sciences, such as communication, physiology and political economy, are brought together and linked within it. Scientific research is no longer made up of fields that are distinct from one another, compartmentalised by boundaries. On the contrary, these boundaries have become so blurred that we don't know where research ends and development and applied research begin.

2) **The relationship between science and technology *:***

All contemporary research is made up of a back-and-forth between concept and application, theory and practice, to use Bachelard's language, between "the working mind" and "the worked matter"[6]. In this relationship, theoria precedes techné, so if the development of technology depends on pure science, the progress of the latter depends closely on technology, which means that today it is increasingly difficult to separate science from technology: What Bachelard said about the edifice of electrical rationalism applies in fact to the whole edifice of contemporary scientific research: "We

[3] ***Modelling: "The original meaning (of the concept modelling) is that of 'model', the Latin modulus being an architectural term designating the arbitrary measure used to establish relationships of proportion between the parts of a structure (...), however material it may be, a model is not a real object but an artificial object which belongs to the register of invention. Houriya Sinaceur, dictionnaire d'histoire et philosophie des sciences, Paris, P,U, F, 1999, p 99.***

[4] ***Ibid. p 247.***

[5] Cybernetics: the science that studies the control of information and communication, which, through its applications, is credited with the ability, among other things, to network scientific knowledge - the true matrix of techno-science. Lafontaine. L'Empire cybernétique : De la machine à penser à la pensée machine. Paris: Seuil, 2004, p187.

[6] ***G. Bachelard :*** L'activité rationaliste de la physique contemporaine, Puf, paris 1956, p3.

must grasp both the rational and the real in a true coupling in the electromagnetic sense of the term, constantly insisting on the reciprocal reactions of rational thought and technical thought[7]".

This notion of coupling implies that from the most theoretical research to the most applied research, and from the latter to the former, we see not the fortuitous passage from intellectual adventure to technology, but the deliberate organisation of reciprocal exchanges. Technical invention is made up precisely of these constantly reciprocal relationships between the rational idea and industrial application. In this context, Edgard Morin has said: "Today, the development of science develops technology, which in turn develops science, and we are talking about techno-science"[8].

Hence the obvious question: How are we to understand that science has broken with purpose and interest to announce an organic relationship between science and technology and the capital thing that ends up replacing truth with efficiency and explanation with governance, power, which has become the extreme value of science today?

In fact, science and technology used to be separate, but today technology has become an applied science, which means that it is difficult to separate the two fields. This is what led Gaston Bachelard to prove that twentieth-century physical science produces and constructs most phenomena with the help of instruments, This led him to assert that it is the fruit of the union of science and technology or, to use his own expression, that it is an applied rationality, because it considers as true everything that can be applied and everything that can be verified by experiment.

This means that we can no longer avoid research into the moral consequences of science, because in modern times science has become a force and a power that influences our lives and our behaviour[9]. Today, we can no longer talk about science for science's sake, because we can no longer avoid seeing that science is concerned with the dangers that threaten humanity.

3) Savoir et pouvoir :

« "The world is marching blindly at an ever-accelerating pace. Spaceship Earth is propelled by four interconnected engines. Science, technology, industry and the capitalist economy. These four engines are increasingly closely linked. Science has become increasingly central to society, omnipresent in business and government. It has become closely allied with technology and has produced gigantic powers that are beyond the control of scientists... Knowledge of the atom has given rise to the technology of atomic weapons and nuclear energy, and knowledge of genes has

[7] ***G. Bachelard :*** L'activité rationaliste de la physique contemporaine, Puf, paris 1956, p3.

[8] ***E. Morin*** : *Science avec conscience*, Paris, Seuil, 1990, p160.

[9] ***Pouvoir*** : (n.m) le fait de pouvoir : de déposer des moyens naturels ou occasionnels qui permettent une action ; Le pouvoir de saisir la réalité, de connaitre l'avenir, Le petit robert, dictionnaire alphabétique et analogique de la langue française, Collectif, Alain Rey, Edition 1994, p 2038.

given rise to a whole industry that is already manipulating them; science and technology are associated and so are profits. It is this four-wheel drive that is propelling our off-centre planet.»[10]

In his book Science avec conscience (Science with Conscience), Edgar Morin emphasised the relationship between science, technology and politics, and defended the widespread irresponsibility of scientists on the grounds that the knowledge they produce is hyperspecialised and requires group work, and that interdisciplinarity[11] is anonymous. He also emphasised the interaction between scientific and technological research and the techno-bureaucratic institutions of society, and their alliance, which has given rise to widespread irresponsibility, because the disciplines are closed in on themselves, and the power that results from them and emanates from them escapes their control and power, to submit to the exploitation of the politicians and bigwigs who hold the decisions. In this context, our thinker asserts that science is neutral and that morality and politics are bad, while technology is alternately good and bad.

Edgar Morin points out that: "We are now in the age of big science, techno-science[12], which has developed titanic powers. But it should be noted that scientists have been totally dispossessed of these powers, which nonetheless emanate from their own laboratories: these powers have been reconcentrated in the hands of business leaders and state powers. There is now an unprecedented interaction between research and power, and many scientists believe that they are avoiding the problems posed by this interaction by thinking that there is a disjunction between science on the one hand and technology and politics on the other. These scientists say: "Science is very good: it's moral. Technology is ambivalent, like Aesop's tongue*[13]. Politics is bad, and the bad developments in science are due to politics"[14].

4) **Techno-science progress and robotic art :**

[10] ***E. Morin***, La méthode : L'humanité de l'humanité, l'identité humaine, éditions seuil, paris, 2001, p280.

[11] *Interdisciplinarity: The word 'interdisciplinarity' is not one of those which, like scientific terms, are defined in a single and universally accepted way... the Report of the Director-General of Unesco to the Executive Board on the preparation of the Medium-Term Plan for 1984-1985 (113 EX/4, para. 426). It states "Since the concept of interdisciplinarity is situated at the epistemological level, it may be considered to refer to the co-operation of various disciplines, which contribute to a common achievement and which, through their association, permit the emergence and progress of new knowledge."" L'interdisciplinarité dans l'enseignement général": Division des sciences de l'éducation, des contenus et des méthodes May 1986.pp 87. 89*

[12] Techno-science: is a concept [...] that tries to remind us of certain obvious facts that philosophers had helped to blur and dismiss. Technoscience, the combination of technology and science, is a reminder that there has probably never been a science completely free of technology. The idea of a pure science is a fabricated one, [...] which probably responds to an ideal of academic purity but which does not correspond to any reality. Hottois, G. La technoscience: De l'origine du mot à son usage actuel. In J.-Y. Goffi (ed.), Regards sur les technosciences. Paris: Librairie Philosophique J. Vrin.2006, p21-38.

[13] A Greek poet: He said: "Lacquering is the worst and the best of things.»

[14] ***E. Morin***, Science avec consciences, p, 116-117

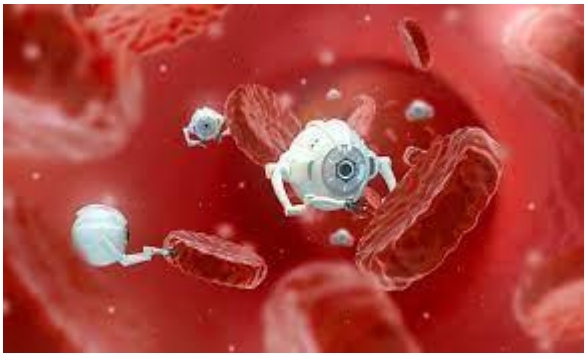
Robots[15], from simple toys to intelligent autonomous robots and virtual agents, are increasingly present in our daily lives. As artists, we want these robots to serve us, work for us and interact with us. To this end, scientific and artistic progress in the field of robotic art has become impressive and has transformed the way art is created and perceived. With this in mind, I'd like to outline a few key points concerning these advances: Automation and virtual reality: These technologies have become tools for artists, helping them to create works of art and performances. "Robots with artificial intelligence" have been integrated into the artistic field to create works of art and interact with visitors. The advances also include "Art and science in symbiosis": artists and scientists work together to explore the boundaries between art and science, creating works that question and challenge norms and conventions. Then there's 'Connected Objects and Art': Connected objects are playing an increasingly important role in art, with artists using smart technologies to create works that explore the relationship between humans and machines. And finally, 'Hybridity and cloning': Scientific advances in the fields of hybridity and cloning have enabled artists to create bio-artistic works that fuse natural and artificial elements, as in Jonathan Pêpe's Exo-biote project.

It is worth mentioning that robotic art is a form of art that uses robotic or automated technology to create dynamic and spectacular works in an increasingly robotised society, where contemporary artists are interested in Artificial Intelligence, which is revolutionising human existence and even the condition of the work of art: its production, exhibition, dissemination, conservation and reception.

During the study day on "Ethics and post-human experiences in contemporary art" organised on 15 October 2023 in Gabés, Tunisia, Zaven Paré (a pioneer of robotic art) developed this idea by saying that robotic art consists of using robots or other automatic technologies to compose a work of art. Robotic art installations are often interactive thanks to the use of sensors. This form of art differs from more traditional kinetic art in that it is interactive. There are many contemporary artists practising robotic art, such as Theo Jansen, Stelarc and many others. Robotic art exhibitions have also been organised, such as the one at the Cité des sciences et de l'industrie in France.

[15] The robot is defined as a machine that implements and integrates : - Data acquisition capabilities with sensors capable of detecting and record physical signals.
- The ability to interpret the acquired data to produce knowledge.
- Decision-making capabilities which, based on data or knowledge, determine and plan actions. These actions are designed to achieve objectives, most often provided by a human being, but which may also be determined by the robot itself, possibly in response to events.
- Capabilities for executing actions in the physical world through or through interfaces.
IEEE Robotics and Automation Society Technical Committee on Robot Ethics http://www.ieee-ras.org/robot-ethics

On the subject of nano-art, Amine Elgheryeni points out in a scientific article entitled "The alliance between nanotechnology and interdisciplinarity: a new vision in the world of the infinitely small" that "Nanorobots, or nanites, are nanoscale robots built using emerging nanotechnologies. Although their use is mainly focused on fields such as Nano-art, medicine, biotechnology and engineering (...)Nanorobots are mainly devices programmed to perform specific tasks at the nanometric scale, and although discussions on their artistic use may exist.....[16]



Nano robots biohybrides[17]

For his part, Cris Orfescu adds in his article entitled "NanoArt and surrealist photography" that "Nano-Art is a new artistic discipline at the intersection of art, science and technology. Using nanorobots, it presents nano-landscapes (molecular and atomic landscapes that are natural structures of matter on a molecular and atomic scale) and nano-sculptures (structures created by scientists and artists by manipulating matter on a molecular and atomic scale using chemical and physical processes). These structures are visualised using powerful research tools such as scanning electron microscopes and atomic force microscopes, and their scientific images are captured and further processed using various artistic techniques to convert them into works of art presented to a wide audience. "[18]

This interdisciplinarity between art, science and robotics raises important ethical questions, particularly concerning the use of robots, their impact on society and the environment, and their potential autonomy and decision-making capacity.

Several authors and researchers have tackled this subject, highlighting concerns such as artificial empathy, human responsibility in the use of robots, and the possibility of granting rights to robots.

[16] Amine Elgheryeni, The alliance between nanotechnology and "Interdisciplinarity: A new vision in the world of the infinitely small, GOIDI Journal, USA, p217, TICAD-2022.
[17] Consulted on 24/12/2023 on the following website https://www.drugtargetreview.com/news/101789/biohybrid-micro-and-nano-robots-could-revolutionise-drug-delivery/
[18] Consulted on 26/12/2023 on the following website: https://crisorfescu.com/

It is essential to reflect on these issues if we are to frame the development and use of robotics in an ethical and responsible manner. The articles consulted address various aspects of ethics in robotics, such as artificial empathy, human responsibility and the possibility of granting rights to robots. They underline the importance of reflecting on these issues in order to provide an ethical and responsible framework for the development and use of robotics. The question that arises from this line of thought is as follows: What are the main ethical issues involved in robotic art?

5) Robot-artists, creativity and intellectual property

In an increasingly robotized society, artists are seizing on Artificial Intelligence to question the very existence of humans and the condition of the work of art. While many artists are seizing on artificial intelligence (AI) as a tool to support their creations, robots are today becoming autonomous players in the creation of works of art, and reality, which is now taking precedence over science fiction, could upset the Tunisian conception of copyright. The question that arises in this direction is: what do we mean by robot-artist?

Ai-Da with Her Paintings. Photo: Victor Frankowski[19]

I'll take the example of Ai-DA, the first humanoid robot, built in the UK's south-west peninsula by the company Engineered art. She has the features of a young brunette woman with wide-open eyes. But her arms and mind are those of a robot. She is able to represent what she sees - in her own way, she had a solo exhibition (Paintings, sculptures, videos, performances) on Wednesday June 12, 2019 at Oxford University.

[19] Consulted on 25/11/2023 on the following website https://news.artnet.com/art-world/ai-da-robot-artist-parliament-2190611

The artist welcomes visitors amidst her works, and even engages in conversation: "I started my life in Cornwall, in a very pretty English town called Penryn," says the robot. Now I live near London, about an hour from here." . the 20 Heures teams visited the studio of artist Ai-Da, they say: it's a fake skin covering eight computers, two cameras and a robotic arm. Its creator is a former gallery owner who has surrounded himself with engineers. Its owner wanted to create a robot that observes its environment and makes artistic decisions on its own.

It's worth mentioning that several works of art signed by software, or robots, are beginning to make their mark on the art market. Last December, Christie's auction house sold for the first time a work signed by an artificial intelligence, for £400,000. As for Ai-Da, its entire body of work went for 1.12 million euros.

The question here is: Are Ai-DA's artistic creations eligible for copyright protection? In other words: does a robot-artist have the right to intellectual property?

Whether a robot has the right to intellectual property is a matter of debate. Robots can create works in the copyright sense, but they cannot be considered authors in the legal sense of the term, as they are not natural persons. However, the question of whether robots can be considered creators of works of the mind is becoming increasingly relevant, as robots are increasingly autonomous and capable of creating works without human intervention. Here we can add that a work of the mind is defined as an original intellectual creation materialized on a tangible support. If the condition of materialization is met in the case of a robot's work, it is more difficult to recognize it as an intellectual creation.

Indeed, it is unlikely that the work will qualify as original, despite the machine's degree of autonomy. The creator of the algorithm will therefore benefit from the right to the work, provided it qualifies as original. In the absence of originality, the work cannot be protected. As things stand, therefore, Tunisian law - and even French law - does not allow robots to acquire copyright over their works.

Several solutions have been proposed to solve this problem, including assigning copyright to the robot's owner or designer, or creating a special form of copyright for machine-generated works. However, no such legislation has yet been passed. In fact, the problem no longer arises for works created with the help of a computer. In a ruling handed down on January 31 2005, the Bordeaux Court of Appeal laid down the principle that "a work of the mind, even one created using a

computer system, can benefit from the rules protecting copyright, provided that it reveals even in a minimal way the originality intended by its creator". The condition for a work to benefit from copyright protection is therefore that it reveals the originality of its designer. In this case, copyright is for the benefit of the person, not the machine.

In 2017, the European Parliament recommended that the European Commission consider creating a specific status for robots with artificial intelligence, but this proposal has not yet resulted in concrete legislation. In short, the question of whether a robot has the right to intellectual property is a complex and evolving one. Although robots can create works of the mind, they cannot be considered authors in the legal sense of the term. Solutions to this problem have been proposed, but no legislation has yet been passed.

What are the criteria for determining whether a work created by a robot is eligible for copyright protection?

The criteria for determining whether a work created by a robot is eligible for copyright protection are complex, and require a case-by-case approach. Here are a few elements that may be taken into account: The level of autonomy of the robot: if the robot is capable of creating autonomously, the work can be considered an intellectual creation and protected by copyright. However, if the work is the result of an algorithm, it cannot be protected by copyright. Originality of the work: to be protected by copyright, the work must be original. If the work is considered an intellectual creation, it must bear the imprint of the author's personality. Materialization of the work: to be protected by copyright, the work must be materialized. If the work is created by a robot, it must be fixed on a tangible support. Qualification of the work: whether or not a robot's production can be considered a work of the mind depends on the robot's level of autonomy and the work's ability to bear the imprint of the author's personality.

What are the challenges involved in protecting the intellectual property of works created by robots?

According to the results of our research, robots can be protected by intellectual property law, but this depends on the level of autonomy of the robot and the ability of the work to bear the imprint of the author's personality. Robots may be considered creators, but they are not recognized as legal persons. Works created by autonomous robots may fall into the public domain, unless a sui generis right of the robot's progenitor over the latter's autonomous creations is recognized. Furthermore, robots cannot be considered authors within the meaning of copyright law, as they do not have the capacity to create works within the meaning of copyright law.

Ultimately, the issue of intellectual property of works originating from robots highlights the increasing complexity and legal difficulties, as these technologies continue to develop and integrate into various forms of artistic expression, legal issues related to ownership and protection will likely continue to arise. In Tunisia and even in Europe, there is as yet no specific legislation on the subject, but the European Commission launched a public consultation in 2020 to gather the views of stakeholders. What will Tunisia's position be on the issue of AI and copyright? Only time will tell.

5) Ethics of responsibility:

The question raised in this perspective is the following: In these different activities, what attitude should modern man adopt, whether in terms of ideas or behaviour, towards this world disrupted by changes, events and revolutions?

This question undoubtedly belongs to the domain of values, because before adopting an attitude that we choose and before taking a decision, we ask ourselves the question around the value of what we know, and around the value of our actions, and therefore the value of what we achieve.

Feyerabend highlighted the conflict between theories in this direction. He also highlighted the difficulties that arose as obstacles to any decision, revealing that "The fact of investing money and energy in a scientific research programme and giving it a special place in educational, intellectual and philosophical life changes science and society in such a way that it is no longer possible to go back to the original situation and reverse this decision. The nuclear threat we face today is the result of an irreversible choice. We can therefore say that scientific decisions are decisions in a pool of possible solutions. Each stage of scientific evolution, each stage of life, is the result of decisions that have no scientific or living basis.»[20]

In truth, ethics according to Alain Badiou today designates a principle of relationship to what is happening, a vague regulation of our commentary on historical situations (ethics of human rights), techno-scientific situations (ethics of the living, bioethics), social situations (ethics of being together), media situations - ethics of communication. It concerns the search for a good way of being or the wisdom of action, so the ethical order essentially consists of the immediate decision. On this subject and in the same context, Edgard Morin had this to say: "the problem of scientific knowledge in its relationship with morality (and more particularly with ethics) did not arise in the past, precisely because modern Western science was established and developed, refusing any

[20] J. Paul Feyerabend, la science en tant qu'art, éditions Albin Michel, S.A 2003, P, 154, 155

entanglement or intervention on the part of (politics) religion and morality.»[21] . Whatever the results, the aim was to achieve knowledge. This separation of disciplines was not only produced by science, which was content with judgements of reality, whereas the moral order encompassed value judgements, but it also arose in the scientific sphere from the fact that real judgement took on the quality of supreme value.

In the 20th century, this separation posed no problem, and this at a time when the sciences had developed destructive energies and great manipulations. The proof of this can be seen in the fact that the relationship between scientific knowledge and morality has become an essential issue, which explains the growth of ethics committees and the birth of social associations. Given, however, the fact that the capacity of morality is far from limiting and controlling science, and is also far from being achieved, because science is separate from morality.

As a result, the elements that require agreement and conformity are now in a state of total separation. In short, the question that arises from the foregoing for either Edgard Morin or Alain Badiou is the following: What is the nature of the relationship between science, which aims at objectivity and efficiency, and research, which aims at values and the attainment of meaning? Is it based on repulsion and therefore struggle, or on concord and harmony? Is the interaction actually observed or is it just a request, or a task to be accomplished in the future? The next question is: Is it achievable in the modern and post-modern situation? How can we move beyond this crisis relationship in today's world?

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