A Survey on Computer Ethics (w.r.t. Artificial Intelligence, Robot Weaponry, Fuzzy Systems, Autonomous Vehicles)

Naresh Kshetri

Abstract: ***Computer Ethics study has reached a point where Artificial Intelligence, Robot, Fuzzy Systems, Autonomous Vehicles and Autonomous Weapon Systems ethics are implemented in order to make a machine work without intervening and harming others. This survey presents many previous works in this field of computer ethics with respect to artificial intelligence, robot weaponry, fuzzy systems and autonomous vehicles. The paper discusses the different ethics and scenarios up through the current technological advancements and summarizes the advantages and disadvantages of the different ethics and needs of morality. It is observed that all ethics are equally important today, but human control and responsibility matters. Most recent technology can be implemented or improved by careful observation and involvement of organizations like the United Nations, International Committee for Robot Arms Control, Geneva Conventions and so on.***

Keywords: ***Artificial Intelligence, Autonomous Vehicles, Autonomous Weapon Systems, Computer Ethics, Fuzzy Systems, Robot Weaponry.***

I. INTRODUCTION

Artificial Intelligence is the capacity or the ability of a computer or a robot controlled by a computer to do tasks or works that are usually done by humans because they require human intelligence i.e., one of the capability of humans and judge by the understanding of problem. We know that several military robots have been deployed by various armies around the world, robot weaponry is the robotic weapons i.e., remote-controlled mobile robots designed for various military applications like rescue, attacks, transport, and search. Fuzzy system is a logic / method of reasoning that resembles human reasoning, which intimates way of decision making with all intermediate possibilities. Autonomous vehicles are a fully automated driving system in context of external conditions using various in-vehicle technologies and sensors that has adaptive cruise control to navigation technology and lasers too in order to reduce traffic congestion, travel time, accidents and costs. Computers are used rapidly from playing with children, teaching and learning to hunting down terrorists. Computer ethics today *(the definition seems to be shifting slightly)* become AI ethics, Robot / Machine ethics, Fuzzy and Autonomous Systems ethics and so on. Respecting others' privacy, copyrights, licenses, intellectual property and identifying the user accurately seems of second importance when it now comes to Robot wars and terrorists' attacks. As technology progresses and advances, it gives human beings greater command and control over the world that comes with increased responsibility and supervision. This advancement is also true for military technologies that influence human and environmental welfare. The campaign to stop "killer robots" by the International Committee for Robot Arms Control (ICRAC) seems to be growing with wider involvement today. The international prohibition on autonomous weapon systems (AWS) argues in favor based on human rights and humanitarian principles that are not only moral but also legal ones. As we all know that need is the creator of invention. Treaties such as 1949 Geneva Conventions and international customary law point to implicit requirements in the principles of distinction, proportionality, and military necessity. The broad range of AWS, automated technologies including autonomous vehicles imply a specific duty for human rights to life and due process, and the limited conditions under which they can be overridden. It is beneficial and urgent to establish international norms and express this with a treaty before AWS begins to appear and pose a serious threat to the basic rights of individuals. AWS are not common and have different understanding in different states and so do the legal rules in use of the AWS including human agency and control. Currently no rule of international law specifically prohibits or restricts the use of autonomy in weapon systems. But countries and states (in the name of protecting humans and infrastructure) are secretly deploying AWS and Robot technology to attack each other and to gather data and information. The general agreement among Certain Conventional Weapons (CCW) States Parties only reflects use of force through AWS, must strictly comply with international law and in terms of armed conflict, with IHL. Geneva Conventions impose use of an AWS as the "new weapon or warfare" in all circumstances be prohibited under international law.

II. LITERATURE SURVEY

In [1], Peter Asaro, philosopher of technology and also Co-Founder and Vice-Chair of the ICRAC states that, we should respect human morality, dignity, justice, law and prohibit the AWS. In choosing the weapons and tactics we engage in armed conflict; we are also making the moral choice about the world we are living in the context of ethics and morality. Prof. Asaro focuses on the discussions by the international committee on the formation of a treaty to ban AWS. Such a ban will help to focus the development of future military technologies away from these so-called ethical systems and towards the development of systems that can actually improve the ethical conduct of humans in armed conflicts.

Manuscript received on February 19, 2021.
Revised Manuscript received on February 23, 2021.
Manuscript published on February 28, 2021.
* Correspondence Author
Naresh Kshetri*, Department of Computer Science, University of Missouri – St. Louis, Missouri, USA. Email: nkbgy@umsystem.edu

In [2], Ernest et al. introduced ALPHA, an AI that controls flights of Unmanned Combat Aerial Vehicle (UCAV) in aerial combat missions within an extreme-fidelity simulation environment in 2016. The researchers at University of Cincinnati (Nicholas Ernest, a University of Cincinnati alum and founder of Psibernetix company) have designed such an AI pilot that beats US Air Force colonel in multiple trials. The current version of ALPHA (i.e., AI fighter pilot) is already a deadly opponent to face. ALPHA has the ability to continue to seek positional dominance (act as wingmen for planes) even during evasive maneuvers.

In [3], The US Army is using autonomous car tech on self-driving cars. This article on "inverse.com" refers that the ground wars will be autonomous and whether robots will kill without human involvement. The fight between the army and terrorists (like Islamic States groups and many others) will soon include more remote-controlled vehicles (robo-tanks) and less people. Dr. Robert Sadowski, the chief roboticist at US Army Tank Automotive Research, Development and Engineering Center (TARDEC) says, "That reality is not here yet but might not be far".

In [4], Although countries around the world are on the side of banning AV and AWS but they are preparing secretly and rapidly at their end. Russia's new Vikhr unmanned combat ground vehicle (UCGV) was displayed at the Army 2016 military technological forum to gather analysis with the tank giving Moscow a first-class warrior edge while keeping the nation's defense troops out of harm's way across professional transformation. The unmanned tank is based on the BMP-3 infantry fighting vehicle (IFV) with a name that translates to "Whirlwind" highlighting the hopes that the country has that their new unknown gun will be a "revolutionary man" in the battleground. In [5], at the August 2018 meeting of the group of governmental experts (GGE) on lethal AWS, the delegations of Austria, Brazil and Chile jointly submitted a proposal for directive to "set out an authorized binding tool to promise meaningful human control (MHC) over faultfinding functions in AWS". "All firearm means, as well as independent ones, should stand underneath MHC". This MHC principle expresses a point of enormous consensus in the AWS discussion, and was promptly met with interest by a notable number of nations participating in discussions at CCW meetings. In [6], Maya Brehm, researcher at the Geneva Academy of International Humanitarian Law (IHL) and Human Rights (HR), focuses human agents to safeguard human dignity and human rights by exercising the necessary control and operations, involving in target processing, actively engaged in every instance of force application, and exercise human control over every individual attack to enable them to recognize changing circumstances and adjust operations in timely manner. The requirement to place strict limitations on use of an AWS follows not only to safeguard life but more to evaluate the legality of security measures, including those with freedom movement and security / liberty of person.

III. ETHICS W.R.T. AI, RW, FS, AV

Ethics today comprises several factors and disciplines (human ethics to robot ethics). One of the ethical parts here we are discussing is the machine ethics or computer ethics in the context of artificial intelligence (AI ethics), robot systems (Robotics), fuzzy logic / systems and autonomous vehicles (autonomous weapon systems). Ethical and legal arguments advanced against autonomy in weapon systems go a long way (from 1949 Geneva Conventions to today's International Committee for Robot Arms Control that reports to the Certain Conventional Weapons Group of Governmental Experts) towards shaping the content of meaningful human control (MHC). There has been growing debate about the ethical, legal and security implications of AWS in recent years. Such weapons (AV / AWS) after activation, need no further human control or intervention for detecting, selecting and attacking the targets. Like everything went online in this pandemic era (for e.g., small businesses, computer labs, and weekly meetings), so do the battlefields too (hence the use of ALPHA and robo-tanks are in high demand). Although several organizations like ICRAC, IHL and UN have a deep concern over use and deployment of such weapons, states are saying "use of them" as a secondary help for humans like digital assistants and data tracking. There can be a day in the future when this "robo-tanks / AWS" will attack the target without human involvement and without human control. Ethics should be deployed as a phase-wise that are needed to secure people, nations, networks and systems [7]. There should be more ethical involvement to both parties before involving in direct attacks and explosions of systems, networks and physical infrastructures.

A. Artificial Intelligence (AI)

There are a number of obstacles (and hindrances) to a system or a machine being an effective AI that we see in case of a pilot fighter (ALPHA). Regarding implementation, the ability to verify and validate (authentication) the AI is crucial. Safety specifications and operating doctrines need to be guaranteed to be followed via formal methods (beside not matching AI's training data that leads to system exploitation). The idea of AI fighter pilots is not to replace humans but to provide the digital assistant to human pilots with real-time advice and suggestions (is an excellent idea which respects other humans and humanity). Leading researchers in the field of AI and robotics, believe that AI has gained the point where the deployment of AWS is practically feasible. Although AI and the recent advancements in technology may bring several benefits to human beings, it also introduces a "new dimension of threat" and global concern for all humankind [8].

B. Robot Weaponry (RW)

The expanding observation to the issue of personal command come up from diplomatic talks that have been going on in Geneva within the GGE on lethal AWS established by the Nation Parties to the Convention on Conventional Weapons (CCW). There should be human control, supervision, and responsibility and it is thus immoral to kill without the involvement of human reason, judgement, and compassion, and it should be illegal. We must also accept that the means by which we authorize change in the world, or withstand change, thereby become an aspect of that globe.

There is a job upon individuals and states in peacetime, as well as combatants, military organizations, and states in armed dispute situations, not to delegate to an instrument or automated process the authority or capability to commence the use of lethal force independently of person determinations of its moral and legal legitimacy in each and every case.

C. Fuzzy Systems (FS)

Fuzzy systems are basic ideas to represent and process linguistic information, with methods to deal with incorrectness and unpredictability. In many difficulties, fuzzy control has been proved effective. Fuzzy is strong, adaptable, peak speed, computationally efficient, and provides an outstanding framework to integrate formal models for the purposes of consent and affirmation. However, to date, it suffers heavily from the increasing problem scope. Maximum work has been done to expand or adapt methodologies that are proficient of automatically recognizing a fuzzy system from numerical input. An ordinary fuzzy-based system would be exceptionally computational intractable for a difficulty such as air-to-air combat.

D. Autonomous Vehicles (AV / AWS)

In order to keep many people alive, autonomous vehicles (including remote controlled robot-tanks) and AWS which has the ability to operate in harsh conditions, without paved roads and enemy under fire. The use of such vehicles (without a driver) on the battlefield can cause serious harm to other parties (whether they may be involved in battle or not). Hence, the use of AWS and robot-tanks (also the four legs robots) should be under the supervision of humans and can be prioritized in case of natural disasters and emergency help. How can battlefield casualties be minimized, if every party in the battlefield uses and involves AV and AWS? This type of involvement can cause unexpected / serious damages and can cost more lives of the non-involved people. Number of states and cyber power houses are actively engaged in research and development (R&D) of AWS due to the ongoing cyber threats, growing data, to improve performance in communications-denied environments and to reduce exposure of state security forces.

IV. FUTURE WORK

The presented survey examines the computer ethics on basis of four pillars only (Artificial Intelligence, Robot Weaponry, Fuzzy Systems, Autonomous Vehicles / AWS), but it can be expanded on basis of several horizons like Software Engineering (SE) ethics, Paramedic (medical) ethics, Automation ethics, Web ethics, IT ethics, Cyber ethics (since we cannot deny that online crime has a tremendous rise after COVID-19), and so on. Autonomous robots, AV, AWS and unmanned vehicles (UV) can be used for "constructive" purposes rather than "destructive and attacks". Remote driven vehicles and weapons fired remotely should not be involved in any kind of wars between both parties. ICRAC should clearly supervise, enforce and define policies, objectives, nature of use, and monitor the AV and AWS. The UN and various social organizations can initiate the middle-manway between terrorist organizations and countries for talks, peace and ending warfare or war fields. Many "ethical questions" need resolution while using Robot weaponry, Fuzzy systems and Autonomous vehicles.

V. CONCLUSION

Human Rights Watch, IHL and others have called for a preemptive ban on autonomous weapons systems or "killer robots" (should encourage more debate concerning ethics). Although, Pentagon (USA) doesn't support it, the Department of Defense (DoD) directive requires that human beings make the "final targeting decision" (ethically acceptable application systems should be practiced). As Dr. Sadowski said - If an unmanned tank can be driven and fired remotely, that could give US troops a "greater protective bubble" (key ethical challenge to explore technology and application area). Supporter and non-supporter of "robot army" both have their legal agenda, but unless they can be utilized for "constructive works and emergency" help like natural disasters (rather than in wars, attacks and weapons). We can expect more social and ethical challenges from robotics and AWS sooner or later because the robotics industry (including AI technology and use of robo-tanks) is emerging the same way as the computer (as well as IT) business did earlier.

ACKNOWLEDGMENT

I would like to thank my PhD supervisor Prof. Dr. Keith W. Miller (Orthwein Endowed Professor for Lifelong Learning in the Sciences, Department of Computer Science, University of Missouri – St. Louis) for providing the helpful references, research idea and materials related for the "survey paper" topic and I am also thankful to my PhD committee member, Dr. Sharlee Climer (Assistant Professor, Department of Computer Science, University of Missouri – St. Louis) for providing her valuable feedback, time, suggestions and positive motivation while writing this paper.

REFERENCES

1. P. Asaro – On banning autonomous weapon systems: human rights, automation, and the dehumanization of lethal decision-making, Volume 94 Number 886 Summer 2012
2. Ernest at al., Genetic Fuzzy based AI for Unmanned Combat Aerial Vehicle Control in Simulated Air Combat Missions, Journal of Defense Management, 2016, 6:1, ISSN: 2167-0374
3. The Ground War will be autonomous, https://www.inverse.com/article/22530-army-drone-tanks, It's only a matter of time, and whether robots will kill without human oversight
4. Sputnik news, Russia readies futuristic autonomous combat vehicle, tiny drone tank for battle, https://sputniknews.com/military/201609111045200649-russia-vikhr-autonomous-tank-military/
5. What makes human control over weapons systems "meaningful", report to the CCW GGE, August 2019, ICRAC, https://www.icrac.net/wp-content/uploads/2019/08/Amoroso-Tamburrini_Human-Control_ICRAC-WP4.pdf
6. Maya Brehm, Defending the boundary, Geneva Academy of IHL and HR, Constraints and requirements on the use of AWS under International humanitarian law (IHL) and Human rights law (HRL), May 2017, Academy Briefing N9

7. Kshetri N., Miller K., A Study on Cyber-Defense Ethics and Initiatives by Governments of Under Developing Nations: A Study of Selected Countries, The International Journal of Analytical and Experimental Modal Analysis, ISSN No: 0886-9367, Volume XIII, Issue I, January/2021, Page 977-986
8. Mallik A., Role of Technology in International Affairs, Institute for Defense Studies & Analysis, New Delhi, https://idsa.in/system/files/book/book_role-technology-international.pdf

AUTHORS PROFILE

Naresh Kshetri is currently a PhD student with the Department of Computer Science at University of Missouri – St. Louis (UMSL), Missouri, USA. He will graduate with a PhD in Computer Science in May 2022, where he is planning to continue as a postdoc scholar and join the university as an assistant professor of computer science. He received MS (Cybersecurity) from Webster University, Saint Louis, Missouri, USA (2017) and Master of Computer Applications (MCA) from University of Allahabad, India (2014). He is currently working as a graduate teaching / research assistant for the computer science department, UMSL. His current research interests include online crime and computer ethics.