Incorporating Artificial Intelligence in Defence Sector

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Abstract: Artificial Intelligence (AI) has advanced rapidly in recent years and this has resulted in a wide range of applications, on both Civil and Military. It's a fact that, Artificial Intelligence (AI) has the ability to do all most all of the jobs by themself. Artificial Intelligence is a relatively new branch to be implemented in the Military Sector. This has lead research agencies around the world to develop and deploy AI - driven systems in the Military Sector. The Ultimate goal of this, to implement Artificial Intelligence (AI) into as many military systems as possible, this can help in to control and communicate to various systems with precision. In this paper, We will provide a short introduction to Artificial Intelligence (AI) and Some of the Application where this can be used, which will lead to a change in the future of the Warfare.

Keywords: Artificial Intelligence (AI), AI applications, Army tanks, Drones, Missiles.

I. INTRODUCTION

Artificial Intelligence (AI) is a rapidly growing field of technology with potentially significant implications for national security. Nations are developing AI application for range of military functions. AI research is underway in the fields of intelligence collection and analysis, logistics, cyber operations, information operations, command and control, and in a variety of semiautonomous and autonomous vehicles. Already, AI has been incorporated into military operations in Iraq and Syria. Congressional action has the potential to shape the technology's development further, with budgetary and legislative decisions influencing the growth of military applications as well as the pace of their adoption. AI technologies present unique challenges for military integration, particularly because the bulk of AI development is happening in the commercial sector. Although AI is not unique in this regard, the defense acquisition process may need to be adapted for acquiring emerging technologies like AI. In addition, many commercial AI applications must undergo significant modification prior to being functional for the military. A number of cultural issues also challenge AI acquisition, as some commercial AI companies are averse to partnering with DOD due to ethical concerns, and even within the department, there can be resistance to incorporating AI technology into existing weapons systems and processes. Potential international rivals in the AI market are creating pressure for the United States to compete for innovative military AI applications. China is a leading competitor in this regard, releasing a plan in 2017 to capture the global lead in AI development by 2030. Currently, China is primarily focused on using AI to make faster and more well-informed decisions, as well as on developing a variety of autonomous military vehicles. Russia is also active in military AI development, with a primary focus on robotics. Although AI has the potential to impart a number of advantages in the military context, it may also introduce distinct challenges. AI technology could, for example, facilitate autonomous operations, lead to more informed military decision making, and increase the speed and scale of military action. However, it may also be unpredictable or vulnerable to unique forms of manipulation. As a result of these factors, analysts hold a broad range of opinions on how influential AI will be in future combat operations. While a small number of analysts believe that the technology will have minimal impact, most believe that AI will have at least an evolutionary, if not revolutionary effect.

II. ARTIFICIAL INTELLIGENCE (AI)

The design and implementation of systems that possess, reason with, and acquire knowledge is arguably the ultimate intellectual challenge. So why then, when we open almost any book on Artificial Intelligence, does it open with a painstaking, almost defensive, definition of what AI is and what AI is not? Such caution is understandable, for during its short history AI has been dogged by periods of scientific over-optimism followed by disappointment, echoed by similar cycles of media hype' and disenchantment. It is a young and developing discipline: one which has already achieved much, but — if we believe the first sentence — has much to achieve. It is a subject too which raises people's inherent fear of the subjugation of their own intellect by machines, machines lacking in human frailty. Perhaps little wonder that AI is often misunderstood and its current capabilities at once over-estimated by some and berated by others. As with anything,

the nature of AI is best understood by looking at the subject's achievements; but, for what they are worth, here are two definitions from opposite ends of a spectrum of 'one liner's':

- AI is the attempt to build computational models of cognitive processes.
- AI is about generating representations and procedures that allow machines to perform tasks that would be considered intelligent if performed by a human.

The first points both to AI's lofty goal and to its roots in psychology, philosophy and linguistics. Artificial intelligence complements the traditional perspectives on intelligence gained from those subjects because computer models force clarity of thought and precision, and provide generally useful, patient, but uncompromising experimental punch-bags. Creating AI allows us to learn about "real" intelligence. The second one-liner is much more practically based and indicates why engineers should be interested in AI. If machines are able to act in an human-like intelligent manner, they will be more useful. The lofty goal of engineering, after all, is to put natural science usefully to work for mankind. Another one liner which appeals particularly to those involved in understanding perception is that

- AI is the link between sensing of the world, perception of the world, and intelligent action in the world.
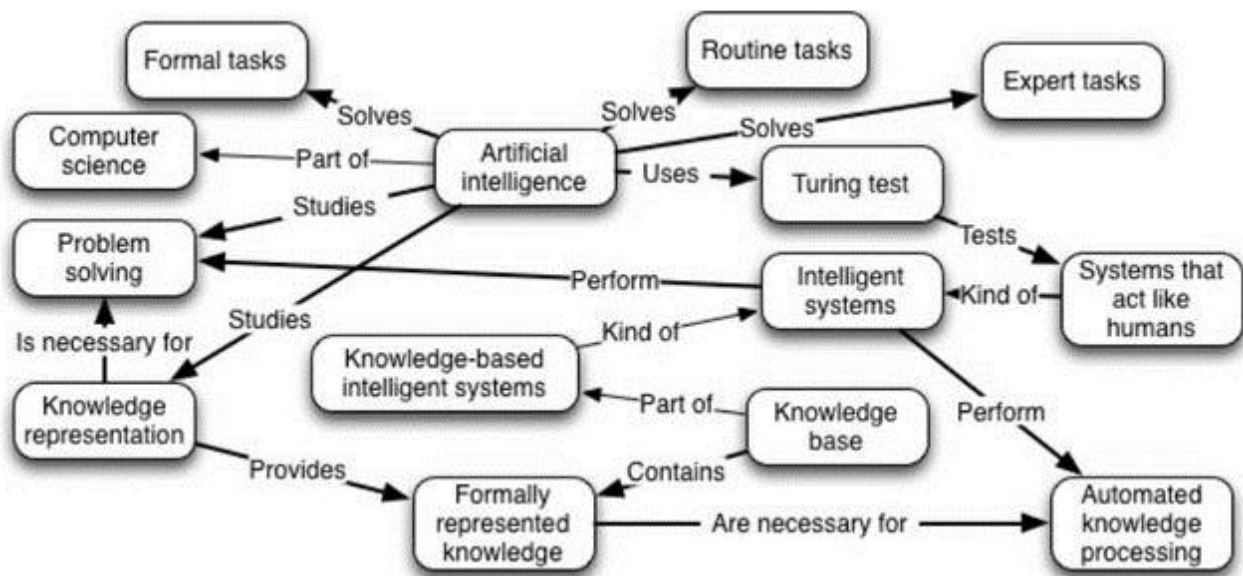

Fig. 1 Concept Map about Artificial Intelligence

III. ARTIFICIAL INTELLIGENCE IN DEFENCE

Artificial Intelligence (AI) is turning into a basic piece of present-day fighting. Contrasted and customary frameworks, military frameworks furnished with AI are equipped for taking care of bigger volumes of information all the more productively. Moreover, AI improves self-control, self-regulation, and self-actuation of combat systems due to its inherent computing and decision-making capabilities. Artificial Intelligence (AI) is conveyed in pretty much every military application, and expanded innovative work financing from military examination offices to grow new and propelled uses of man-made reasoning is anticipated to drive the expanded selection of AI-driven frameworks in the military area.

A. AI Controlled Military Drones

Autonomous flying machines or drones use the computer vision technology to hover in the air avoiding the objects to keep moving on the right path. And now artificial intelligence (AI) is used in drones to make this flying machine smarter. A self-flying drone is built with various in-built with computerized programming and using the technology like propulsion and navigation systems, GPS, sensors and cameras, programmable controllers as well as equipment for automated flights. Computer vision is playing a key role in detecting the various types of objects while flying in mid-air. A high-performance on-board image processing and a drone neural network are used for object detection, classification, and tracking while flying into the air. The neural network in drones helps to detect the various types of objects like vehicles, foothills, buildings, trees, objects on or near the surface of the water, as well as diverse terrain. Drone used to capture the data using the camera and sensors, which is later analysed to extract useful information to utilize for a specific purpose. This process is known as computer vision and related to the automatic extraction, analysis and understanding of meaningful information through one or more images processed through computer vision technology.

B. AI Controlled Missiles

Traditional types of ballistic missiles are being superseded by more advanced systems. They include more maneuverable and precision-guided ballistic missiles, low-flying cruise missiles and hyper-sonic weapons that can travel at speeds of Mach 5 or faster. AI can help the Defence Department as it tries to tackle the problem. AI could enable the military to accelerate response times and reduce the probability of human error. As faster and more maneuverable threats emerge, the missile defence mission becomes harder. Regardless of how much AI is incorporated into a system, the military must ensure that the fire control loop is properly engineered. As the threat environment becomes more complex with enemies fielding more maneuverable systems and elaborate countermeasures, a rudimentary battle management system will not be sufficient.
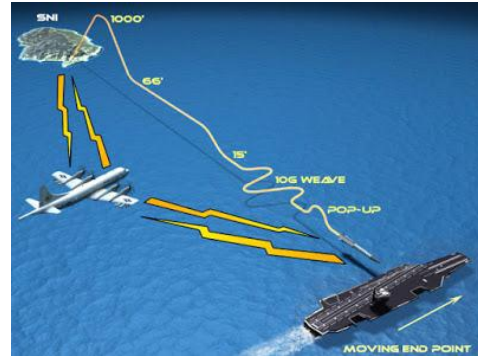

Fig. 2 Heron – Indian UAV

Fig. 3 Battlespace AI

C. AI Controlled Army Tanks

Its the technology that would allow a ground combat vehicle like a tank to automatically detect, target, and engage enemy combatants. The Advanced Targeting and Lethality Automated System (ATLAS) would theoretically give a tank the ability to do everything necessary to take down a target except pull the trigger — a human operator will still need to actually fire, according to Quartz. ATLAS will use an algorithm to detect and identify targets and "parts of the fire control process" will be automated, explains the Army's call for white papers. This means a person will always be the one actually making the decision to fire. The system would ideally maximize the amount of time for human response and allow the human operator to make a decision and then once the human makes a decision, to fire accurately. This can reduce the possibility of civilian casualties, fratricide, and other unintended consequences. It will also keep soldiers safer on the battlefield.

D. AI importance in Vehicle Maintenance

As a military maintains numerous vehicles, those vehicles must be maintained when damaged in combat by the environment or through normal wear and tear. Given the immense number of craft that requires maintenance, any method that increases the efficiency to repair those craft would likely be welcomed. Artificial intelligence may have the capability to aid in the repair of vehicle fleets. Lockheed Martin collaborated with NGRAIN (Canada) Corporation in big data analytic projects to improve the maintenance efficiency for the F-35 aircraft's used by the US Air Force. The project streamlined the capture of damage data, reduce cost and enhance pilot safety through efficient maintenance operations. According to a case study published by the Industrial Internet Consortium, Lockheed Martin currently produces the F-35 Lightning II aircraft and also offers training, prognostics, and maintenance support services for the aircraft. In order to provide efficient maintenance, Lockheed Martin needed a way to accurately assess any damage to the aircraft hull and air frame due to combat or environmental hazards. Traditionally, maintenance technicians assess air frame damage areas by placing a transparent film on affected areas and marking reference points on the film. The line drawings from the film are then cross-referenced with repair data history in a spreadsheet. Lockheed Martin maintenance engineers were finding this process tedious and time consuming. Lockheed Martin developed the Autonomic Logistics Information Systems (ALIS) software suite for use with the F-35 and needed a way for its engineers to visualize damage reports in 3D with a high level of accuracy. The defense contractor used the Canadian AI company NGRAIN's Software Development Kit (SDK) to generate a 3D virtual model of the aircraft.

E. AI Controlled Alerts and Reports

One facet of improving the logistics of an organization is improving the speed at which decisions are made and executed on. Conversational interfaces have the capability to increase the effectiveness and speed of an officer's decisions. Conversational interfaces allow officers to request a diverse variety of information related to the system it is installed on and have it accurately displayed before them or broadcast to them without the need for human interaction and human error. For example, the commander on the bridge of a battle cruiser while in battle could instruct the conversational

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interface, constantly listening for instructions, to immediately alert them when the ammunition of a specific battery reduces below 15%. Knowing precisely when that threshold is achieved could allow for the commander to give orders to replenish the ordinance of that battery at a strategically optimal time. Conversational Interfaces for military use have additional issues than for use with the public. They need to work with a high degree of certainty or else the drawbacks of error or inaccuracy could cost the lives of one or many operators. A system that does not properly deliver a scheduled report to a leader while in battle may cause the leader and the vessel they command to be caught severely off guard and put into a potentially dangerous scenario.

IV.   PROS AND CONS

A.   Advantages

Faster decisions: Using artificial intelligence alongside cognitive technologies can help make faster decisions and carry out actions quicker.

Avoid risks on humans: With artificial intelligence, you can arguably lessen the risks you expose humans to in the name of research. Take, for example, space exploration and the Mars rover, known as Curiosity. It can travel across the landscape of Mars, exploring it and determining the best paths to take, while learning to think for it. Using artificial intelligence in this manner could potentially lead to massive benefits in areas such as demand forecasting, medical diagnosis and oil exploration.

Dealing with mundane tasks: One massive advantage of artificial intelligence is its potential to complete mundane tasks through intricate automation that will increase productivity. Theoretically this can even remove "boring" tasks from humans and free them up to be increasingly creative.

Difficult Exploration: Artificial intelligence and the science of robotics can be put to use in mining and other fuel exploration processes. Not only that, these complex machines can be used for exploring the ocean floor and hence overcoming the human limitations. Due to the programming of the robots, they can perform more laborious and hard work with greater responsibility. They do not wear out easily.

B.   Disadvantages:

Conversational Interfaces for military use have additional issues than for use with the public, They need to work with a high degree of certainty or else the drawbacks of errors or inaccuracy could cost the lives of one or many operators, A system that does not properly deliver a scheduled report to a leader while in battle may cause the leader and the vessel they command to be caught severely off guard and put into a potentially dangerous scenario. A rifle is not prohibited under international law, but using it to shoot civilians would constitute an unlawful use, some weapons (e.g., biological weapons) are unlawful peruse, even when used only against combatants, so, some autonomous weapons systems might contravene international law. Human-out-of-the-loop weapons can select targets without any human input or interaction, This kind of autonomous weapons system is the source of much concern about killing machines, fully autonomous weapons would undermine other, non-legal protections for civilians", They are emotionless robots that kill and instill fear among the population without having to worry about soldiers who might empathize with their victims (who might be neighbors, acquaintances, or even family members).

V. CONCLUSION

AI is at the center of a replacement enterprise to create process models of intelligence and to resolve advanced issues in military that isn't possible by human. The main assumption is that intelligence (human or otherwise) are often diagrammatic in terms of image structures and symbolic operations which may be programmed in a laptop or computer. However AI researchers needn't wait for the conclusion there to dialogue, nor for the theoretical laptop/computer that would model all of human intelligence. Aspects of intelligent behaviour, reminiscent of determination issues, making inferences, learning, and understanding language, have already been coded as computer programs, and at intervals terribly restricted domains, AI programs will surpass human specialists. Currently the good challenge of AI is to seek out ways that of representing the reasonable knowledge and knowledge that alter people to hold out everyday activities reminiscent of holding a wide-ranging language, or finding their approach on a busy street. Standard digital computer is also capable of running such programs, or we have a tendency to may have to develop new machines that may support the complexity of human thought. Weapons with computer science are one among the foremost strongest weapon in military, which may establish the targets itself and may build a call weather to destroy or not.

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