

Will the human disappear in future warfare?

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Introduction

First of all, I want to thank the organizers of this conference for the invitation, to address you on the human role in future warfare, especially related to the development in military robotics.

ⁱ The structure of my lecture is as follows. I'll start making some short remarks on technology and warfare. I'll continue with paying attention to robotics and the different degrees of autonomy. Then I'll discuss some questions on responsibility and ethics, and I'll conclude with some final remarks.

Technology and warfare

As we all know in this military environment, technology affects and changes military organizations in many ways. Military historian Martin van Creveld has argued that 'war is completely permeated by technology and governed by it'. ⁱⁱ Here is how Lieutenant General Robert Wagner, Deputy Commander United States Joint Forces Command, spoke of the substantial impact of technology on warfare in 2004:

"We are now able to create decision superiority that is enabled by networked systems, new sensors and command and control capabilities that are producing unprecedented near real-time situational awareness, increased information availability; and an ability to deliver precision munitions throughout the breadth and depth of the battle space ... these capabilities of the future networked force will leverage information dominance, speed and precision, and result in decision superiority". ⁱⁱⁱ

However, General McChrystal was in his Initial Assessment as COMISAF, more or less modifying those remarks, just five years later:

"Our strategy cannot be focused on seizing terrain or destroying insurgent forces; our objective must be the population. In the struggle to gain the support of the people, every action we take must enable this effort ... Protecting the population is more than preventing insurgent violence and intimidation. It also means that [US and allied forces] can no longer ignore or tacitly accept abuse of power, corruption or marginalisation ... Gaining their support will require a better understanding of the people's choices and needs ... A foreign army alone cannot beat an insurgency; the insurgency in Afghanistan requires an Afghan solution". ^{iv}

Gone are references to speed and precision. Absent is any suggestion that technology can determine a war's outcome. The army no longer seeks battle in order to destroy the enemy; it pursues uplift, hoping to win hearts and minds. The people are the instrument of decision. The role of soldiers is not to determine but to facilitate an outcome.

Robotics

After those remarks which put in perspective the relevance of technology, I'll focus now on the topic of military robotics. In the last decade we have entered the era of remote controlled

military technology. The deployment of those military robots or unmanned vehicles has increased rapidly. Most of these robots are unarmed, have no brains to speak of and are still dependent on human operators at a safe distance, for carrying out their functions. Those functions are mainly reconnaissance, explosive ordnance disposal, logistics (mainly warehouse robots) and base security.

An important aim of the deployment of these robots is to decrease the number of soldiers killed on the battlefield; to gain tactical and operational superiority; and to reduce emotional and traumatic stress among soldiers. Another advantage is that robots also do not get tired, or need to be fed or counseled.

Since some years, the deployment of armed military robots has also become a new instrument of warfare. Targeted killings of insurgents from Al Qaeda and the Taliban with killer robots (unmanned combat aerial vehicles) is a new U.S. focus in Afghanistan and Pakistan. One of the most widely used unmanned combat aerial vehicle (UCAVs) is the *Predator*. This unmanned airplane can remain airborne for 24 hours. The *Predator* drones can fire Hellfire missiles and are flown by pilots located at a military base in the Nevada desert, thousands of miles away from the battlefield. On top of this, its successor the *Reaper*, can carry explosive devices, *Hellfire* missiles, or laser directed bombs. It uses day-and-night cameras to navigate through a sheet of clouds.

The first unmanned armed ground vehicle, SWORDS (Special Weapons Observation Reconnaissance Detection System), was introduced on the battlefield in Iraq in 2007 for patrolling the streets of Baghdad. It can be equipped with machine guns, grenade launchers, or anti-tank rocket launchers and can hit 'bulls eyes' at 2.000 m. Its successor the MAARS (Modular Advanced Armed Robotic System), is already on the market. The SWORDS and the MAARS are both able to autonomously navigate towards specific targets through their global positioning systems, but the firing of weapons must be done by a human operator at a safe distance.

Autonomy

Luckily in my opinion, killer robots in the sense of lethal autonomous military robots still do not exist. Humans remain in the loop, at least wherever the use of force is involved. It is clear why some politicians and military are enthusiastic about future automatic robotics. War is expensive and bloody and it produces casualties. Let me quote a part of the introduction of a US Navy sponsored study on autonomous military robotics:

“Imagine the face of warfare with autonomous robotics: Instead of our soldiers returning home in flag-draped caskets to heartbroken families, autonomous robots – mobile machines that can make decisions, such as to fire upon a target, without human intervention – can replace the human soldier in an increasing range of dangerous missions: from tunnelling through dark caves in search of terrorists, to securing urban streets rife with sniper fire, to patrolling the skies and waterways where there is little cover from attacks, to clearing roads, and seas of improved explosive devices (IEDs), to surveying damage from biochemical weapons, to guarding borders and buildings, to controlling potentially-hostile crowds, and even as the infantry frontlines”.^v

It's not surprising that proponents of military robots find that when robots are to be optimally employed, they must be allowed to make their own decisions. The increasing deployment of

armed unmanned aerial vehicles is a new step on this dangerous path. The current revolution in military robotics and Artificial Intelligence (AI) goes hand in hand and will in part be enabled by the nanotechnology revolution.

Degrees of autonomy

From a technical perspective, autonomy of a machine just means its capability for unsupervised operation. An autonomous machine is a machine capable of carrying out a certain function on its own without the need of a human operator.

Three general types or degrees of machine autonomy can be distinguished: pre-programmed autonomy, supervised autonomy and complete autonomy.^{vi}

1. In the case of pre-programmed autonomy a machine carries out a particular function by following instructions that have been inserted into the machine by a designer or user. Pre-programmed autonomy applies to different classes of weapons such as mines, smart bombs and cruise missiles. In addition there is also the special case of weapons with structured control, which are capable of responding to a greater range of stimuli with different behaviors. An example of such a weapon is the *Phalanx* close-in weapons system. It's a computer-controlled gun installed on US warships. This gun can, once activated, autonomously select and engage targets within the narrow parameters of its programming.

2. Supervised autonomy means that a robot, is capable of carrying out most of its functions autonomously without having to rely exclusively on pre-programmed behaviors. In other words, the possible variance in behaviors is far greater than the case of pre-programmed autonomy, which allows the robot to find its own way and to do many other things without the need of continuous human intervention. More complex functions such as targeting and weapons release would normally still have to be controlled by a human operator, who is cognitively more capable of such decisions. Robots with limited autonomy are also less capable of dealing with situations not foreseen by their programmers. They therefore need some human supervision. Exceptional circumstances or situations are simply flagged to a human operator, who then decides to proceed. Supervised autonomy represents the current state of the art in military robotics. A growing number of military robotic systems fall into this category, as the *Predator* and *Reaper*.

3. The goal for many robotocists, however, is to build completely autonomous systems, where humans no longer have to closely watch the performance of robots. Killer robots with complete autonomy only exist at this moment as experimental robots and are built entirely for research purposes. Completely autonomous robots are able to operate by themselves without the need for any human input. They are often able to learn by themselves and to modify their behavior accordingly. At this moment such robots are simply not intelligent enough to be useful for humans.

The ethical military robot

However, the United States Air Force has planned for the long term a fully autonomous capability.^{vii} Weapons developers and high-ranking officers feel confident that the technology for truly autonomous weapons will in the medium term (after 2025) be available. The U.S. Army is funding a project of Ron Arkin of the Georgia Institute of Technology, to equip robot soldiers with a conscience to give them the ability to make ethical decisions.

Arkin argues that while ‘right’ behavior has been codified or mandated, it does not follow that all human soldiers will behave in a morally acceptable manner on the battlefield, particularly when they come into contact with the enemy. He refers to a report from the U.S. Surgeon General’s Office in 2006, which reported that only 47% of U.S. Soldiers and 38% of U.S. Marines agreed that noncombatants should be treated with dignity and respect. Well over a third of U.S. soldiers and U.S. Marines reported torture should be allowed, whether to save the life of a fellow Soldier or U.S. Marine or to obtain important information about insurgents.

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Arkin claims that the use of autonomous systems would lead to an increase in ethical behavior on the battlefield rather than a decrease. He is developing a set of rules of engagement for battlefield robots to ensure that they use lethal force in a way that follows the rules of ethics.^{ix} Among the advantages of autonomous robots he mentions, that they need not to protect themselves and can be used in a self-sacrificing way when appropriate; they can be designed without emotions that cloud their judgment or result in anger and frustration with ongoing battlefield events; they will eventually possess a broad range of sensors that will give them greater battlefield observation capabilities than humans currently possess; and they can integrate more information from more sources far faster before responding with lethal force than a human possibly could in real-time. Arkin also states that when working in a team of combined human soldiers and autonomous systems, they have the potential capability of independently and objectively monitoring ethical behavior in the battlefield by all parties and reporting violations that might be observed. The presence alone might possibly lead to a reduction in human ethical infractions.

As part of his research project Arkin has begun to translate the laws of armed conflict and the customs of war into a logical structure that can be handled by a software program. The key elements of his program are an ‘Ethical Governor’, which suppresses unethical lethal behavior, and a ‘Responsible Adviser’, which allows the attribution of responsibility for any action of the robot. The Ethical Governor makes sure that any weapons use is in accordance with international law, the rules of engagement and broader ethical principles. The Responsible Adviser advises in advance of the mission, the operator(s) and commander(s) of their ethical responsibilities should the lethal autonomous system be deployed for a specific battlefield situation.^x The ethical programming also tracks any commands by humans and any possible overrides. This would make it possible to determine who would be responsible for any lethal robot behavior. So it would never be possible to blame the robot, as the robot’s decision-making process would always be completely transparent.

Responsibility of cubicle warriors

It’s not surprising that the use of armed military robots in general, raises issues with respect to responsibility. Who can be held reasonably responsible for an atrocity that would normally described as a war crime when it is caused by a military robot? Where does responsibility for injury and death ultimately lie: programmers, manufacturers, operators, commanders, civil servants or politicians?^{xi} Even if a system is fully autonomous, it does not mean that no humans are involved. Someone has to plan the operation, define the parameters, prescribe the rules of engagement, and deploy the system.

The question arises for instance to which extent human operators or so-called ‘cubicle warriors’, computer operators who remotely control armed military robots like the *Predator* and *Reaper*, may or may not reasonably be held responsible for war crimes.^{xii} Many

technological developments in the past, from the slingshot and cannon to the bomber, have increased the physical and emotional distance between soldiers and their enemies. For cubicle warriors the decision-making context differs strongly from that of soldiers in combat. Cubicle warriors operate from behind computer screens, far away from the battlefield. In his well-known book *Wired for War*, Peter Singer quotes a young pilot who operates drones over Iraq and Afghanistan, and describes how he experiences fighting from a cubicle: “It’s like a video game. It can get a little bloodthirsty. But it’s fucking cool”.^{xiii}

From this perspective, cubicle warriors could then be conditioned to dehumanize the enemy, to view them as sub-humans or non-humans, so that is easier to kill.^{xiv} It splits means and ends. Cubicle warriors lose sight of means and ethical implications and start concentrating only on the ends or outcomes. This moral disengagement from destructive and lethal actions reduces, or neutralizes, the soldier’s inhibition to kill. A cubicle warrior speaking with Peter Singer illustrates this: “The truth is, it wasn’t all I thought it was cracked up to. I mean I thought killing somebody would be this life-changing experience. And then I did it, and I was like ‘All right, whatever’. (...) Killing people is like squashing an ant. I mean you kill somebody and it’s like ‘All right, let’s go get some pizza’”.^{xv} So, it’s obvious there is the danger that this makes some cubicle warriors too relaxed, too unaffected by killing, and makes them do things that they would never do if they were there in person on the battlefield. The depersonalization of war caused by the dehumanizing of the enemy means that cubicle warriors cannot be held reasonably responsible for the decisions they make, since the ‘knowledge condition’ is not fulfilled.^{xvi}

Responsibility for autonomous armed robots

Technology is a double-edge sword with both benefits and risks, critics and advocates. Autonomous military robotics are no exception, no matter how compelling the case may be to pursue such research. The worries include not only where responsibility would fall in cases of unintended or unlawful harm, but also the possibility of serious malfunction and robots gone wild; capturing and hacking of military robots that are then unleashed against us; lowering the threshold for entering conflicts and wars, since fewer military lives would then be at stake; the effect of such robots on squad cohesion, for instance, if robots recorded and reported back the soldier’s every action; refusing an otherwise-legitimate order; and other possible harms.

Ethical issues

Automated killing is also a sensitive ethical issue and one that has been discussed ever since sea mines came into use in the nineteenth century. In ethical terms there would be no difference between a person killed by a mine or a person killed by an autonomous robot.^{xvii} In both cases the consequences are the same, as well as the fact that humans were only indirectly involved in the act of killing by putting in place and activating the mine or the military robot, respectively. This perceived immorality of automated killing is a rather problematic position from a consequentialist perspective. I realize, it’s also an argument that is hard to accept for military organizations, which have a long tradition of using automated weapons such as mines.

Discussing now Arkin’s ethical military robot, opponents say that machines could not discriminate reliably between buses carrying enemy soldiers or schoolchildren, let alone be ethical. They find claims that a Artificial Intelligence system can discriminate between a combatant and an innocent are unsupportable and irresponsible. Unmanned killer robots may be from a technical and practical standpoint very fascinating. However, the moral and ethical

aspects of such weaponry are much more important. Many academics are very concerned about the emergence of robotic warfare and the possible development of autonomous weapons and they demand political intervention.

British Sheffield robotics professor Noel Sharkey considers automated killer robots as a threat to humanity.^{xviii} He claims that the arms race for developing and fielding military robots is already well under way, as more than 40 nations are developing robotic weapons. The Australian ethicist Robert Sparrow argues that a robot is no moral agent.^{xix} A moral agent has not only the ability to tell right from wrong actions, but he has to be able to feel remorse and to be punishable. He sees the greatest ethical problem with autonomous weapons in our inability to hold them morally responsible for their actions in a meaningful way.

One of the most outspoken opponents of military robots is British professor Christopher Coker. He states that in increasing the distance between ourselves and our enemies, robotics is also demanding less and less of the societies that send them out to battle. Coker considers as one of the most dangerous features of the computer age, that it has impaired the use of language.^{xx} Information is employed as if it were synonymous with knowledge.

Even if machines were to develop some of the feelings that we associate with sentient beings, they would not embody the qualities we still identify with warriors: camaraderie, and the willingness, in extreme circumstances, to sacrifice oneself for a friend, according to Coker. This is actually what still gives war the moral context within which we can use the words 'right' and 'wrong'. Without it we would find ourselves living in a world without meaning, in which taking the life of another person would be no more wrong than unplugging a computer for good. A robot can inflict suffering, and even affront human dignity, but it cannot be altruistic. It can not sacrifice itself even for another robot. It lives, in that sense, in what we would see as a meaningless world, is Coker's conclusion.^{xxi}

Final remarks

Unmanned systems provide a number of advantages to the military. However, in my opinion, unmanned systems and autonomous systems are most unlikely ever to replace the soldier on the ground fully, particularly in complex emergency operations such as counterinsurgency. Rather than a giant computer game played by 'Nokia warriors', modern conflicts have sometimes turned out to be more like 'social work with guns'.^{xxii} The real challenge in those conflicts is not to kill the enemy but to win over the population. Weapons are in those conflicts less important than cultural sensitivity. Winning hearts and minds is likely to require diplomacy and human relationships that robots would not be capable of delivering.

Most military robots currently find their application in surveillance, reconnaissance, and the location and destruction of mines and improvised explosive devices. These robots are unarmed, harm no one, and save lives. But not all military robots which are currently used on the battlefield are unarmed as I discussed before, and they create problems in the field of responsibility and ethics. The value of the human will remain critical in people-centric operations where influence is vital and some military tasks will remain manpower intensive. Machines will never absolve mankind from its responsibility making ethical decisions in peace and war. As prices of robots are falling and technology becoming easier, a robot arms race can be expected that will be difficult to stop. It is of the utmost importance that

international legislation and a code of ethics for autonomous robots at war will be developed before it is too late.

There are currently two emerging schools of thought on the future of military robotics.^{xxiii} One school of thought views military robots as human extensions in the battle space, or as force multipliers, each effectively doing the work of many human soldiers, while immune to sleep deprivation, fatigue, low morale, perceptual and communication challenges in the ‘fog of war’, and other performance-hindering conditions.

The other school advocates autonomous robots as autonomous agents or a stand-alone independent capability without any necessity of having a human in the loop. In my opinion, the whole idea of automated killing is perverse. In my opinion, an action so serious in its consequences should not be left to mindless machines. War is fundamentally a social problem that demands human solutions. I agree with Thomas Adams when he states that “wars are human phenomenon, arising from human needs for human purposes. This makes intimate human participation at some level critical, or the entire exercise becomes pointless”.^{xxiv} In other words, ‘a man in the loop’, is essential for unmanned systems to work properly, let alone ethically.

ⁱ The main sources which have been used for this presentation are: Robert Arkin, *Governing Lethal Behavior: Embedding Ethics in a Hybrid Deliberative/Reactive Robot Architecture*, Technical Report, Atlanta, Georgia Institute of Technology, November 2007; Armin Krishnan, *Killer Robots, Legality and Ethicality of Autonomous Weapons*, Ashgate, Farnham, 2009; Patrick Lin, George Bekey and Keith Abney, *Autonomous Military Robotics: Risk, Ethics, and Design*, CALPOY, 20 December 2008; and P.W. Singer, *Wired for War: The robotics revolution and conflict in the twenty-first century*, The Penguin Press, New York, 2009.

ⁱⁱ Martin van Creveld, *Technology and War: From 2000 B.C. to the Present*, The Free Press, New York, 1989, p. 1

ⁱⁱⁱ Statement by Lieutenant General Robert Wagner, Deputy Commander United States Joint Forces Command, before the Committee on Armed Services, 26 February 2004

^{iv} *COMISAF's Initial Assessment*, Headquarters International Security Assistance Force, Kabul, Afghanistan, 30 August 2009

^v Patrick Lin, George Bekey and Keith Abney, *Autonomous Military Robotics: Risk, Ethics, and Design*, CALPOY, 20 December 2008, p. 1

^{vi} Armin Krishnan, *Killer Robots, Legality and Ethicality of Autonomous Weapons*, Ashgate, Farnham, 2009, pp. 43-45

^{vii} *United States Air Force Unmanned Aircraft Systems Flight Plan 2009-2047*, Washington DC, Headquarters, United States Air Force, 18 May 2009, p. 50

^{viii} *Surgeon General's Office, Mental Health Advisory Team (MHAT) IV Operation Iraqi Freedom 05-07*, Final Report, November 17, 2006

^{ix} Robert Arkin, *Governing Lethal Behavior: Embedding Ethics in a Hybrid Deliberative/Reactive Robot Architecture*, Technical Report, Atlanta, Georgia Institute of Technology, November 2007

^x *Ibid*, p. 61

^{xi} Elizabeth Quintana, *The Ethics and Legal Implications of Military Unmanned Vehicles*, The Royal United Services Institute for Defence and Security Studies (RUSI), London, 2008, p. 15

^{xii} Lambèr Royakkers and Rinie van Est, *The cubicle warrior: the marionette of digitalized warfare*, Ethics Inf Technol, DOI 10.1007/s10676-010-9240-8, Published online, 4 July 2010

^{xiii} P.W. Singer, *Wired for War: The robotics revolution and conflict in the twenty-first century*, The Penguin Press, New York, 2009, pp. 308-309

^{xiv} Note xii

^{xv} Note x, pp. 391-392

^{xvi} Note xii

^{xvii} Note iv, pp. 133-134

^{xviii} Noel Sharkey, ‘Robot Wars are a Reality’, *The Guardian*, 18 August 2007

^{xix} Robert Sparrow, ‘Killer Robots’, *Journal of Applied Philosophy*, 24:1, 2007, pp. 62-77

^{xx} Christopher Coker, *Ethics and War in the 21st Century*, Routledge, London and New York, 2008, p. 149

^{xxi} *Ibid*, p. 150

^{xxii} Andrew Bacevich, 'Social Work with Guns', *London Review of Books*, pp. 7-8

^{xxiii} *Note* iv, p. 35

^{xxiv} Thomas K. Adams, 'Future Warfare and the Decline of Human Decisionmaking', *Parameters*, Winter 2001-02, p. 65