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Modest Prospectives for Military Robots in Today's Asymmetric Wars

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„They don't forget their orders." (P. W. Singer 2009)

Abstract
Some recent developments in (semi-)automatic weaponry (like the "irobot 510 Packbot" or MQ-9 Reaper drones) have revived the interest in"unmanned warfare" and "robot soldiers". A closer look reveals that such devices are apt to accomplish many specialize tasks shunned (or impossible to carry out) by human fighters, that they increase offensive and defensive action capacities of armed forces and that they may lower the threshold for applying violence and entering wars. On the other hand, their dependence on highly structured, simplified environments makes them of little use under conditions of modern infantry fighting, in asymmetric warfare characterized by a blurring between military and civilian individuals and targets, and especially in peace enforcing and nation rebuilding missions where even the much higher polyvalence and versalility of human soldiers is challenged to the extreme. Within military organizations, robots facilitate the centralization and strict implementation of normative rules, and on a strategic level, they may indirectly fuel worldwide terrorism because attackers are motivated to divert violence form battlefields to softer (human) targets.

Contents

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1. Current trends towards more autonomous weapon systems

The absolute zero point of human technological development is marked by man working and fighting with his bare hands: thus controlling all sensomotoric processes and mental judgments with his own bodily functions.
In a long-term evolution stretching from stone axes to bows and arrows, firearms, battle tanks and intercontinental nuclear missiles, man has succeeded to externalize and amplify the motoric aspects of warfare, while sensory and (especially) reflective processes remained on archaic no-tech or low-tech levels. As a consequence, war technology assumed the status of an intervening variable increasing the distance and decreasing the sensory contact between fighters and their targets: thus making the relationships between human action and its consequences ever more indirect and ever more difficult to predict, verify and control.

> *„Each new military technology, from the bow and arrow to the bomber plane, has moved soldiers farther and farther from their foes." (Singer 2009c: 44).*

Such developments are most clearly seen in the rise of „automated" weapons activated without any human intervention: e. g. in the case of pitfalls later followed by booby traps and spring gun systems (as implemented on the boundary between Western Germany and the Soviet-controlled DDR; Arkin 2007: 4).
Since time immemorial, then, man had to cope with the ethical problems arising from the blurring of responsibility associated with such „self-activating" devices: Whoever installs antipersonnel mines hazards the consequence that innocent individuals will be killed by them – without running the risk of being accused of „murder" because no direct causal accountability can be established; and a bomber pilot may considered to be „negligent" (or at most „reckless"), but never strictly „guilty" for the collateral damages he or she causes by just fulfilling their mere duties. As we know from Stanley Milgram's famous experiments (Milgram 1974) as well as from many other empirical sources, the distance caused by intervening technical devices causes dangerous moral disinhibitions that are much less present among collocal individuals readily respecting elementary social norms based on empathic reciprocal relations.

Weapons become „robotic" to the degree that in addition to motoric potentials, they are also equipped with sensory capacities as well as with computing capacities that enable them to use such sensory inputs for making „their own decisions": so that their activity is at least partially governed by internal processes, not by (intentional or unintentional) external control exerted by human beings (Sullins 2006: 26).

> *„Robots are machines that are built upon what researchers call the "sense-think-act" paradigm. That is, they are manmade devices with three key components: "sensors" that monitor the environment and detect changes in it, "processors" or "artificial intelligence" that decide how to respond, and "effectors" that act upon the environment in a manner that reflects the decisions, creating some sort of change in the world around a robot." (P. W. Singer in Shachtman 2009).*

Notwithstanding their wide popularity in Isaac Asimov's writings and many other Science Fiction literature of the 20th century, technological progress in military robot construction has been conspicuously slow, so that no autonomously acting war bots competing with human soldiers (or substituting them in fighting activities) are yet in sight. In fact,

> *„The Pentagon had little to show after decades of research, leading the promise of robotics to be largely derided and dismissed as a failure of overly exuberant imagination." (Carafano/Gudgel 2007:2)*

Nevertheless, we could see the rise and continuous perfectioning of stationary semi-autonomous weapon systems mainly dedicated to defensive operations: beginning with

- the famous „Norden bombsight" in World war II which *„made calculations of height, speed, and trajectory too complex for a human alone when it came to deciding when to drop a bomb." (Singer 2009a: 39);*
- tele-operated tanks of the German Wehrmacht used in a quite similar way as analogous vehicles in Iraq and Afghanistan today (Donnelly 2005).

In the *U. S. Navy*, such technological strands are vividly exemplified by the highly sophisticated "Aegis-system" introduced in the 1980ies. When fully activated, it is capable of protecting the ship on which it is installed by observing the surrounding environment and by intercepting approaching torpedoes or missiles on the basis of autonomous decisions (Sullins 2010: 269ff.).

In the *American Army*, some very recent developments have resulted in locomotive devices that have far more resemblance to Asimov's imaginations. This is certainly true for the "irobot 510 Packbot" extensively used in the Iraq war: a portable mobile device that can be efficiently used for a wide range *"dangerous, dull and dirty activities"* (Singer 2009a: 36): activities typically declined (or impossible to fulfill) by conventional human soldiers:

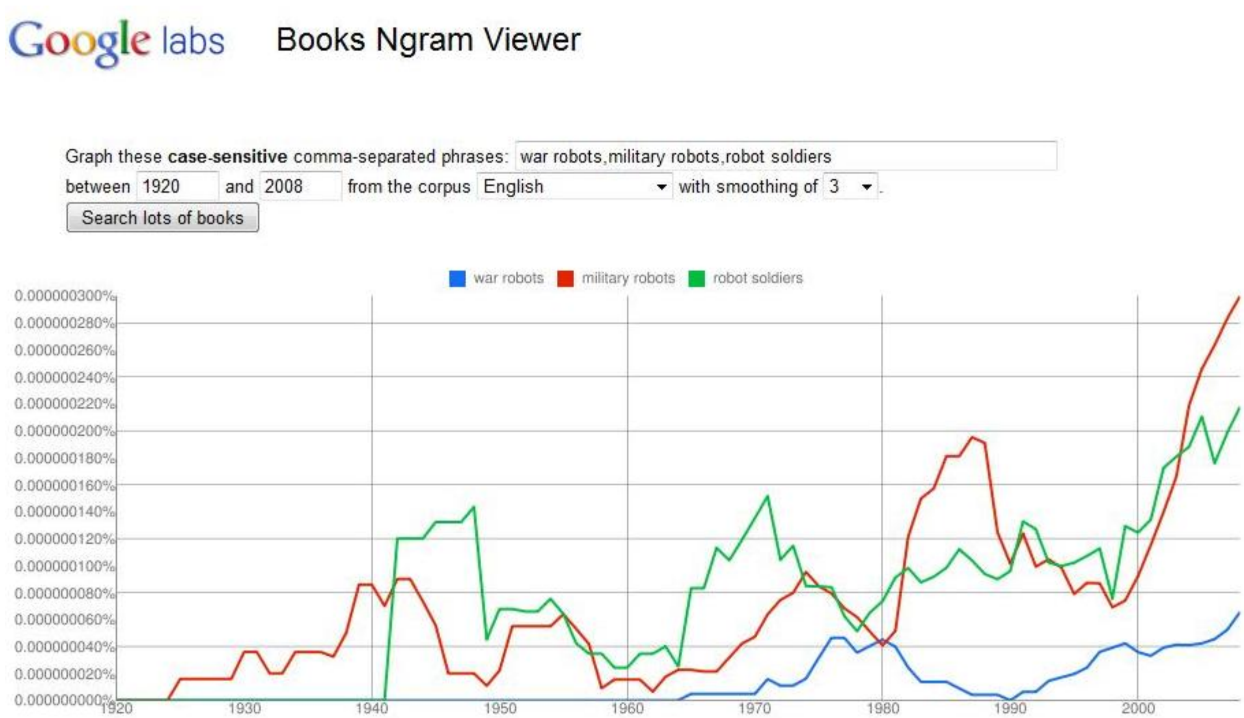
> *„About the size of a lawn mower, the PackBot mounts all sorts of cameras and sensors, as well as a nimble arm with four joints. It moves using four "flippers." These are tiny treads that can also rotate on an axis, allowing the robot not only to roll forward and backward using the treads as a tank would, but also to flip its tracks up and down (almost like a seal moving) to climb stairs, rumble over rocks, squeeze down twisting tunnels, and even swim underwater. The cost to the United States of this "death" was $150,000." (Singer 2009a: 319).*

In the *U.S. Air Force*, the trend toward more autonomous weaponry is illustrated by

- the development of „smart bombs" (used in the Golf War of 1991) that were capable of finding and precisely hitting their target after they have been released;
- the rise of „cruise missiles" able to travel without human guidance and to recognize and attack their target on the basis of ex ante internal programming;
- the recent emergence of „Predator" and „MQ-9 Reaper" drones capable of monitoring suspicious territories for detecting potentially relevant features, of attacking envisaged targets and of finding their way home without human assistance (e. g. in cases communication links are broken; Axe 2009).

These recent developments have given rise to several scholarly studies that try to assess the implications of current (and envisaged future) war robot technology for the individual soldier and military organization as well as the wider perspectives of warfare and international geopolitical relations (e. g. Sullings 2006; Arkin 2007; Sparrow 2007; Lin/Bekey/Abney 2008; Singer 2009a;b; Torrance 2008 etc.).

This professional literature seems to mirror a wider revival trend of war robot topics in the general public: reflected in the rising relative frequencies of terms like „war robots", „military robots" and „robot soldiers" since 2000 (in the huge literature scanned by Google). The Ngram graphic (generated on Jan 10th 2011) shows that at least the terms „military robots" and „robot solider" have much longer careers characterized by periodic maxima in the 1940ies, the 1970ies and around 1990: suggesting that apart from linear technological progress, cyclical cultural influences may (also) be at work.



Skeptics may argue that packbots, drones and similar devices are still submissive human tools not unlike all conventional weapons: as they are usually (tele)operated by responsible soldiers and any „autonomy" they enjoy is strictly specified and based on (always reversible) acts of human „permission". However, such arguments ignore that regardless of such technological conditions, many factors work together that such devices „emancipate" themselves from human control, and that they feed back on human behavior more than human behavior is determining what they do.

Certainly, it is always possible to reduce robot machines to the status of pure „advisors" whose recommendations can be ignored or overridden by „human veto power", but there are many reasons why it is often preferred to let them act on their own, or to rely at least on their recommendations (Singer 2009a: 39f.).

1) Only by taking himself completely out of the feedback loop, man can fully profit from the breathtaking capacities of robots to make observations, evaluations, decisions and reactions within extremely short time: so that the „kill chain" (find, fix, track, target, engage, assess) is

reduced from hours to minutes or seconds (Guetlein 2005: 5). Of course, such capacities are particularly indispensable for countering unforeseen inimical attacks (Royakkers/van Est 2010).

> *„There is simply no time for a human operator to enter into the firing decision because we just think too slowly to be of any use. The machine is programmed to determine the nature of a threat and can engage it without any human input in fractions of a second, a design feature that is very attractive in a fast-moving modern warfare situation." (Sullins 2010: 269)*

Thus, whenever both warring parties use robots, there will be an intrinsic tendency toward „automated wars" fought exclusively by robots engaging themselves mutually with very high speed (Singer 2009a: 38). Such wars then will be transformed into mere „hardware battles" undoubtedly won by the party with the higher quantity and quality of equipment.

2) Automated modes of robot action will be chosen whenever no communicative links to them are existing: either for physical reasons or because it is feared that such communication could be intercepted by the enemy (Herman/Fritzson/Hamilton 2008)

> *„If the robots aren't going to fire unless a remote operator authorizes them to, then a foe need only disrupt that communication. Military officers counter that, while they don't like the idea of taking humans out of the loop, there has to be an exception, a backup plan for when communications are cut and the robot is "fighting blind." (Singer 2009a: 41).*

3) Scarcity of qualified staff can make it necessary to rely more on automated robot behavior: thus reducing human labour by changing from permanent control to a more sporadic, intermittent mode of „supervision" (Sullins 2010: 269).

> *„To achieve any sort of personnel savings from using unmanned systems, one human ‚operator has to be able to ‚supervise' (as opposed to control) a larger number of robots. For example, the Army's long-term Future Combat Systems plan calls for two humans to sit at identical consoles and jointly supervise a team of 10 land robots. In this scenario, the humans delegate tasks to increasingly autonomous robots, but the robots still need human permission to fire weapons." (Singer 2009a: 41)*

Following Peter M. Blau's sociological analyses; it can be argued that similar to industrial plants and other formal organizations, the „span of control" (= the number of robots per supervisor) will covary with various conditions (Blau 1967). Thus, supervisors will soon reach their limits even with a very small number of „subordinates" if these latter are highly qualified to produce large amounts of information and/or to exert many different modes of action. Similarly, supervision is difficult when-ever a roboter works in highly complex and volatile environments that create a need for permanent monitoring and intensive „upward communication". Under all such conditions, there will be an increased tendency to „delegate" decision making competence to robots: thus changing from a control mode to a „trust mode" as we know it from conventional hierarchical relations (e. g, in bureaucratic settings: Singer 2009a: 44).

In reality, we find a manifold of subtle intermediary stages between direct control and indirect (supervisory) guidance. For instance, the piloting of telerobots (e. g. flying drones) gives rise to the phenomenon called „tele-epistemological distancing": a condition of partial human marginalization caused by the fact that pilots can see the war scene exclusively through the „eyes" of the sensors built into the technical equipment (Sullins 2010: 268), and that they have to follow the „foci of attention" selected by ways board computers interpret environmental conditions and events.

Another subtle form of human marginalization is caused by the fact that human control is reduced to „veto power": the ability to override intrinsic robot action by countervailing orders. However, such veto power is weakened to the degree that there is often more trust in the decisions of highly sophisticated and experiences computers than in the judgment of human beings typically directed by spontaneous intuitions (Singer 2009a: 40). Under real life conditions, responsible humans will often be discouraged to override robot decisions because whenever their decision will turn out to be wrong, they will face heavily difficulty of justifying their „deviant behavior".

> *„The most dramatic instance of a failure to override occurred in the Persian Gulf on July 3, 1988, during a patrol mission of the U.S.S. Vincennes That day, the Vincennes's radars spotted Iran Air Flight 655, an Airbus passenger jet. The computer system registered the plane with an icon on the screen that made it appear to be an Iranian F-14 fighter (a plane half the size), and hence an "assumed enemy. Aegis was in semi-automatic mode, giving it the least amount of autonomy, but not one of the 18 sailors and officers in the command crew challenged the computer's wisdom. They authorized it to fire. Only after the fact did the crew members realize that they had accidentally shot down an airliner, killing all 290 passengers." (Singer 2009a: 40).*

4) The autonomy of robots is promoted when they are endowed with the capacity of engaging in learning processes: making them ever more prone to cope with situations not anticipated by the original algorithms built into them at the time of construction (Sparrow 2007: 70; Lin/Bekey/Abney 2008: 23). Even very elementary learning will result in high unpredictability of robot behavior: thus leaving human controllers helpless in „understanding" why „he" acts in certain ways and reducing their factual power to the drastic dual alternative of letting „him" act or shutting „him" down.

> *„Artificially intelligent weapon systems will thus be capable of making their own decisions, for instance, about their target, or their approach to their target, and of doing so in an 'intelligent' fashion– While they will be programmed to make decisions according to certain rules, in important circumstances their actions will not be predictable. However this is not to say that they will be random either. Mere randomness provides no support for a claim to autonomy. Instead the actions of these machines will be based on reasons, but these reasons will be responsive to the internal states —'desires', 'beliefs' and 'values'— of the system itself." (Sparrow 2007: 65).*

2. Functional capacities and potential role assignments

Unquestionably, the capacities of military robots extend to many domains where human soldiers are not able or not willing to compete. Their deployment is thus prone to change the conduct of war mainly on tactical, but also on strategic levels, and to increase the degree of

asymmetry between the U. S. forces on the one hand and all their adversaries (still relying on conventional human soldiers exclusively) on the other.
For mere physical reasons, war robots are disposed to tolerate 16 G and even more in air fighting (Herman/Fritzson/Hamilton 2008), to scan narrow tunnels and very deep underwater locations unreachable by any human being, or to deactivate booby traps in a fifth of the time needed by conventional soldiers.

> *„If they thought an insurgent was hiding in an alley, they would send a MARCBOT down first and, if they found someone waiting in ambush, take him out with the Claymore. Of course, each insurgent killed in this fashion has meant $5,000 worth of blown-up robot parts (Singer 2009a: 36).*

As they do not succumb to fatigue or temporary distractions, robot drones can easily monitor suspicious territories for 30 hours on constant level of diligence, and army bots can be sent to most dangerous missions because in the worst of all cases, their destruction evokes replacement costs of maybe $ 150 000 (Singer 2009a: 31): without entailing letters to desperate parents or expensive pension payments to surviving widows and kids (Guetlein 2005: 14).
Fighting robots certainly increase the *defensive* capacity of infantry forces, because they can counter sudden attacks immediately: without losing time for rescuing wounded or dead comrades and for seeking a save hiding place for themselves. (Lang 1965: 870; Singer 2009a: 41). Similarly, they improve *offensive* potentials because they can move much nearer to the enemy's position (Lin/Bekey/Abney 2008: 53) and because they can easily risk pure „Kamikaze"-actions where chances of survival are practically nil. (For similar reasons, robots can be used as completely self-less body guards protecting the life of civilians in the midst of densely combated areas (Arkin 2007: 11)).
Such considerations make it easy to understand that in questionnaire surveys, it is found that most respondents (especially the experts involved in robot construction, but also military personnel and the general population) think that the main rationale for the deployment of robots is to protect human soldiers from injury and death - not to save costs or to make war conduct more effective (Moshkina/Arkin 2007: 20). Their inability to experience pain, fear and anger sets war robots in sharpest contrast to human fighters who have always been deeply affected by psychological stress factors resulting from the impending risks of injury and death. Since the Trojan War, military organizations and military culture were fundamentally shaped by the challenge to cope with the instinctive inhibitions of human beings to accept such existential individual risks (and to inflict such risks on others): much more than civilian bureaucracies all aiming at a „work-life balance" (usually by just paying monetary remunerations on a regular basis).

> *„Armies throughout history have learned to counter this most human of instincts by carefully instilling their troops with a close band-of-brothers camaraderie. Drill sergeants are famously adept at molding recruits into an effective fighting force, not by preaching righteous abstractions at them but by instilling a sense of mission and fostering strong ties of loyalty among fellow troops." (Herman/Fritzson/Hamilton 2008).*

Apart from the instinctive drive of soldiers of minimizing their risks by keeping quit and seeking protection, it has also been found that only a fraction of them actually aim at another human soldier with the manifest intention to kill, while most others prefer to just fire in the general direction on the enemy (Grossman 1995). As J. Pike (director of the military information Web

site GlobalSecurity.org) argues in his Washington Post article, such hesitance can paradoxically result in more costly and violent wars because indiscriminate firing results in more collateral damaging and a geographical expansion of battlefield and theatres of war (Pike 2009).
With their categorical psychological insensitivity and indolence, war robots contrast most impressively with the particular stressful roles of modern combat soldiers as they have been studied since World War II. Most of these studies have shown that especially the fighting behavior (and thus: operational effectiveness) of infantry personnel is extremely dependent on mental and emotional conditions that are themselves much more affected by informal microsocial relations (e. g. solidaric bonds to „buddies" and leadership qualities of lower officers) than by any formal organizational measures (Basowitz et. al. 1955; Egbert 1958). Such informal relations are of course dysfunctional insofar as casualties lead to painful vacancies that cannot be readily filled up with new team members (Shils/Janowitz 1948).

It has been argued that the exposition to serial gunfire (by automated guns or pump action grenade launchers) has particularly contributed to increase the level of fear in infantry battles, making combat behavior ever more determined by motivational factors that are shaped much more by immediate situational and informal social factors than by any formal commands and rules, charismatic army generals or general patriotic commitments (George 1971: 294f.). Evidently, such dire conditions increase the motivation of political and military leaders to develop more controllable combat actors who execute given orders unconditionally, without the interference of disturbing (or even aborting) informal factors:

- by feelings of anger and revenge (or other reactions to fallen comrades) as they have been permanently decisive at least since the Trojan war (Borenstein 2008: 21);
- by widespread attitudes of attrition, despondence and disillusionment similar to those that have finally contributed to the end of the Viet Nam War (Gabriel/Savage 1978).

> *„Unlike their human predecessors, a robotic soldier would not act out of malice or prejudice. A sense of revenge, which might compel a human to commit a war crime, would not have the same kind of influence on a computerized system. Thus, supporters of technology contend that tragedies occurring in combat, such as accidental casualties, would be reduced. (Borenstein 2008: 2/3).*

In addition, war robots enable command centers to implement new tactical procedures and „rules of engagement" in shortest time and without any resistance, because no cumbersome processes of re-learning and resocialization are needed for eradicating existing habits and for internalizing new behavioral styles.

> *„If needed, ROEs can be rapidly changed and disseminated in a more agile fashion to robots than would be possible to human warriors in the field during an execution of an operation. Also, if required, re-tasking can be frequent and rapid, much more so than would be acceptable when commanding human warriors." (Young/Kott 2009).*

Whoever attacks robots has to accept that spectacular „shock and awe" actions or longer-term sieges with the aim of attrition are no longer readily options, because automated weapons will never give up for any psychological reasons, but only insofar as their operability is annihilated by physical impacts (Herman/Fritzson/Hamilton 2008).

On the other hand, adversaries attacked by robots may become demotivated more quickly and more profoundly, because

- the perspective of hitting just easily replaceable equipment (instead of killing humans) is not giving rise to much pugnacity (Singer 2009a);
- shooting at the enemy implies extreme risks because in comparison to human soldiers, robots are much more prone to identify the aggressor's location and to counter-target him with utmost precision.

Seen from this perspective, war robots may well contribute indirectly to a wider spread of international terrorism because asymmetric enemies – finding themselves ever more helpless on the battlefield – will increasingly turn their aggression towards „softer targets" e. g. unprotected civilians and civil establishments within the homeland of their adversaries.

> *"It is also worth contemplating the effect a no-fear robotic army would likely have upon an enemy. Any human foe faced with the impossibility of confronting and defeating any live soldiers on the field — after all, what glory or satisfaction would there be in killing a robot? — might be all the more tempted to adopt terrorist tactics that strike directly at civilians. In the long run, therefore, a no-fear military has the potential to simply transfer fear from the battlefield to society at large." (Herman/Fritzson/Hamilton 2008).*

Finally, the high (and steadily increasing) calculative capacities of computerized robots makes them prone to play an ever larger role in modern armies who depend crucially on their capacities to absorb and process very rapidly large quantities of information. In fact, conventional human soldiers tend to marginalize themselves by their limited (and hardly expandable) ability to cope with the increasing amounts of relevant information originating from satellites, reconnaissance aircraft, weather stations, intelligence service etc. that have to be synthesized preferably in no time in order to facilitate optimal decision making under volatile and unpredictable environmental conditions.

> *„Robots can integrate more information from more sources far faster than a human possibly could in real-time before responding with lethal force. This can arise from multiple remote sensors and intelligence (including human) sources, as part of the Army's network-centric warfare concept and the concurrent development of the Global Information Grid." (Arkin 2007: 124).*

These same capabilities makes robots much more prone then human soldiers to engage in mutual R-R relations: e. g. to exchange relevant information in order to be able to react to a new threat rapidly in a highly *collective* fashion: by parallelizing their forces to identical big targets, or by effectuating ad hoc role specializations based on horizontal accordation (instead of vertical commands): e. g. in search operations where forces have to be spread out to wide geographical regions without thinning out their communicative interactions (Singer 2009a).
In fact, recent developments in robotics provide sufficient knowledge for integrating a large number of robots to „swarms" that show fascinating forms of complex and unpredictable emergent behavior on the basis of a few very simple rules (Spears et. al. 2004). Combined with their ubiquity and „fearlessness", such unpredictabilities add to the helplessness of the attacked enemy who has ever more difficulties of (re)acting in rational goal-directed ways. (Lin/Bekey/Abney 2008: 79).

> *„Swarms may not be predictable to the enemy, but neither are they exactly controllable or predictable for the side using them, which can lead to unexpected results. Instead of being able to point and click and get the immediate action desired, swarm takes action on its own, which may not always be exactly where and when the human commander wants it."(Singer 2009b: 110).*

3. Limitations and Dysfunctions

While the place of war robots has been very modest so far, some experts are still optimistic that in the longer run,

> *„we will have robots fully capable as human soldiers in the battlefield." (Robert Finkelstein, head of Robotic technologies Inc. in Singer 2009a: 43).*

Such bold predictions evidently ignore the fundamental difficulties in constructing robots that match human beings in their polyvalence and flexible adaptiveness of motoric behavior, their richness of sensory perception and their immensely versatile capabilities of learning and mental reflection. In particular, they underestimate the degree to which robots will always be highly specialized actors whose behavioral capacities are limited by intrinsic particularities of their hardware construction and software programming – even if the latter enables them to engage in open learning processes and non-anticipated reactions to novel situations and problems, (Geser 1989; Hayes-Roth 1997).

The rather disappointing results of most attempts to create „artificial intelligence" have demonstrated that informatic agents are only effective in highly formalized problem areas that can be neatly segregated from more complex environments (Nilsson 1980). Thus it is rather probable that no man or women will ever again win World Championship competitions against the most sophisticated chess computer (after Kasparow has lost his tournament against „Deep Blue" in 1997 already). But it is highly unlikely that a fully functional breakfast-preparing robot will ever be constructed: because „he" would have to be endowed with an almost unlimited amount of informal, tacit life-world knowledge mastered easily by any „unskilled" female ready to do the job for a few Euro's per hour (Puppe/Stoyan/Studer 2003; Mandl 2008).

Disregarding plays and other purely artificial environments created by simple man-made rules, such conditions of simplicity and predictability are met particularly

- in the realm of industrial production where robots can be dedicated to highly standardized repetitive procedures that can be fully specified ex ante because environmental conditions as well as the means-end relationships of all action processes are completely (and explicitly) known (Nof 1999);
- in space missions or for the exploration of Mars or similar planets where – due to the lack of atmosphere, plants, and animals - "rovers" and similar vehicles face much less environmental complexity than on earth (Bares et. al. 1989).

In the military, a similar dominance of formalized norms and routinized behavior can only be found in *times of peace*, where everyday life of soldiers are filled up with "drill": rigid rituals of order and obedience. Instead, *times of war and fighting* are characterized by volatile, unpredictable and idiosyncratic events and developments which necessitate quick reactions based on personal experience of spontaneous intuition, and which give rise to small group cultures and informal behavioral practices that may deviate sharply from officially reigning ideologies, formal rules and hierarchical structures (Ziegler 1968: 30).

In sharp contradiction to the rise and continuous expansion of bureaucratic structures in public administration, schools, clinics, labor unions, parties and most other spheres of civilian life, military combat (especially infantry fighting) has been subject to a long-term trend of informalization: manifested in a growing relevance of microsocial team solidarity, corporal leadership „buddy relations" (George 1971: 295). If technology would have been available, „automated soldiers" may have played a major role between the 17th century and the Napoleonic Wars where soldiers were ordered to execute collective gun volleys on command: aiming just at the general direction where the enemy was (assumed to be) located, without engaging individual adversarial soldiers. But how will they find a role in modern combat situations where situational conditions are so variable and unforeseeable that each soldier is requested to make use of his weapon at his own discretion (Lin/Bekey/Abney 2008: 31). – let alone in fights against asymmetric enemies employing a wide range of constantly changing tactics or acting in the midst of complex urbanized settings in order to blur the difference between combatants and civilians and between civil and military targets?

> *„The modern nature of war is such that it often takes place in the middle of civilian areas where combatants are not easily distinguished from non-combatants. The irony is that precise and sophisticated weapons may put innocents in more, rather than less, danger. Since enemies are rarely labeled clearly, it will be immensely challenging, if even possible, to develop algorithms that are sophisticated enough to allow an AWS to discern friend from foe. (Borenstein 2008: 6).*

Similarly, autonomic weapons

> *„would not be the preferred weapon against dual-use targets where the target has both a military and a civilian use. In order to engage these targets, the warfighter has to make the complicated determination if the military value of the target far outweighs the potential for collateral damage." (Guetlein 2005: 16).*

Even in then case trivial everyday tasks like cooking, sanitation services or transportation, robots hit their functional limits because they don't possess the necessary „tacit knowledge".

> *„One of benefits of having humans serving as soldiers is that they can handle situations by relying on instinct and tacit knowledge, things which are difficult to articulate and encode into formal rules. For example, countless, sophisticated nuances are associated with communicating information. Consequently, even if an AWS has the capacity for language, that feature could be rendered rather moot if it is unable to process other, less tangible forms of communication. Humans are capable of expressing themselves without the use of language such as by using hand signals and non-verbal cues. Perceiving this kind of information can help to distinguish aggressive movements from signs that a person may be willing to surrender." (Borenstein 2008: 5).*

And even less can they substitute human soldiers in the case of singular, idiosyncratic problems (e. g. the liberation of captured hostages) as they are dealt with by „Special Forces".
Seen form another angle, the deployment of army robots would improve the chances of asymmetric enemies to weaken or even neutralize the attacker by making the combat environment so fuzzy and complex that robots are no longer effective: e. g. by making it harder to discern combattants from civilians, or by dislocating into „tabu targets" (like churches, clinics, schools etc.) that are known to be preprogrammed „no-go areas" for robotic devices.

On a general level, robots increase the vulnerability of the attacking army insofar as they always have to operate on the basis of fully explicit, prespecified rules embodied in their computer software: digitalized information that can easily to be copied, stored, transferred and read by any non-authorized actors. Whenever the enemy acquires such information (e. g. by „hacking" or by buying it from ready traitors), he will have many ways to either paralyze robot functioning (e. g. by intercepting and disrupting communications), or to neutralize their impact by correlative adaptations (e. g. withdrawing from locations known to be preferred targets; Borenstein 2008: 7;10). In other words: conventional human soldiers and officers will always be badly needed to maintain the degree of unpredictability necessary for keeping the enemy uninformed about next moves – and thus incapable of anticipating how to maximize his own chances. This „strategic insecurity" is far better preserved by human soldiers and officers who deliberate and decide continuously anew on the basis of tacit knowledge and nonrational „intuition".
Even amidst pure military fighting, the Geneva conventions demand that aggressors finish shooting when the targeted combatants emit signs of surrender: signs usually based on analogue nonverbal signals that may be hard to „understand" for robots functioning exclusively on the basis of digital information (Sharkey 2008).

> *„To illustrate, consider the capabilities of (a) recognizing surrender gestures and (b) telling bystander or friend from foe, which are often discussed in connection with the prospects of robotic warfare. In order to make a good showing in any behavioral test designed to control whether one is capable of providing satisfactory (albeit not infallible) human-level solutions to problems (a) and (b), a robotic system must possess a wide variety of perceptual and deliberative capabilities that are well beyond state-of-art artificial intelligence and cognitive robotics. Human-level solutions to problems (a) and (b) are issued on the basis of context-dependent disambiguation of surrender gestures, even when these are rendered in unconventional ways, understanding of emotional expressions, real-time reasoning about deceptive intentions and actions. (Tamburrini 2009: 16).*

Least obstacles for robot deployment certainly exist in neatly circumscribed „no-go territories" where it is certain that all observed intruders are law-breakers that have to be dealt with gunfire or other military reactions specified ex ante. Such conditions are certainly met in the demilitarized border zone separating North Korea from South Korea along the 37th degree.

> *„Signs are clearly posted and it is common knowledge that unauthorized entry into this area is forbidden. Since any and all noncombatants who enter into this zone (there are two very small villages in the region) must have been cleared through a checkpoint, it is*

> *assumed that any unauthorized personnel who cross the MDL (Military demaracation line) are hostile, unless there is an overriding reason to believe otherwise. Further, we also assume in this scenario, that as part of the authorization process, personnel are issued an FFI tag (friend-foe identification) that the robot can interrogate to discriminate the target. It can potentially be the case that a defector may be attempting to cross the DMZ without appropriate credentials. This has occurred in the past, although the likelihood of a repetition has decreased due to new North Korean tactics as a result of a previous successful attempt. Thus, for this scenario, the probability of any human encountered who does not pass friend-foe interrogation being a hostile is high in this well-posted area" (Arkin 2007: 93).*

As a general rule, it may be stated that robots are more adequate for *reactive* then for *proactive* engagements: because answering inimical attacks by shooting back is in most times fully covered by the reigning „rules of engagement", while complex assessments of current situational conditions and imminent future risks are necessary for deciding whether, at what time and in what way an attack shall be initiated (Singer 2009: 41).

Of course, the role of robots is most restricted in polyvalent „broadband" missions as they occur in all endeavors directed at peace enforcement, peace keeping or restoring a broken socio-political order. Here, even conventional human soldiers are usually too specialized, because fighting skills have to be combined with skills for negotiation and conflict mediation, abilities to "win the hearts and minds" of the indigenous population, and capabilities to provide medical help, organize food distribution and to cooperate with local civil organizations (Berdal 1993; Geser 1996).

4. Robots as agents of ethical behavior and social controls?

Disregarding some exceptions like the Peloponnesian War, the Medieval Mongolian invasions or World Wars I and II, there has rarely in history been a condition of „Total War" characterized by a doctrine justifying any combat activity (and any other harming of the enemy) regardless of its outcome and irrespective of its nonconformity with any ethical and moral rules. Thus, feudal societies in the Middle Ages have conducted warfare according to strict rules of family feud and knightly honor – behavioral and ethical standards deeply ingrained and reliably transmitted in their reigning landowning elites.

In more recent times, the increasing potentials of advanced weaponry has given rise to formalized norm structures and institutions (like the Hague and Geneva conventions or the Red Cross) aiming to limit the initiation and destructive impacts of wars and to preserve at least minimal human rights for combatants as well as for the civilian population. Since the Nuremberg processes following World War II, we also see increasing efforts to define boundary lines between justified war activities and excessive „war crimes" that have to be sanctioned by international penal courts (Jackson 2005). On more specific intramilitary levels, we finally observe a growing body and significance of „Rules of Engagements" that specify the condition when and where what kind and amount of force shall be applied (Sagan 1991).

All these developments have not eradicated, but rather sharpened the basic contradiction permeating all warring activities. On the one hand, tactical and strategic goals urgently demand to exert maximum force to overcome and destroy hostile forces, while on the other hand, humanitarian norms demand to restrict violence to the necessary minimum under almost any conditions: e. g. for sparing the wounded, and keeping POW's alive and well (Lin/Bekey/Abney 2008: 47ff.), minimizing collateral damages and preventing irreversible destruction of infrastructures that will be needed in post-war reconstruction. Similarly, the proliferation of formal rules does not change the basic reality that soldiers remain deeply affected by informal norms and extraordinary situations conditions that facilitate all kinds of deviant behavior.

Since the seminal „American Soldier" studies in World War II, it is known that warfare is a fertile breeding ground for ethical violations that may well weaken the formal authority of commanding officers or even hamper the continuation of the war. Thus, it has been found that such violations (often related to the loss of a near comrade) tend to rise with increasing combat experience (Stouffer et. al. 1949: 141; Arkin 2007: 7.).

According to an Army report that examined the mental health of military personnel serving in Iraq,

> *"Only 47 percent of the soldiers and 38 percent of Marines agreed that non-combatants should be treated with dignity and respect" (Surgeon general's office 2006: 35).*

Concerning the „Rules of Engagement" (ROE), 9% of marines and 8% of soldiers reported their unit had modified the rules without authorization and 7% of marines and 5% of soldiers simply ignored the rules to accomplish their mission (Surgeon general's office 2006: 35). Less than fifty percent of soldiers and marines stated that they would report violations committed by their comrades to higher authorities (including stealing from non-combatants, or mistreatment and killing of innocent civilians; Surgeon General's office, 2006: 37).

These conditions have given rise to the perspective that robots may help to reduce or even eliminate such delinquencies that seem to be intrinsic consequences of warfare itself, not manifestations of particularly „bad-minded" soldiers (that may potentially be removed by changing procedures of recruitment, socialization and social control). In Arkin's view, human soldiers set the bar for ethical conduct in warfare so low that even small changes may be seen as a significant improvement (Arkin 2007).

Such thinking starts with the unquestionable premise that to the degree robots are enabled to make their own decisions based on their own sensory inputs and computational algorithms), they need to be guided by norms and constraints, prohibitions and permissions analogous to those governing human ethical behavior Picard 1997). Instead of executing just an „operational morality" as obedient slaves of human commanders, they have to be endowed with a „functional morality" enabling them to relate general principles to specific current situations and tasks.

> *"…. three factors suggest that operational morality is not sufficient for many robotic applications: (1) the increasing autonomy of robotic systems; (2) the prospect that systems will encounter influences that their designers could not anticipate because of the complexity of the environments in which they are deployed, or because the systems are used in contexts for which they were not specifically designed; and (3) the complexity of technology and the inability of systems engineers to predict how the robots will behave under a new set of inputs." (Lin/Bekey/Abney 2008: 26.).*

Given their deductive intellectual orientation, philosophers confronted with this problem are likely to suggest a top-down approach by encoding an antecedently specified ethical theory into the robot's software systems (Lin/Bekey/Abney 2008: 27) and analyzing

> *"its computational requirements to guide the design of algorithms and subsystems capable of implementing that theory" (Wallach/Colin/Smit 2007: 79-80).*

Considering the fundamental functional limitations of robots discussed above, the question arises what kind of ethics they may be potentially able to realize within the ranges of their autonomous action. It has been correctly observed that robots are not capable of implementing any *consequentialist* (*or utilitarian*) *ethical systems* because such systems demand very high skills in anticipating and assessing the results of one's action - and even more for evaluating how they affect the interests and well-being of the parties inflicted: especially when

- indirect effects on third parties,
- longer-range effects (that may run counter to the immediate consequences)
- psychological as well as physical consequences

have to be considered (Lin/Bekey/Abney 2008: 34).

More than that: the utility or disutility of any warring actions may be judged differently according to the tactical, strategic or political *frames of meaning* within which it is considered. While computerized agents may be endowed with such a frame, they are not able to set different frames in mutual relations and to change among them according to current developments and events – human capacities that may be hardest to imitate by any software complexities and levels of computational skills (Dreyfus 1985).

Thus, it seems far more promising to commission robots to a *deontologist ethical system* where moral judgments are not based on the extrinsic consequences of actions, but on their intrinsic (non)conformity with general norms, rules and constraints. Such normative standards may be derived from the Golden rule, the Biblical Ten commandments, Immanuel Kant's categorical imperative, Aristotle's virtues, various formal law systems like the Geneva conventions – or the famous three Asimov's laws:

1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws. (Asimov 1942).

By „deontological programming", robots could well be determined to conform strictly to currently valid laws of war and rules of engagement – which would then win a much higher degree of institutionalization and observance than has ever been possible with conventional soldiers (Lin/Bekey/Abney 2008: 25ff.). In particular, they could be programmed to observe neatly the hierarchical relations among different levels of formal ruling: e. g, taking side for the Geneva conventions whenever these conflict with more specific and parochial "rules of engagement" (Lin/Bekey/Abney 2008: 53.).

However, the notion of „functional morality" implies that robots resemble humans in operating with a basic hiatus between the level of theoretical ethical principles on the one hand and the level of specific, practical moral decisions on the other. As the whole history of moral phi-

losophy as well as empirical studies on moral human behavior has shown, there is no fully determinate one-to-one relationship between the theoretical and the practical sphere, because general principles lend themselves to a variety of deductions, and principles of equal rank often conflict with each other, so that ad hoc choices have to be made that are themselves not covered by ethical laws.
Even in the cases of the three hierarchically arranged Asimov's laws, it has been demonstrated that unsolvable contradictions can result

> *„when, for example, the robot received conflicting instructions from two people or when protecting one person might cause harm to others." (Lin/Bekey/Abney 2008: 30).*

In terms of *Lawrence Kohlberg's* theory of moral developmental stages, robots may well reach stage 4 (law and order morality characterized by an uncompromising observance of currently established rules), but not stages 5 and 6 which demand that principles are themselves subject to critical evaluation in the light of more universalistic concerns of social order and human rights (Kohlberg 1981: passim).
At this stage, the lively current discussion about „robot ethics" still seems rather utopian and more inspired by the (undoubted) moral deficiencies of human soldiers than by the (more doubtful) ethical capacities of digitally programmed nonhuman agents. Nevertheless, it seems fruitful to contemplate some corollaries and consequences that would (or will) be associated with these developments – even if these are still in quite embryonic stages,

1. The intellectualistic ("Stoic") bias

First of all, robots (and all other computerized agents) will display a strictly „Stoic" model of morality: implementing more effectively than ever the concept that moral reasoning should be guided by dispassionate objectivity and be completely free of subjective emotions.

> *''Robots don't get angry or seek revenge but they don't have sympathy or empathy either…. Strict rules require an absolutist view of ethics, rather than a human understanding of different circumstances and their consequences.'' (Noel Sharkey cited in Simonite 2009).*

Unquestionably, such extreme intellectualistic strands collide most violently with any contemporary notions concerning „emotional intelligence": the view that ethical judgments are based in the phenomenological consciousness, psychological affects or even in the biological embodiment of human beings („organic view of ethical status" in terms of Torrance 2008).

> *„Over the past few decades it has become apparent that moral judgment in humans is much more than a capacity for abstract moral reasoning. Emotional intelligence (Damasio 1995; Goleman 1995), sociability, the ability to learn from experience and social interactions, consciousness, and the ability to ''read the minds'' of others all contribute to moral intelligence." (Wallach, Colin & Smit 2008: 566).*

In contrast to pure „intellectual rationality, such „empathic rationality" presupposes that the moral actor is itself also a „moral patient": a recipient toward whom moral actions of ALTER EGO's are directed (Torrance 2008: 510f.).

„….moral agency would require the ability, not merely to make rationally based judgments and decisions in the purely intellectual way that one could expect information-processing mechanisms to do, but to engage in the kind of engaged empathic rational reflection on the experiential states of others in a way that seems to be at least partly constitutive of taking a moral point of view." (Torrance 2008: 511).

2. The increased need for explicitness and systematic codification

Secondly, robots will always have to rely on perfectly explicit and logical consistent rules as they have to be spelled out completely in order to be incorporated into algorithmic software codes. While contrasting sharply with the informal, „tacit" or even unconscious normative habits that use to govern the behavior of human beings, such rules have an intrinsic affinity to formalized norms as they are coded in the legal systems as well as in the formal regulations and procedures of military organizations. As Arkin has demonstrated in an ambitious (but still essayistic) manner, robot ethics has first to rely fully on previous rule codifications (like in the case of the Geneva conventions or the „Rules of Engagements" (ROE) specified in the U.S. forces), and secondly, it catalyzes additional formalization: e. g. by generating the need for codifying areas hitherto left informal or for eliminating conflicts arising when two or more formal principles of equal level collide.

„Implementing moral faculties in AI (artificial intelligence) will require that scientists and philosophers study and break down moral decision making in humans into computationally manageable modules or components. It is also assumed that if an autonomous agent refuses to conduct an unethical action, it will be able to explain to some degree its underlying logic for such a refusal." (Arkin 2007: 4).

Thus, many specific moral judgments that have hitherto been made ad hoc by operative military officers and soldiers must now be determined ex ante by centralized agencies involved in the programming of robot agents; for example:

- How many civilian casualities shall be tolerated in airstrikes leading to the elimination of 40 armed combatants?
- How many civilian victims can be accepted in cases where only 20 combattants are taken out: including of high ranking commander, or a hardly replaceable specialist in the construction of terrorist explosive devices?
- Are attacks still ethically legitimized when there is a probability of 80% that they miss the target: hitting civilians instead of combatant fighters?
- Is an attack justified on an individual who have a 5% likelihood to be not combatant, but just an innocent youngster with toy pistol?
- Is it justified to provide a robot worth $ 150 000 with self-defense capabilities that may potentially harm human soldiers – or only when it costs $ 300 000 or more?
- Shall there be a rule that the incapacitation of 100 robots is preferred to the death of s single human soldier even if one of them contains information that enables the enemy to gain an edge in fighting and inflict very much harm?

"For instance, the ROE to minimize collateral damage is vague: is the rule that we should not attack a position if civilian deaths are expected to be greater than—or even half of—

> *combatant deaths? Are we permitted to kill one (high-ranking) combatant, even if it involves the death of five civilians—or $ 10M in unnecessary damage? A robot may need specific numbers to know exactly where this line is drawn, in order to comply with the ROE. Unfortunately, this is not an area that has been precisely quantified nor easily lends itself for such a determination." (Lin/Bekey/Abney 2008: 76).*

Such needs for anticipatory explication have the consequence that more ethical decisions than ever will be removed from the decentralized level of operative combat troops to the centralized levels of military and political command: thus increasing the risks that normative structures are governed more by rigidly codified and generalized idealistic thinking rather than by pragmatic responsiveness to concrete situational conditions.

3. The blurring of responsibilities

Efforts to establish robots as „moral agents" will at least partially be aborted by the fact that robots will never achieve the status of autonomously acting subjects. Instead, they will assume a dubious semi-autonomous role thus contributing to the growing difficulty of attributing the personal responsibilities of any war-related actions.

Even in conventional military operations, personal responsibilities are hard to identify because military actions and their consequences are usually co-determined by various decision makers like politicians, weapon manufacturers, generals, higher officers and common soldiers.

All these conditions contribute to the need to apply a generalized concept of „mindless morality" (in the sense of Floridi and Sanders 2004) sharply separated from criminal guilt: a notion of causal (instead of moral) responsibility as it is applied in private law of "strict liability" (especially in dealing with economic corporations and other legal persons). However, such notions increasingly collide with the growing worldwide demands to attribute war actions to particular individuals in order to make them personally accountable for „war crimes": demands that have found expression in the Nuremberg processes as well as in the more recent expansion of intramilitary iurisdictions and the establishment of the International Penal Court.

> *"It is a minimal expression of respect due to our enemy — if war is going to be governed by morality at all — that someone should accept responsibility, or be capable of being held responsible, for the decision to take their life. If we fail in this, we treat our enemy like vermin, as though they may be exterminated without moral regard at all. The least we owe our enemies is allowing that their lives are of sufficient worth that someone should accept responsibility for their deaths. Similarly, their grieving relatives are entitled to an answer as to why they died, which includes both knowing who is responsible and what their reasons were. Ensuring that someone can be held responsible for each death caused in war is therefore an important requirement of ius in bello." (Sparrrow 2007: 69).*

With the inclusion of robots, empirical studies show that core accountability is shifting to the producing enterprises and engineers on the one hand and to the centralized political and military command agencies (responsible for their deployments) on the other. In addition, however, there is a tendency to attribute part of the responsibility to the robot itself – thus implicitly exculpating at least to some extent the co-involved human individuals (Moshkina/Arkin 2007: 17; Lin/Bekey/Abney 2008: 73).

Thus, robots deviate from most other industrial artifacts where manufacturers are strictly liable for all damages caused by their products – at least insofar as consumers have handled it in accordance with the written instructions. Evidently, such notions hardly work in the case of robots because manufacturers are unable to anticipate for what purposes they will be used - partly because the military itself decides to what actions and goals they are committed, and partly because due to their complexity and learning abilities, robots display actions and cause effects that cannot be anticipated and intentionally controlled (Lewis, 2009).

> *„Perhaps robot ethics has not received the attention it needs, given a common misconception that robots will do only what we have programmed them to do. Unfortunately, such a belief is a sorely outdated, harking back to a time when computers were simpler and their programs could be written and understood by a single person. Now, programs with millions of lines of code are written by teams of programmers, none of whom knows the entire program; hence, no individual can predict the effect of a given command with absolute certainty, since portions of large programs may interact in unexpected, untested ways. Furthermore, increasing complexity may lead to emergent behaviors, i. e., behaviors not programmed but arising out of sheer complexity." (Lin/Bekey/Abney 2008: 54).*

Thus, robots are giving rise to an irreducible „responsibility gap" roughly comparable to police dogs or child soldiers (Marino/Tamburrini 2006; Sparrow 2007), insofar as human agents can well be held directly accountable for their deployment, but only indirectly for all consequences of their actions. Evidently, such conditions are hard to tolerate in the traditional „ius in bello" doctrine which demands that there is an identifiable human cause for all war fatalities (Sparrow 2007), and even harder to bear in the face of current efforts to label excessive killings as „war crimes" that have to be sanctioned by (international) penal law. Thus, we may well see very soon broad international efforts to restrict the use of war robots (or even prohibit them) similarly to anti-personnel mines (Sparrow 2007), because they are also perceived as indiscriminate weapons inflicting unselective and unpredictable damages outside the reach of political and military command.

Given the vanishing of *individual* (or clearly defined *collective*) responsibilities, the only remaining option is to attribute cause and guilt to the *whole system* encompassing all (political, military, technical and economic) agencies that are directly or indirectly involved. Thus, when the „United States" or „NATO" is seen as the culprit, we will not be surprised to see asymmetric enemies attacking such entities indiscriminately by terrorist acts at any point where they are vulnerable – instead of fighting them in battlefields where no accountable inimical actors can be singled out anymore.

5. Lower thresholds for initiating wars?

When contemplating the more general strategic impacts of robots on human warfare, much authors focus on the question whether unmanned automated weapons lower the threshold for initiating new (or entering already existing) wars.

Under current conditions, such considerations have certainly only limited significance for the army, where robots are preferably used as tools for highly specialized „missions: so that the concept of a „war of robots" continues to denote a Science Fiction imagery not likely to be realized in the near or middle range future. Unquestionably, such a notion has far more relevance for the Air Force where „unmanned air vehicles (UAV's) like drones have effectively replaced conventional piloted planes: with the effect that undeclared „drone wars" are taking place (e.g. in Pakistan and Yemen): wars almost unnoticed by the public that would be conducted very differently (or most probable: not at all) if only conventional manned aircraft were available.

Tele-operated UAV's may lower the threshold for warfare insofar as attacks can be effectively implemented by distant „pilots" sitting in front of computer displays somewhere in Nevada: without leaving behind their families and civilian lifestyle, let alone risking personal injury and death.

> *"You are going to war for 12 hours, shooting weapons at targets, directing kills on enemy combatants, and then you get in the car, drive home, and within 20 minutes you are sitting at the dinner table talking to your kids about their homework. (Singer 2009a: 34)"*

Thus, it is no surprise that in the large public opinion survey conducted by Moshkina and Arkin in fall 2007, most of the (military as well as civil) respondents (69%) maintain the opinion that robots are facilitating the initiation of wars, while only small minorities (about 5%) have a contrary view (Moshkina/Arkin 2007: 22).

On a political level, such conditions are certainly welcomed by increasingly sensitive Western populations unwilling to see their kids die in distant wars with dubious aims and outcomes: sons and daughters in whose socialization and education much effort and resources have been invested and who have far better occupational perspectives in the civil sphere than any careers professional military forces are able to offer.

„A captured, wounded, or dead soldier is a political liability. The "CNN factor" alone is enough to deplete the popular support for the mission. CNN's graphic footage of noncombatants (civilians and contractors) being beheaded by Iraqi insurgents; of American soldiers coming home in body bags; or of U.S. Marines shooting wounded Iraqis in order to neutralize the threat of being bushwhacked; all had a repulsive effect on the worldwide audience and continue to erode political will in support of the war in Iraq." (Guetlein 2005: 14)

At least in democratic Western nations where politicians have to be highly responsive to critical publics and media,, such sensitivities have increasingly inhibited war engagements or forced to end war engagements prematurely, before significant strategic aims have been achieved (Lin/Bekey/Abney 2008: 2).

> *„One of the principal ways that a war is shortened is when the public realizes and appreciates the human cost involved. When this occurs, it can place growing pressure on politicians to seek a quicker, and possibly more diplomatic, solution to a conflict. (Borenstein 2008: 12)*

Thus, as much as the horrific manslaughters in Bosnia, Rwanda, Congo became widely known to everybody, they did not trigger any Western interventions (aiming to restore human rights), because the political costs were considered to be incalculably high (Singer 2009a).

By facilitating war engagements without human losses, robots may have the effect of giving political and military leaders wider spheres of discretion, because they

> *"will further disconnect the military from society. People are more likely to support the use of force as long as they view it as costless. Unmanned systems represent the ultimate break between the public and its military. The result is an American public that is less invested in and linked to its foreign policy than ever before in a democracy." (Singer 2009a: 44).*

Depending on prevalent political strategies and goals, we may well see *"more Kosovos, less Iraqs." (Lawrence J. Korb in Singer 2009a: 44)* in the future, insofar as „selfless“ war commitments dictated by human rights protection will become less risky and less costly in terms of human life.

> *"Indeed, imagine all the genocides and crimes against humanity that could be ended if only the human barriers to war were lowered. Getting tired of some dictator massacring his people? Send in your superior technology and watch on YouTube as his troops are taken down." (Singer 2009a: 48).*

However, we may as well experience more force applied for protecting specific national interests: e. g. for keeping an important ship route open, preventing an enemy to infiltrate certain territories, or for curtailing the construction of unwanted airfields, missile bases or nuclear plants in very early stages.

6. Some preliminary conclusions

Recent developments in self-guided weapons (as deployed in Iraq and Afghanistan) have revived the public interest in „robot soldiers“ and given rise to a scholarly literature that tries to take distance from older Science Fiction projections by setting these new phenomena in a realistic perspective. This realism includes the assessment that technological progress in war robotics has been disappointingly modest within the last 50 years, and that the main trend goes toward semi-autonomous weapon systems with quite specialized capabilities (as for instance the naval „Aegis system“ that has basically remained unchanged since the 1980ies).

In a functionalist perspective, robots are certainly prone to absorb a variety of „dangerous, dull and dirty“ jobs (shunned or impossible to accomplish by human beings), and to fulfill any orders with a degree of totally reliable obedience, diligence and fearlessness never realizable by conventional soldiers. When deployed extensively, robots raise the degree of war asymmetry to unprecedented new levels: by enabling the attacking army to upgrade offensive and defensive potentials and avoid battlefield casualties, and by demotivating the enemy because he doesn't find human targets. Indirectly, this may lead adversaries to divert their aggression to globally spread terrorist activity, because responsibilities for war impacts become so blurred that they can no longer be attributed to specific military actors, but only to the encompassing military-political-societal system (e. g. the U.S. the NATO as a whole).

On the other hand, some major developments in army organization, weaponry and fighting conditions (going on at least since World War II) have considerably reduced the range of activities and tasks where robots can potentially play a useful role. Thus, even conventional modern battlefields demand extremely alert and responsive soldiers able to cope with highly unpredictable and constantly changing situational conditions. And such exigencies are much increased under asymmetric war conditions, especially when fighting occurs in the midst of urban settings where combatants and civilians are as hardly to separate as military from nonmilitary targets. And they culminate of course in the case of peace enforcing and nation rebuilding missions, where the application of force occupies only a minor role in comparison with many other activities (like policing, negotiation, iurisdiction, food distribution etc.) that transcend the role of conventional soldiers.

Under such conditions, optimistic hopes that robots may lift operative military action to higher ethical levels seem to be largely unwarranted – even if their unconditional obedience makes them attractive in the eyes of command centers for a full implementation of formal rules: especially under conditions where the conformity and "morale" of human soldiers seems highly doubtful. Unquestionably, the moral programming of robots is an attractive task for practically minded philosophers who find new rationales for fully explicating and systematizing systems of ethical principles and norms. However, this would increase the degree to which ethical behavior on battlefields is governed exclusively by intellectual considerations unaffected by any emotions.

On a most general level, this implies that the man-robot relationship will always be governed by complementarity – similar to the relationship between computers and their human users (Geser 1989). Thus,

- to the degree that robots become effective in accomplishing highly specialized, narrowly defined tasks, the more human soldiers will stress their polyvalence and all-round ability to react to any new, never foreseen environmental conditions and to interpret current events in wider perspectives;
- insofar as robots increase the prominence of intellectualistic ethical orientations, the more human soldiers may in turn specialize on their empathic and emotional faculties where they don't have to compete with any technical equipment.

> *„….the last thing that computers will ever hope to match is our "emotional intelligence." This is the part of the brain that makes sense of social situations, which is often the toughest part of a soldier's job in dealing with complex situations in conflicts like Iraq or Afghanistan. So, that's why so many folks think we will head towards "warfighter's associates" programs. These are mixed teams of human and robot soldiers, each doing what they do best.“ (P. W. Singer in Shachtman 2009).*

While currently highly improbable technological developments (e. g. toward self-conscious robots) can of course never been fully excluded, we may predict that in Western Culture, there will be particular resistance to accept artificial agents as full members in military teams or to even consider them to be full substitutes of conventional human soldiers.

As Kitano (2006) has recently argued in a highly enlightening paper, Western culture is governed by the notion of "intersubjectivity": meaning that the status of interaction partner is only granted to ALTER EGO's: beings endowed with a phenomenological consciousness and psychological emotions like myself. This premise is certainly manifest in the transcendental phenomenology of Edmund Husserl and Bernhard Waldenfels and in the "intersubjective action theories" expounded by Max Weber, Alfred Schütz, Talcott Parsons and many more.

According to Kitano, such Western views contrast fundamentally with Japanese culture where still shaped by "animistic" religious traditions: by the disposition to see also animals, plants or even nonliving objects as soul-bearing entities that can be addressed in terms of social interaction (e. g. by asking it to accept an offering or to divert an impending evil). Given that the central goals is not to maximize individual happiness but the maintenance of a harmonic social order (Run-In), robots may well be included as social partners when they contribute to this purpose.

> *„In Japan, ethics is the study of the community, or of the way of achieving harmony in human relationships, while in the West, ethics has a more subjective and individualistic basis. in my opinion, the Japanese expectation, or belief, that robots could keep ethical behaviors to be safe, harmonious, useful, sometimes even cute and cartoon-like tools increases the social and personal interests on robots, and motivates to improve their capability and functionality." (Kitano 2006: 81)*

As robot construction is not curtailed by any negative "Frankensteinkomplex" as in Western countries, the Japanese may well become pioneers in the development of "artificial soldiers" in the same way as they dominate today's market of robots dedicated to industrial production and the delivering of services in senescent societal environments where younger age cohorts are on a long-term decline.

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