



Ordering, informing, preparing, fighting in the age of disruptive technologies

Reflections and proposals

RIEUTORD Dylan

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The contributions of what is wrongly called new technologies are visible in our daily lives. The SCORPION programme for the French case but many other projects within foreign armies show that the ground has become favourable for the reception of these technologies within armies, bringing new capability perspectives. Through new contributions to be integrated into every stage of military life, from training to combat and intelligence, technologies increase the scope of possibilities. While some require more maturity, investment, research and development or interest, others are mature and are only waiting to be exploited for the greatest benefit of mankind. How can we take advantage of them? This is the subject of the proposals and reflections made in this article.

Ordering, informing, preparing, fighting in the era of disruptive technologies: thoughts and proposals

The contribution of new capabilities through technology in our daily lives or in the exercise of the military profession is major and omnipresent. Take for example, in the military profession, simulation is used to educate and train pilots and tactical leaders, and to apply military processes and procedures by learning them. Another example is the booming 3D printing that allows for increased operational readiness (OCM) by, for example, providing small spare parts directly at the theatre of operation. This additional resource allows for more flexible and enduring manoeuvre through a new approach to support.

This contribution is also visible in other "operational functions" that we believe to be cardinal. In command first (I). Intelligence next (II). Support (III) and finally combat (IV). A final section will be devoted to the hologram (V). The technologies we are going to

mention are the result of crossovers and developments in already well-established technologies such as computers, algorithms and robotics. This is why we challenge the term new technology. What is new are the uses they allow and the TTPs, tactics, techniques, procedures, reevaluated in the light of these new ranges of skills.

Thus, we will rely on robotics and automation, augmented and virtual reality, and most surprisingly, video games, to show the new combinations and synergies possible between technology and the military thing, starting from the premise that the connectors between all these technologies are artificial intelligence and algorithm.

I) The command function

As far as command is concerned, the objective sought and the main added value of technologies in this function is decision support, on any scale, whether at the tactical, operational or strategic level. The acceleration of the tempo of manoeuvre, the deconcentration of forces or their dazzling convergence, the ever more voluble data transfers at the speed of light, lead the decision-maker to wonder how to process the information gathered in order to remain efficient. Automation must allow the highest spheres to proceed smoothly and smoothly, assisted or even autonomous from the heavy and time-consuming procedure that decision-makers have to deal with. Through the automated filling in of forms, notes or administrative processes, humans could focus more on managing their peers or, failing that, take over and validate the first draft made by automation.

A) Under the prism of augmented reality

1) At the tactical level

Augmented reality can, as close as possible to the field, purify or optimize the display of information for the user. Indeed, a subtle balance must be found between the sensor and the user. If each user remains a basic sensor, conscious and able to listen and observe his environment, we should perhaps consider a delegation not exclusive but greater delegation of data capture by technology. This would allow the user to concentrate and focus on the immediate realities of his action by delegating the interpretation of details and information from the perceived reality to analysts behind the action.

In terms of user experience, this technology can also enhance the ergonomics of the soldier and the management of people by contact managers. By simply displaying biological readings such as heart rate, hydration, ammunition levels, a compass, and the ability to see points determined by himself or other operators who have set them up to detect the action, the user can easily see the biological readings on the visor of his full head protection. If the user could sign targets via a tablet or another tool, a form of enhanced blue force tracking, the user would benefit from a comfort in the exercise of his mission that would take away a lot of inconvenience in addition to a cognitive and material overload. For the contact framework, better team management with an

optimization of distributed missions would be made possible.

2) At higher levels

Augmented reality, through the use of tools such as the digital version of the sandbox, would allow higher levels of design and planning to have a better, more accurate, scalable, and more visual view of the reference situation. From a command and link perspective, it could display on a map the status of the links and the actual transit of data for a vivid view of the evolution of the electromagnetic spectrum. This ubiquity would make possible a direct and surgical action capability on the transmission problem should it fail, represented on the digital sandbox.

B) Link between video games and command

1) Awareness-raising experiences from the top to seduce the bottom

We're bringing video games and virtual reality closer together. Video games have always been closely linked to the military sphere, whether in terms of the themes used, the influence generated, or the target audiences. As a recruitment tool too, let's remember the US Army's game, America's Army [1], supposed to be a propaganda vector for the enlistment of young recruits, or more broadly all First Person Shooters in the military environment [2]. But the world of video games is today also a breeding ground for skills. For example, DARPA is conducting indirect experiments [1] on the brains of "gamers" in action in order to see the possible beneficial effects for soldiers who would be required to control fleets of hundreds of drones for example [2]. 2] Germany has also recruited profiles from gamers for their broader knowledge of computers.

2) New form of command

In the article "Tomorrow, the geeks warlord?[4]", a mimetic attitude to adopt on the part of tomorrow's war operators towards real-time strategy game players was encouraged. Indeed, we believe that a return to mass, made possible by robotics, will lead an operator to control tens or even hundreds of robotic units. Impossible to manage, control and command on a tablet, operators would have to do it from computers. The human-machine interface is a perfect solution, provided that they can simulate the terrain in real time on the tool through the computer. This could be mapped by fragment or not by "spores", a term we will explain. What we call C2 for Command and Control could therefore be transformed by the number and nature of the command that will change with the progressive implementation of robotic units in the ranks of armies.

II) Intelligence

Intelligence through knowledge and anticipation lies at the heart of decision making by its very nature. By directing the search for information in order to exploit it and disseminate it to the decision-maker, the intelligence field will be subject to structural difficulties that will come up against the technologies used today and tomorrow. As with other operational functions, we propose here some reflections in relation to the virtual and certain possibilities offered by technology.

A) Virtual space and intelligence

1) The video game industry

Video games and virtual reality contain within them unprecedented possibilities for intelligence interests. Recently, a news agency used the power of a video game to hide inside the game, books and articles censored by authoritarian regimes or even dictatorships[1], modelled and accessible for reading in a game library. This means that the information is now also found elsewhere than in our reality. Machines will not be able to find it. This paradox of seeing the machine gaining in presence in the real and Man gaining in presence in the immaterial is quite singular. Video games that contain their own communication channels or that generate auxiliary software to allow communication [2] are enormous channels of information to be taken into account. Even if algorithms or scripts would allow to track the information by keyword system or other, it will be difficult to decode the part of the game code in which the censored writings are contained, to use our example. User players will therefore have to "play" to find the information, which is nothing like a game but an investigation, on new territory that needs to be mastered.

2) Analogy between video games and modes of warfare

The parallel between video games and the real world continues for us by saying that unconventional warfare is the real mirror of the cheaters in the video game world. The basic game is coded, has its own graphics engine and rules, it is the conventional, normed world, that is to say, declining a war that respects international law, with rules of engagement and the use of legal weapons. But people with divergent interests always try to find the flaw, the line of code, to recode it, to go beyond it and take advantage of its weakness to rewrite it as they will have decided [3], these are the unconventional modes of action. If the information is in the virtual, the battle of information will go looking for it, beyond what we already see at work between fake, intox, deepfake etc. We believe that it would be appropriate to invest in software for the verification of data flows already captured by technological tools.

B) Robotics and intelligence :

1) Permanent omniscience

The "spheres" raise the question of their effectiveness in carrying out intelligence missions[4]. 4] Robots or automated systems that can be deployed at any time and in any place, but which contain other weak points such as limited storage capacity, are free from sleep and weather conditions, variable or even fragile transmission links, which require cyber security imperatives, would nevertheless make it possible to mesh gigantic territories by providing information in real time and continuously. These robots would be the "spores" that would make it possible to pollinate an entire area of operation. Technologies such as Lidar[5], the Artificial Neural Network[6] or GEOINT[7] would make these spores fearsome.

2) Crazy guards against vulnerabilities

In the event that the robot is captured, there is no risk of leakage of information through physical or psychological pressure due to torture as can be practiced on a soldier. On the other hand, in order to stop the dissection of its software and to read what it contains like an open book, by specialists who will be more and more numerous, a self-destruction or black box system would make it possible to trace, block or destroy them remotely if they fell into the wrong hands. Intelligent camouflage[8] is beginning to make its way into the military research and development landscape. With a heat and sound signature that makes them virtually invisible, these spores may be the most stealthy and zealous collectors of information in history. We could also imagine other functions such as burying and deploying relays to increase network coverage or to allow an electromagnetic bubble in a point space-time.

C) Algorithms :

1) The relevance of the integration of algorithms in the intelligence business

Algorithms already show the extent of their computational power in translation functions [9]. For the intelligence component this is an enormous added value. By making it possible to translate any language or dialect even approximately in real time, the possibilities of collection are multiplied tenfold, the important thing will then no longer be to speak the language even if it is said to be rare, but to know the culture and history affiliated with this language. This is a human prerogative. Technology then refocuses man at the heart of the process.

2) The human role in the end is always paramount

Analysts with more manpower would dissect all of this, from raw information, or information already purged through decision support, to the intelligence produced. But this remains dangerous insofar as the machine that would miss a variable or index deemed useless and ultimately capital, would divert the final result making the intelligence unusable or even worse, counterproductive. Man must therefore remain in the chain at all stages; the question lies in the man-machine ratio. As for the cultural

aspect, the association of ideas, the knowledge of innuendoes and unspoken words, the cultural codes resulting from an irrational part of our affects will never be understood by the machine, capable at best of simulating them. Even if intelligence of human origin will experience difficulties of its own, which we will not discuss here, it will remain first.

III) Support

Training becomes more and more difficult due to a hectic environment, limited resources and equipment that is not available. However, we believe that support should also benefit from the contributions of technology, as feasible solutions could bring about a positive change in the daily lives of soldiers and their preparation.

A) Alternative realities

1) Digital drive

At the user level, virtual reality can also be used in training. Moving on to a higher level where simulation allows procedures to be repeated and applied, it would be possible to improve the quality of the training reflexes and to "live" the training by taking advantage of important gains in the global economy of the means as with the HoloLens of Microsoft. Moreover, the analysis of the past action from all possible angles with editing functions such as pause, rewind, would allow everyone to gain experience thanks to tailor-made feedback, infinite and costing nothing.

2) New forms of assistance that perpetuate competence

Another aspect of support, augmented reality could be great for maintenance, the loss of skill would be frozen. In order to limit the loss of a rare skill or simply because of a shortage or hemorrhage of human resources, augmented reality would make it possible to keep the acquired knowledge and to automatically train anyone who would need this skill, either on a one-time basis or on a permanent basis. In the field of health care and sanitation, what we call "distant reality", i.e. a tele-deportation of a certain know-how through an avatar located at other place than the operator, would allow doctors or surgeons to intervene on patients who are victims of contagious viruses and bacteria by controlling the hands of automatons present far away from the crisis situation. In short, the operator could be on the national territory or behind the theatre while the automaton would be present as close as possible and tele-managed by a professional. In the event of an accident on the group doctor, the avatar would also make it possible to bring care to the victim by this means.

B) Robotics and support

1) Optimization, let's train as we fight

Concerning training, we have already mentioned the opportunity to train in real conditions thanks to virtual reality. With the help of other technologies, we could optimize training by saving time and increasing realism. First of all, armouries should be able to be equipped with a robot that would give the weapon to the shooter. By automating perceptions and reintegrations, a considerable amount of time would be saved. The same goes for the collection of holsters during a shooting session. A small robot cleaning the firing point by itself would save an enormous amount of time. By also using robots as targets when shooting, we could gain in realism on moving targets, on realistic and moving tactical situations, we could equip these robots through virtual reality or not, with different uniforms to allow the soldier to consolidate his knowledge in identification. By gradually injecting algorithms and eventually artificial intelligence, scenarios could be set up.

2) A new "rear-forward" logistics

For logistics, robotics can also be beneficial. In handling tasks, whether it be in the transport of parcels, loading and unloading of live ammunition or any other resource, automatons such as industrial robots could do it. Concerning forward logistics, autonomous convoys are one of the future solutions envisaged [10]. [10] We believe that they could be complemented by robots capable of producing, from 3D printing or other means, resources that can be directly used by soldiers on the spot, from energy to food, material parts or even ammunition. The ability for a small automated portable factory, creating other spore robots or robots for combat would be a revolution. A deployed unit would therefore be self-sufficient and autonomous thanks to this proto portable industry. We could also mention the idea of polymorphic robots also called origami. These prototypes have the ability to aggregate to form unique structures, punctual and reversible in number. Like the ant, these small robots are capable of supporting weights far greater than their own. By investing in this technology, we may very well be able to build bridges, infrastructure, through the aggregation of hundreds or thousands of small robots.

C) Artificial intelligence

As in the world of video games, artificial intelligence, wrongly called as such because they are purely algorithms, has made dizzying progress. From Pong[11], which simply returned the ball, to enemies that adapt to the player's behaviour[12], the algorithms of the civil world and the video game world would make the military sector gain enormously in training and education.

IV) Combat

Having outlined some thoughts on the preparatory phase, we now need to focus on the combat part of the process. Technology has always been of direct benefit to the

combatant, to make him or her more precise, better protected and more mobile. What about the technologies we are talking about here?

A) Deported and augmented forms of combatants

1) Deportations

In our other articles[13] where we think that the mecha is the future of the fighting figure, we show that the agility of the gamers made possible by the joysticks is taken up in the control the remote control of today's robots via Xbox or Playstation controllers because ergonomics is the best and users are used to this type of support and controller. The control of remote tele-operated avatars on the battlefield could be devolved to the joystick or the keyboard. But remote reality could very well, through nanotechnologies or biotechnologies still in gestation, be operated by thought [14], or by other senses.

2) Increase

In the combat part, an artificial voice or a remote binomial called user 2 could advise and monitor the situation of user 1, the human. By doubling the analysis of the situation, by benefiting from another witness, by taking advantage of a distancing of the sight, user 1 would be there also lightened or even helped in his functions. In the form of a technology implanted in protection or related to the combatant, this companion would be extremely useful for the combatant on an individual but also collective scale.

B) Communication issues

1) Challenges and weaknesses of the intermediary

While technology will enable new working methods, providing a more detailed and immediate knowledge of what is happening on the battlefield or in operations, it will inevitably bring its own set of frictions. By automating, Man, as we have shown, is not going to be diminished, he is going to be reclassified where he is most needed. But this will lead to at least four possibilities of incomprehension. By delegating the role to the machine, the latter can misinterpret what it perceives in relation to the enemy machine (first possibility), or to the enemy (second possibility). The link between the allied machine and the operator can also be damaged (third possibility). The understanding of the human on his human enemy, what we know since the first duel in History (fourth possibility) adds to this set of complexities. Through this intermediary that is the machine, we can see that the routing of reality or information is more than ever a crucial issue. If we continue our reasoning, the operations of deception, trickery and other stratagems, whether by cyber or by hacks of any other nature, will multiply, forcing us to revalue electronic warfare and to continue the work in progress in the cyber field.

2) Acculturation to the system

Decision-makers in ten years or more who will also have been users, will have bathed their whole lives in this universe and will be sensitive to these issues. If we can imagine an off-line mode or the use of software to allow the collection of information and its processing while avoiding the risk of compromise, deterioration or deception operations, we can imagine the use of a system that will allow the collection of information and its processing. It is necessary to integrate into the codification and software matrix of the tools one wishes to use, three forms of intelligence thought out and specially designed for specific purposes. They would be reinforced by regular security updates just like the computer world. An evolutionary hardware, the platform or robot, complemented by a software constantly monitored and corrected from the point of view of security, its algorithms, and its artificial intelligence.

C) Intelligences for synergies

A performative intelligence (first), computer intelligence, would be the best in calculations or a particular action, it could be integrated into the cyber and informational domination, or even zone defense for example. Any interpretative layer would be forbidden. A biological intelligence (second), based on the evolution of species, would advocate an adaptive solution. Human intelligence is not the only one required for survival, as animals show us. This form can be applied in the physical domains where robots and systems would have to evolve, this would therefore affect operational functions such as support, contact, support. The third form would be subjective intelligence, derived from human intelligence and ethics, and would be a prerequisite for the use of robots in combat. It is therefore advisable to take what technology can give, always keeping Man in the foreground.

V) The hologram as a tool and weapon at all scales and for all functions.

A) Origin

Popularized by the Star Wars saga, the hologram [15] must be thought to be used also by the military. If we hear the hologram in its current technology, it is only light that must be projected on a support in order to be visible. The Star Wars hologram is therefore for the moment science fiction, since etymologically the hologram would be a 3D photograph made possible by laser technology. In fact, what is commonly and erroneously called hologram, is in fact only an optical illusion [16] based on a 19th century theatrical technique for the staging called "Pepper's ghost".

What happens in our imagination when we hear the word hologram is based on a technology called free space volumetric display [17], and is much more similar to the popularized image of the Star Wars hologram. Also, if we start from this vision, in personalized accompaniment and assistance, it could be used for both the individual and

the collective. One can also imagine the replacement of videoconferencing or the use of the telephone by this device. In fact, it could only have a messenger, monitoring and advisory function.

B) Possible uses

In the intelligence world, the deepfake[18] combined with the deepvocal [19] could make the hologram a diabolically effective weapon. By taking on the appearance of everyone and being able to reproduce a person's voice provided that a one-minute sample has been extracted, artificial intelligences would make the hologram a weapon that is diabolically effective. The virtual image would become a sensor or even an intelligence agent, limited and ephemeral but destructive. This weapon could turn against anyone, so as always, it is advisable to think about the security and countermeasures of the system before its deployment. In combat, the hologram could be a relevant aid in that it could prove to be a mobile and dynamic decoy with pre-established recordings of sounds or behaviours to be produced in order to carry out certain specific missions.

Conclusion :

To conclude on the contribution of technologies that we prefer to qualify as emergent and disruptive, we maintain the idea of the mecha, the most relevant in our opinion to keep this eWe maintain the idea of the mecha, the most relevant in our view to preserve this balance between Man and machine, to protect and enhance Man, while keeping him safe from the breaches created to deceive automation and machine. It is not only technology that will win the battle, let alone the war. It is the "how we are going to" use it that will be predominant. "One machine can do the work of fifty ordinary men. No machine can replace the work of one extraordinary man. 20] It is therefore by making an extraordinary man, capable of remaining competitive at the speed of information, and by supporting him with fifty complementary machines that the new lines of the art of war could be made possible.

1] The first version, subtitled Recon, was released on July 4, 2002, designed by the US Armed Forces to improve the image of the US Army and to encourage people to enlist, it is a free game to reach as many people as possible.

2] While many candidates fantasize about military life through games such as Call of Duty or Battlefield, they nevertheless remain vehicles for advertising the commitment to arms.

3] <https://www.analyticsinsight.net/darpas-initiative-train-military-robot-swarm-using-gamers-brain/>, Accessed March 15, 2020.

4] <https://www.weforum.org/agenda/2020/02/darpa-gamers-brain-waves-train-robots-artificial-intelligence/>, Accessed 15 March 2020.

5] https://hitek.fr/actualite/armee-allemande-bundeswehr-gamescom_20394, Accessed 15 March 2020.

6] Rieutord, Dylan, "Tomorrow, the warlord geeks? ", DSI, N°144, November-December 2019.

7] <https://www.businessinsider.fr/us/minecraft-library-censored-newspaper-articles-online-books-rsf-reporters-borders-2020-3>, Accessed 15 March 2020.

8] In addition to internal messaging within games or servers, let's think for example of software such as TeamSpeak, Mumble, Discord.

9] Better known as cheats, these codes give various advantages to the player who becomes invincible or who grants himself bonuses that completely change the balance of the game.

10] <https://www.c4isrnet.com/unmanned/robotics/2020/03/06/are-orbs-the-future-of-security-drones/>, Accessed March 15, 2020.

11] Laser remote sensing, the most advanced technology today and more powerful than radar, it is used in Tesla autonomous cars.

12] Technology that allows to translate in a natural language what appears on an image. It thus allows target identification and generates a form of awareness of the environment in which the sensor must operate.

13] A method that takes advantage of geographic, geolocalized and/or potentially geolocalizable data in order to provide decision support.

14] <https://sciencepost.fr/ils-ont-developpe-une-veritable-cape-dinvisibilite/>, <http://www.opex360.com/2018/11/24/le-francais-nexter-developpe-un-concept-susceptible-de-revolutionner-le-camouflage-des-vehicules-blindes/>, Accessed on 15 March 2020.

15] Systran and Google Translation have a monopoly.

16] <https://www.futura-sciences.com/tech/actualites/technologie-armee-us-teste-convoi-vehicules-autonomes-54384/>, Accessed March 15, 2020.

17] One of the first arcade video games and the first sports arcade video game marketed from November 1972.

18] The hero's enemies in the FEAR game are known, among other things, to be one of the best AI in video games.

19] Rieutord, Dylan, " Le robot idéal ", S'ENGAGER PAR LA PLUME, vol.2, 2018, p. 117-126.

Rieutord, Dylan, "L'éthique appliquée à la robotique militaire par le filtre de l'officier", RDN Tribune, 2019.

Rieutord, Dylan, " Blitzdaten et mecha, quand l'imaginaire rencontre le nécessaire ", DSI, N°133, January-February 2018, pp.80-85.

20] For example, the Americans are working on the control of robots via a special bracelet, via the sense of touch. The Russians are working on the control of drones through thought. Here are two possible methods.

21] The work of the Hungarian-born British researcher Dennis Gabor led to the development of holography in 1941. But it was not until 1972 that researcher Lloyd developed the integral hologram, combining the visible white-light transmission hologram with cinematography to produce moving holograms.

22] The music group Black Eyed Peas achieved the so-called feat of performing a concert using the hologram when it was tomography. The Japanese have been using a holographic product called Atsune Miku, who is a real star in Japan, for several years. It is a "hologram" that dances and sings during a concert when it is actually an image projected on a glass background. In the political field, Jean-Luc Mélenchon used technology in appearance, since here too it was a 2D video projection from the ceiling of the theatre on an almost transparent film screen placed at 45°, creating an optical illusion during his campaign.

23] <https://www.courrierinternational.com/article/technologie-un-hologramme-en-3d-presque-comme-dans-star-wars>, Accessed March 16, 2020.

24] <https://la-rem.eu/2019/11/deepfake/>, Accessed March 16, 2020.

25] <https://www.clubic.com/technologies-d-avenir/actualite-842781-voix-imitee-minute.html>, Accessed March 16, 2020.

26] Elbert Green Hubbard.

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