**Cognitive warfare: the race to dominate the intelligent age**

 Source: PLA Daily

Release time: 2020-03-20

<https://m.yunnan.cn/system/2020/03/20/030622151.shtml>

　The widespread use of artificial intelligence technology in the military field has given rise to a new form of intelligent warfare, cognitive warfare. When the winning mechanism is integrated with the characteristics of the intelligent era, a new way to win cognitive warfare is formed. Optimal decision-making, vision-driven, clustered energy release, and unmanned autonomy based on cognition are typical characteristics of winning wars in the intelligent era, and have become the key to taking the initiative and winning in wars. The fundamental way to win in the intelligent era lies in cognition, and cognitive advantage is the basis for winning. Moreover, when the strength of the two opposing sides is equal, the advantage difference formed by the cognitive gap becomes the main factor for winning.

**Winning through optimal decision-making based on intelligent cognition**

　　Decision-making is the key to victory in modern warfare, not only because of its important role, but also because in the OODA (observation, judgment, decision-making, action) loop, decision-making is the bottleneck that restricts the speed of the cycle. Intelligent cognition that integrates knowledge and action is a powerful means to break this bottleneck.

　　Optimal decision-making based on intelligent cognition means forming a cognitive advantage over the enemy through artificial intelligence algorithms, and then transforming the cognitive advantage into a decision-making advantage, thereby gaining the initiative and winning. In the war of the intelligent era, intelligent means provide the intelligent cognitive capabilities required for war to the greatest extent possible, comprehensively perceive, reason, and judge the strength, time and space position of the physical domain of the two opposing sides on the battlefield, the power system and command system of the information domain, and the plan and possible actions of the cognitive domain, which continuously provide "input" data for the algorithm; the superior algorithm quickly analyzes, judges and compares the results of intelligent cognition, finds out the weak links or fatal points of the enemy, gives full play to our advantages and characteristics, and forms a scientific, reasonable and executable decision-making plan. At the same time, it also combines the combat capabilities and combat characteristics of the two opposing sides to further amplify the cognitive advantage, so as to achieve "second-level advantages become winning advantages" and "a little advantage becomes winning advantages".

　　In this process, intelligent cognition is the foundation. It is the "data" of the superior algorithm, providing the correct source for correct decision-making and guiding the direction of operational decision-making advantage. Without intelligent cognition, algorithms and decisions will face the dilemma of "cooking without rice", not to mention algorithm advantages and decision-making advantages. Intelligent algorithms are the key. Its input is cognitive thinking and its output is decision-making plans. It is the specific method and intermediate bridge for cognitive advantages to transform into operational decision-making advantages, and plays an increasingly important role in modern warfare. To this end, driven by intelligent technology, all countries have elevated the "algorithm warfare" that supports decision-making effectiveness to the level of "war". In 2017, the US Department of Defense announced the establishment of a special "algorithm warfare" cross-functional team to unify the leadership of the US military in conducting "algorithm warfare" research and application. Decision-making advantage is the core, the true embodiment of cognitive advantage in the command field, the touchstone for testing the effectiveness of algorithms, and the ultimate display platform for intelligent cognition and intelligent algorithms. The wisdom of a commander is incomparable to that of a machine. It is integrated with profound decision-making experience and matched with unique personal command art. The decision-making strategies formed are ever-changing and difficult to capture. Only when the superb decision-making art is amplified and enhanced by intelligent algorithms can a truly winning decision-making advantage be formed.

**Vision-driven success based on goal recognition**

　　The war stage is never a performance of a single force, but a joint effort of multiple forces. How to make the various forces involved in the war work together and the various actions converge into one force is a necessary condition for winning the war. Therefore, before the war, it is necessary to formulate a detailed combat plan, anticipate various possible situations, and repeatedly organize combat coordination and targeted training for various actions. However, during the implementation of the operation, changes in the battlefield situation, changes in the intentions of superiors, changes in core tasks, changes in friendly forces, etc., make it difficult for this traditional coordination method to achieve the expected results, and often become a restrictive factor affecting the progress and outcome of the war.

　　In fact, every commander and every participating force has a beautiful vision for the combat mission in their hearts, and may have an action plan to realize the beautiful vision. If these visions can be unified and spontaneously integrated into the overall action, then coordination will no longer be a bottleneck, and the concept of vision-driven will come into being. Vision is the prospect that people yearn for, the picture that people actively strive for and hope to achieve, and a strong expression of will, including future goals, missions and core values. Behavior driven by vision is no longer a compliance behavior constrained by rules and regulations, nor is it an investment behavior agreed upon by obligations and rights. It is more of a spontaneous and conscious dedication behavior. This is a state of mind, not just investment, but a feeling that one must take full responsibility for the realization of the vision. The role of this subjective initiative is unimaginable. The latest research results show that the reason why mental work causes fatigue is because people are subjectively bored with the mental work they are engaged in. Once the subjective initiative is restored and maintained, mental work will remain efficient for a long time. This is not only a source of power for innovation, but also a source of power for vision-driven.

　　The generation of vision-driven is based on cognitive ability and is determined by the level of intelligent technology. For war, a complex giant system with obvious social characteristics, common cognition supported by intelligent technology makes vision-driven possible. Each participating force, based on the core tasks and basic requirements clearly defined by the commander, develops its own combat operations, clarifies the relationship with other forces, and clarifies the specific list of support or support required, so as to form an individual action plan. The commander collects the individual action plans of each participating force, conducts comprehensive analysis and comparison, examines whether the core tasks can be completed, retains the reasonable content of the individual vision as much as possible, forms a flexible group vision implementation plan, and leaves each participating force with a large space to complete the combat mission independently. Driven by individual visions, all commanders and combat forces in combat give full play to their individual enthusiasm and initiative, and creatively play their personalized characteristics and roles; driven by common visions, they actively coordinate and cooperate with other forces to jointly complete combat missions.

**Winning through cluster release based on group cognition**

　　Intelligent swarm warfare is a popular topic at present. In fact, swarm is not a new concept. The inspiration comes from nature. Swarm behavior is a collective behavior of organisms. Insects, birds, fish, etc. in the biological world all show swarm behavior. In particular, this swarm behavior can resist enemies that are several times larger than themselves and obtain more food sources, which is even more amazing. It is difficult for people to explore the activity patterns of the brains and nerves of these organisms, and it is difficult to directly grasp the root cause of swarm behavior. However, we can continuously dig out the organizational principles and operation methods of swarm actions from their performance patterns, and use artificial intelligence technology and modern network technology to apply them to human social life and the military field, and become the way to win the war in the intelligent era.

　　Cluster energy release based on group cognition means integrating a certain number of low-cost, miniaturized, unmanned combat platforms into a unified combat cluster, and achieving common combat goals through targeted and precise energy release. It is a comprehensive embodiment of the philosophical principle that quantitative change leads to qualitative change, and group cognition is the fundamental motivation for qualitative change. Without group cognition, the cluster can only be a quantitative change, and it is difficult to produce substantial changes in combat effectiveness. The reason why cluster energy release can win is that it has a multi-dimensional saturation attack capability that wins by quantity, distributed detection and attack capabilities, high anti-destruction and continuous strike capabilities, and system precision and intensive energy release capabilities, thus forming a subversive winning advantage.

　　Swarm combat is based on group cognition, which requires that in rapid action, each individual should accurately and comprehensively recognize his or her position and status in the group, and provide cognitive capabilities for the group or subgroup to which he or she belongs; the group or subgroup should accurately and comprehensively recognize the status of its internal members, accurately and comprehensively recognize its own status, and provide cognitive capabilities for the group to which it belongs. Group cognition in the intelligent era allows combat to simulate the collaborative behavior and information interaction of swarming organisms, showing the cluster characteristics of decentralization, autonomy, cluster recovery, and function amplification, and releasing combat effectiveness and completing combat tasks in an autonomous and intelligent overall collaborative manner.

**Unmanned autonomous victory based on active cognition**

　　In the war of the intelligent era, intelligent unmanned systems will fill the entire intelligent battlefield, and people will be less and less on the battlefield. Intelligent unmanned combat systems will become the new force of the intelligent battlefield. They have capabilities that humans cannot achieve, such as stronger battlefield adaptability, stronger weapon control ability, stronger reaction speed, stronger continuous combat capability, stronger self-protection ability, and stronger self-regeneration ability. In addition, they do not have the psychological pressure, physiological reaction to bloody scenes, sentimental human emotions, and fear of war-weariness and cowardice formed by humans in the face of fierce battlefield confrontations. All these indicate that the future confrontation battlefield will be the stage for intelligent unmanned combat systems. Therefore, under the overall leadership of humans, actively and creatively understanding the battlefield, allowing intelligent unmanned combat systems to freely and fully exert their advantages and effectiveness, has become an important method to win the war.

　　Unmanned autonomous victory based on active cognition is to give full play to the active role of intelligent unmanned combat systems in the cognitive field. Machines and humans have different ways of thinking and different behavioral characteristics. Just like Alpha Zero can open up a new era of Go, machines can often create new spaces that are difficult for humans to explore. Therefore, wars in the intelligent era, under the overall leadership of humans, must fully provide a broad space for intelligent unmanned combat systems to display their talents, give full play to their active and creative abilities, and quickly absorb and focus on the huge energy brought by active cognition.

　　Intelligent unmanned combat systems show themselves. Human domination and machine passivity will make it difficult to bring into play the comprehensive advantages of intelligent unmanned combat systems. It is necessary to break the shackles of intelligent unmanned combat systems driven by the concept of autonomy. Only by keeping the basic bottom line and allowing machines to fight freely on the battlefield can the precise and rapid combat effectiveness of intelligent unmanned combat systems be demonstrated, and only then can they be fully and autonomously exerted in war, truly releasing the huge energy of intelligent unmanned combat systems in all aspects.