

A Study on Integrated Manned-Unmanned Teaming for Future Ground Warfare Victory

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Abstract

One of the current focal points in the defense sector is how to strategically leverage the technologies of the Fourth Industrial Revolution in military operations. The Fourth Industrial Revolution denotes a transformational shift in the environment where automation and connectivity are maximized, primarily driven by advancements in machine learning and artificial intelligence. Coined by Klaus Schwab at the 2015 Davos Forum, this term signifies a profound change in human activities, akin to how a single machine replaced hundreds of laborers in the past. The military application of Fourth Industrial Revolution technologies is increasingly researched and anticipated to be actively implemented. Combat, as a subset of warfare, entails military actions between units conducting war. Typically performed by units to achieve one or more objectives, the concept of combat involves the fundamental ideas guiding the conduct of military operations against adversaries, both presently and in the future. Hence, it is imperative for our military to develop future combat concepts by harnessing the key technologies of the Fourth Industrial Revolution.

Keywords: *Victory, Manned-Unmanned, Future, Ground, Military Operations*

1. INTRODUCTION

In the recent era of the Fourth Industrial Revolution, rapid advancements in science and technology are reshaping the landscape of future warfare. One of the most noteworthy changes is the shift from human-centric to unmanned combat systems as the primary agents of engagement[1]. This transformation is prominently evident in recent wars conducted by the United States, prompting efforts within the army to establish drone bot combat units in alignment with this trend[1]. Considering this contextual shift, it becomes imperative to articulate and define the concept of integrated manned-unmanned teaming, which has not yet been clearly conceptualized. Moreover, there is a pressing need to conduct research on how to deploy such systems on the

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battlefield[1].

2. DISCUSSION ON INNOVATION IN FUTURE ARMY COMBAT CONCEPTS

The innovation of future army combat concepts can be broadly categorized into three main aspects. Firstly, there is the concept of the Korean-style combat system. In other words, a Preemptive-Predecision-Preaction-Defense-Support system where each combat system operates in mutual interaction, aiming for the shortest time, minimal damage, and maximum effectiveness.

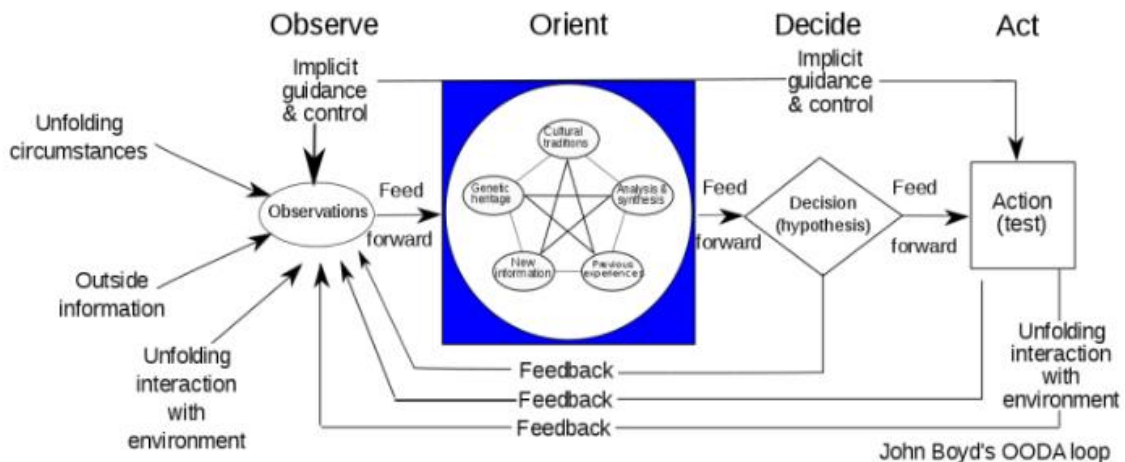


Figure 1. OODA Theory[2]

Among these, the Pre-emptive system focuses on anticipating the enemy's intentions, prioritizing target information processing, particularly in surveillance gap blocking (satellites, drones), 24-hour surveillance (energy harvesting), and ensuring the survivability of information assets (stealth). The pre-decision system involves the integration of combat units and combatants (real-time sharing of information, visualization, and prediction of combat situations). The Pre-action system refers to precise strikes using various means such as sensor-shooter fusion and automated firepower control. The defense system includes distance and time-variable interception (active defense), new concepts of weapon systems such as nano-technology combat suits and gas masks (CBR defense), and drone defenders. Lastly, the support system involves overcoming time and information constraints (unmanned transport equipment), on-site support (3D printing), and predictive supply (AI, IoT).

3. FUTURE DEVELOPMENT DIRECTIONS FOR COMBINED MANNED AND UNMANNED TEAMING IN THE ARMY

The future development direction of the South Korean Army's manned and unmanned combat operations is as follows. The organization of unmanned systems is considered, taking into account the control capacity of combat personnel. This involves considering a one-person, one-unmanned system, considering combat load and cognitive overload, enabling both manned and unmanned combat operations.



Figure 2. Manned and unmanned Combat System[3]

Furthermore, from the perspective of military innovation (RMA), it is essential to comprehensively study the concepts, structures, and weapon systems of manned and unmanned systems. Finally, integrating human combatants, autonomous combat weapons, and combat units into a single platform will enable the execution of combat missions. The conceptual design of the South Korean Army's manned and unmanned combat operations is as follows. The collaboration between AI-based autonomous robots and human combatants is crucial for conducting combat operations, disrupting the strategic focus of the enemy in a multi-domain battle environment. The intelligent robot system is expected to be the key capability in manned and unmanned combat. To achieve manned and unmanned combat, multi-sensors such as heat and sound will be utilized to collect enemy information, and the data will be analyzed by artificial intelligence, reporting to the commander. Super soldiers and intelligent robots will collaboratively perform missions, with human combatants in robot suits capable of autonomous flight, organized in teams with autonomous robots under their control. Real-time communication between manned and unmanned combat systems will enable mission execution.



Figure 3. hyperconnected map Map[4]

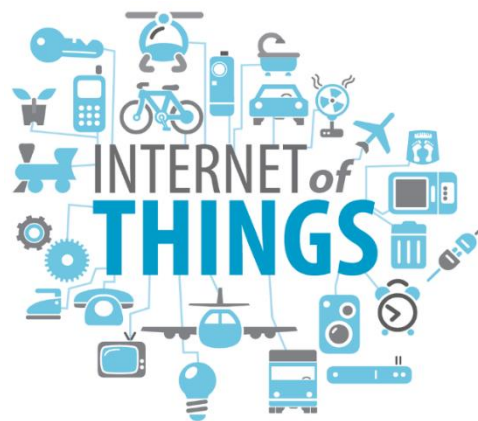


Figure 4. hyperconnected IoT Map[5]

To establish the foundation system for manned and unmanned combat, the integration of human combatants, autonomous combat weapons, and combat units into a single platform, with a differentiated mix of manned

and unmanned ratios based on the nature and risk level of the combat mission, will be developed.

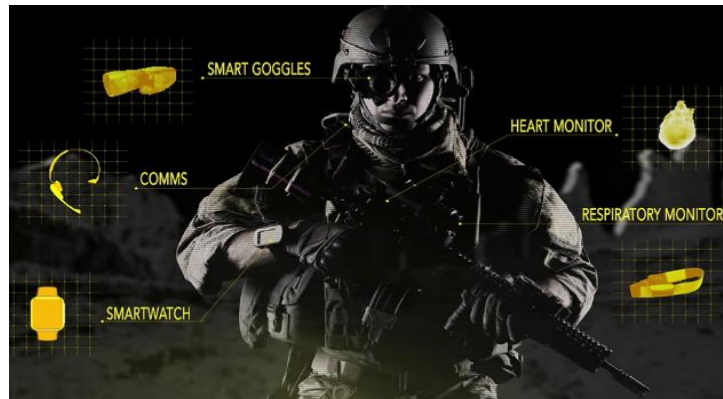


Figure 5. Manned and unmanned Combat System[6]

4. CONCLUSION

The future concept of army combat operations should effectively utilize the core capability of unmanned combat robots through the interaction of the "Pre-emptive," "Pre-decision," "Pre-action," "Defense," and "Support System" to neutralize the enemy center and achieve "the shortest time, minimum damage, and maximum effect." To achieve this, it is crucial to develop military science and technology in line with the unique characteristics of Korea, concretize the concept of unmanned combat operations, and efficiently build the infrastructure for effective combat operations. This will position the military as a game-changer in the future.

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