DRONE SWARMS FOR ARTSAKH'S DEFENSE

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Category: Opinions

Prof. Z. S. Andrew Demirdjian, Los Angeles

"The era of drone swarm is coming, and we need to be ready for it".
Zachary Kallenborn

Mother Nature has always provided models for humans to emulate. As a result, we have now scientific fields such as biomimetics or biomimicry, which focus on emulating models, systems, and elements of nature for the purpose of finding solutions to complex human problems. Birds are studied in aviation, fish for ship/submarine design while insects are emulated for swarm intelligence, to cite a few.

In a previous article, I presented the most recent low-cost anti-drone devices for Artsakh to acquire for defense. Here I will introduce "Drone Swarms" which are attack drones that operate in groups to seek, identify, and target enemy positions for destruction without a leader telling them what to do when difficulties arise.

Technically defined, *Drone Swarms* are "multiple unmanned platforms and/or weapons deployed to accomplish a shared objective, with the platforms and/or weapons autonomously altering their behavior based on communication with one another." Let us shoot for a simpler explanation of this new technology.

The backbone concept of drone swarms (DSs) is the theory and practice of Swarm Intelligence (SI), which comes from nature, especially biological systems. The source of SI are deeply embedded in the biological study of self-organized behaviors found in social insects. SI systems consists of a biological population of simple members (aka agents or boids) interacting locally with one another and with their environment. The individual members follow very simple rules. Although there is no centralized structure (i.e., a leader) to dictate how individual agents should behave, the interactions between such agents lead to the emergence of "intelligent" global behavior unknown to the individual agents.

Swarm intelligence in natural systems are familiar to us. They include systems such as ant colonies, bee colonies, bird flocking, animal herding, hawks hunting, fish schooling, and microbial intelligence (as in Coronavirus).

The application of swarm principles to robots is called swarm robotics, while SI refers to the more general set of algorithms (problem solving functions). The earliest use has been in swarm prediction in the context of forecasting problems. These intelligent machines, inspired by swarms of insects, will revolutionize the future conflicts. From swarming enemy sensors to wide area search-and-rescue missions, they have an extensive range of uses on and off the battlefield.

Essentially, Swarm Intelligence (SI) is the collective behavior of decentralized, self-organized systems, natural or artificial. The concept is employed in work on artificial intelligence. The SI

expression was introduced by Gerardo Beni and Jing Wang in 1989, in the context of cellular robotic systems.

The power of SI is being harnessed by military weapon manufacturers as the most sophisticated weapon the world has ever known. To appreciate well the power of DSs, we should first understand how SI takes place.

So, let us ask, under what conditions does SI emerge? Very recent scientific studies have shown that those creatures such as insects and other primates produce a phenomenon known as SI. Interestingly enough, this phenomenon is not exhibited in its individual members. But it will appear in them when they are in a group (something like the old social-psychological concept of the Mob Effect observed during the French Revolution --docile citizens becoming violent demonstrators when in a group. A lone wild beast will not dare cross a raging river to greener pastures except when it is in a group. Let us examine a familiar Uninvited Guest --or rather Pest: If you were to look at an uninvited guest such as an ant, say on a kitchen counter, you would see that it is going frantically back and forth as if it is lost. The ant moves aimlessly in circles without any scheme – it is not teleological (not goal-directed). Here are the metamorphoses (changes) of the dumb ant. When this "dumb" ant gets into its group, when it smells other ants and communicates with them, it suddenly becomes a crafty architect, an accomplished engineer, a consummate bridge builder, an artistic pathway designer, a clever multilevel-multiple-lane freeway constructor, and even an astute estate developer of the finest underground mansions with many rooms and storages.

This tiny creature is suddenly enabled to haul food hundredfold its weight. The ant becomes a hardworking genius when in a group because of SI effect. Locusts fly in swarms of up to two billion, and when in groups--can eat and destroy crops of an entire field in a matter of minutes.

The genius of swarms is now dawning on the human mind. This freak of nature is being emulated in human activities. While a single ant is not smart as an individual, but its colony (i.e., group) has intelligence. The study of SI is providing insights that can help humans manage complex systems. Such systems run the gamut from truck routing to military robots such as DSs, from managing a firm to managing large keiretsus (large interconnected family of companies).

In swarm communities, how they form, interact, and disperse, and carry out certain tasks is irrevocably changing the landscape of humans to organize for efficiency and effectiveness. Remember, in swarm colonies, there are no generals giving orders (We do not need our deadbeat generals, anyway). Each and every member of the group acts to uphold the mission of the group without being told to do. Such a behavior ushers in the concept of self-organizing, being self-motivated, being goal-directed, and working toward the good of the whole group. Armenians need that kind of characteristic to make them avoid getting into a "double crisis", such as having their President (Armen Sarkissian) resign when the country is still caught in the quagmire of the first crisis created by the 44-day war 2020.

Would it be far-fetched to say that since Armenians are individualistic, they do not work well in groups, and therefore they miss producing SI very often?! I am asking a question which has bothered me since my high school days.

The characteristics of SI in military weapons are also frightening. Once DSs are programmed and given a mission, no one can escape from their pursuit until they accomplish their mission.

You think attack drones are dreadful. Wait till you get acquainted with swarm drones, which like a pack of wolves chasing in coordinated unison a lonely prey in the darkness of night. They are the ultimate predator squadron in the sky rendering the battlefield as their own backyard to play lethal games on their enemies.

Most likely, Armenia won't be able to buy DSs, but anti-drone devices would not be that expensive. As a result, they should strengthen their defensive position against enemy attack drones and DSs.

The problem with DSs is compounded. While attack drones are launched individually, DSs are unleashed as a group for mass destruction. Therefore, anti-drone devices are very effective against individual drones, but not yet so effective against a self-organized, self-motivated, self-directed squadron of drones flying in the sky as a flock of birds. I am certain that very soon we shall have the technology to effectively fight against DSs as a gang and disable them before they would accomplish their mission. Drone robotics will continue to produce all sorts of UAVs in the near future. Currently, the emphasis is on laser-based anti-drone technology.



How different is DSs from the attack drones that were used by Azerbaijan/Turkey's forces? When we compare and contrast attack drones with DSs, we would get a better idea about this new, celebrated aerial killer:

1. Attack drones are operated by a remote pilot, while DSs do not require one once they are launched with a mission. A person can program them to launch against the enemy from the comfort of his home.
2. Attack drones must be directed by remote pilots in order to accomplish their mission, but the DSs are self-directed.
3. Attack drones can function singly, while DSs biggest advantage of a swarm operation is the ability of the DSs to work together in numbers --and numbers matter when it comes to the battlefield. As a result, the latter must be purchased in multiples of two or more.
4. Once an attack drone is disabled, no one can easily reactivate it, while DSs are able to solve problems as a group to continue with their mission.
5. Attack drones only communicate with their remote pilots, while DSs communicate with one another in the group to adjust behavior in response to real-time information.
6. Attack drones are electronically driven from a distance, while DSs are self-directed based on Artificial Intelligence and computer algorithms.
7. Attack drones are designed for either offensive or defensive purpose, while DSs have significant implications for both the offensive and defensive strategies.
8. Unlike attack drones that fly singly, DSs are vulnerable to electronic warfare attacks such as by anti-drone devices (e.g., anti- drone RF Sensors). Since DSs are dependent on drone-to-drone communications, disrupting that signal also disrupts the swarm's connectivity.
9. The key difference between DS technology and the current drones is self-organization and initiative of the DSs drones when launched to seek targets for destruction..
10. Finally, an attack drone can be purchased from China for $1m, while DSs must be purchased more than one and since it is based on new technology, they are over several millions of dollars for just one. However, compared to attack-drones, they are very inexpensive.

The corruption among the Armenian senior military leaders is unforgivable. The embezzlement of the money geared for modern military weapons must have deprived Armenia from owning attack-drones. Armenia has to drain the swamp in order to get rid of egocentric officers. The essence of any kind of human relationship is loyalty. For the opposite of loyalty is betrayal.

Based on the November 9, 2020 ceasefire trilateral agreement by Armenia, Azerbaijan, and Russia, Armenia and Artsakh have a margin of five or at most ten years to become ready to respond to Azerbaijan's demands. Consequently, Armenia and Artsakh should be ready to protect their rights when President Ilham Aliyev declares that he is ready "to teach the Armenians a second lesson" if they do not accept his mandate of building a corridor through Syunik Province (marz) or of his insistence of turning over Artsakh (Nagorno-Karabakh) to Azerbaijan's rule.

Azerbaijan has become a force to reckon with in the last ten years while Armenia's top military brass hid its head in the sand not to face reality of the rapid militarization of its arch enemy and became distracted with the pursuit of personal gains.

Armenia and Artsakh most likely will dilly dally again and when the moment of truth comes, they won't measure up to the enemy's challenge. The Diaspora has to step in and make sure that Armenia and Artsakh are concentrating on strengthening national security of especially Artsakh. Armenia's attitude of "just send us money, we know what we are doing" is inoperative. The Diaspora should reject Armenia's self-defeating 'know-it-all' attitude and demand direct involvement in the enhancement of national security of the homeland.

The deployment of drones was a major factor in Azerbaijan's winning the war. Failure to acquire anti-drone devices will result in losing another war. Enemy drones stole the wind out of Armenia's ground forces' sail. Now, imagine a gang of SDs heading toward Stepanakert, seeking out targets and spraying nerve agent. Right now this scenario is imaginary, but will become quickly a reality with SDs technology, which will have significant effect on every area of military conflict, from expediting supply chains to delivering nuclear bombs. Most military experts marvel at the martial skills the new weapon has in making difference in the outcome of an armed conflict.

Armenians made a fatal mistake in the war for not being prepared to counter Azerbaijan's drone attacks. I cannot fathom how Armenian generals overlooked Azerbaijan's preparedness. Were they the daredevils who were sure that fate was on their side?

Unlike other natural systems, Armenians function well as individuals, but when in a group, they fail to produce SI or synergy because of lack of unity. Let us not come together only in times of crisis; let us get together to map out and execute strategies for solving future problems, carrying out projects, and advancing Armenia and Artsakh. Being proactive requires Armenia to plan ahead to face the waywardness of its adversaries.

Most importantly, it is about time also to enlist Diaspora's non-monetary contributions with genuine gratitude and open arms in enhancing homeland's national security position to be enjoyed by generations after generations in their ancestral land.

Despite Zachary Kallenborn's warning in October 25, 2018 that "the era of the drone swarm is coming, and we need to be ready for it," Armenia and Artsakh paid no attention to the fact that combat drones are changing the world of military aggression. As a result, they paid dearly for that indifference during the Second Artsakh War in 2020. Kallenborn is an author and analyst who specialize in WMD (Weapons of Mass Destruction) terrorism, unmanned systems, drone swarms, and homeland security. Let us heed his warnings.

If our beloved Yeghishe Charents (1897-1937) were here today, he would have declared: "Oh, the people of Artsakh, your only salvation is in the power of your drones!" Here is the left-brain question: Would we have listened to him in time? Or we would have bemoaned later for the opportunity lost?

Comments



Michael Benlian – 2022-03-02 21:14:57
Excellent article. Very informative. Now is the time to unite, to prepare and to be ready. Thank you Prof. Demirdjian. Amen.