Simulation of Armed Conflict Using Unmanned Aerial Vehicles (UAVs) in Ground Combat Operations

Borysenko , Volodymyr (School: Cherkassy School Number 28)

The modern world is on the threshold of a technological revolution in warfare, which requires a rethinking of the simulation of combat operations, considering the increasingly important role of robotics and UAVs. Stochastic models of armed conflict based on Lanchester's quadratic law are considered herein. These models assume the heterogeneity of armed forces and describe casualties in terms of a Poisson process, considering combat units as a single indivisible whole. For one of these models, the distribution of solutions was obtained using the Monte Carlo method, which ranged from the most unfavorable to the most favorable scenarios using two properties: the number of casualties of the winner at the end of the battle and the duration of the battle. Attacked targets are chosen randomly following the probability of attacking the first detected target. The obtained results are visualized in the form of a heat map. The model provides information in terms of the probability of success of military operations with given permissible losses. The second model, with cellular automata, considers information about the positioning of individual combat units on the plane, which can move one cell at a time or make fortifications per unit of time and interact with the enemy within the radius of fire damage as in the previous model. This model also considers modifications such as natural obstacles, physical maps, mined territory, and UAV drones, the range of which is significantly higher than the range of conventional forces weapons. The impact of UAVs on the battlefield situation is evaluated and indicates a significant advantage of such systems in the probability of victory. The results of modeling may be useful for tactical military planning, with the inclusion of UAVs and robotics.

Awards Won:
King Abdulaziz &amp
his Companions Foundation for Giftedness and Creativity: Full Scholarship from King Fahd University of Petroleum and Minerals(KFUPM) (and a $400 cash prize)
King Abdulaziz &amp
his Companions Foundation for Giftedness and Creativity: NOT TO BE READ -- $400 cash prize for each Full Scholarship from King Fahd University award recipient