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# 基于自适应A*算法和改进遗传算法的反舰导弹航路

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Title: Path Planning of Anti-ship Missile Based on Adaptive A* Algorithm and Improved Generic Algorithm

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摘要: 以计算时间和航程距离为优化指标,以反舰导弹机动性、最大动力航程、各种通行障碍为约束条件,提出了反舰导弹射前航路优化的改进A*算法和改进遗传算法。改进A*算法通过构建一个网络来搜索次优路径,在搜索过程中,网络节点间距和节点密度随战场环境自适应改变。该算法以更小的计算量获得更优的航路,而且能够应对复杂程度很高的战场环境。改进遗传算法通过实数编码技术和初始种群智能化创建方法,生成具有可变长的染色体和全部由可行解组成的初始种群,避免了初始种群中由于存在大量非可行解而导致搜索效率降低的问题。最后,对两种改进算法在不同复杂程度的作战环境中进行了仿真实验,结果表明,改进A*算法适合用于复杂战场环境下的实时航路规划,改进遗传算法则适合用于导弹发射前并且精度要求高的航路规划。

Abstract: Computation time and voyage were optimized as objectives whereas maneuverability of the anti-ship missile, maximal flight, all kinds of obstacles were considered to be constraints, and path planning methods were presented for pre-launch route optimization of an anti-ship missile based on adaptive A* algorithm and improved generic algorithm. In improved A* algorithm, sub-optimal path was obtained by constructing a network in which node distance and node intensity could be changed adaptively with respect to operation environment in the search time. With this method, closer optimal path was found out in less computation load, furthermore, it could solve the problem of path planning in particularly complex environment. In improved generic algorithm, through using real-valued encoding technique and intelligent creation method for initial population, feasible individuals only were created which had variable-length chromosome and real-valued encoding. The problem was solved for low search

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efficiency due to a great deal of infeasible solution in initial population. Finally, simulating experiments were done to use two proposed improved method in different operation scenario. The results show that the first method is suitable for real-time path planning in complex operation zone, whereas the second method is suitable for high-precision path planning problems in pre-launch phase.

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