

Anti-Jamming Weighted Clustering Algorithm for UAV-Mounted Weapon Self-Organizing Network

Siqi LI*, Xiang GAO*, Yuhan LIU*, Piao HE*, Jianing JI*, Peng GONG*

* *National Key Laboratory of Mechatronic Engineering and Control, School of Mechatronic Engineering,
Beijing Institute of Technology, Beijing, China*

lsqbit@163.com, bitxianggao@bit.edu.cn, rainyhelen@163.com, 3220230127@bit.edu.cn, jjianing2023@126.com,
penggong@bit.edu.cn

Abstract—Compared to traditional self-organizing networks, UAV-mounted weapon self-organizing networks are characterized by high node mobility, vulnerability to interference and attacks, extensive coverage, and large-scale network sizes. These factors complicate network management and the operation of routing protocols. Cluster-based topologies can be employed to optimize network management, reducing the impact of local topology changes on the entire network. To address the issue of cluster instability caused by the high mobility and interference susceptibility of UAV-mounted weapons, a anti-jamming weighted clustering algorithm(AJWCA) is proposed. The algorithm builds on existing weighted clustering approaches by incorporating an interference factor into the cluster head selection process. Additionally, a backup cluster head mechanism is introduced to mitigate cluster oscillations resulting from the failure of cluster head nodes in battlefield and emergency scenarios. The effectiveness of the proposed algorithm was validated through simulations. The results show that the algorithm effectively enables efficient clustering of network nodes and improves cluster head duration under interference conditions. Moreover, the method demonstrates rapid recovery capability in the event of node failures, making it well-suited for deployment in complex operational environments.

Keyword—UAV-Mounted Weapon, Network Topology, Clustering Method, Interference Factor, Backup Cluster Head



Siqi LI received the BS degree and MS degree in Beijing Institute of Technology in 2018 and 2021, respectively. Now she is a Ph.D. candidate in School of Mechatronic Engineering, Beijing Institute of Technology. Her research interests include intelligent IoT system, communication network simulation, optimization of communication resources and so on.



Xiang Gao received the BS degree, the MS degree and the Ph.D. degree in school of Mechatronic Engineering from Beijing Institut in 2014, 2016, and 2021, respectively. Now he is a associate professor in Beijing Institute of Technology. His research interests include network simulation and emulation, NOMA, VLC, D2D communications, IoT, cryptography and so on.



Yuhan Liu received the BS degree in North China Institute of Science and Technology in 2020, and followed by the MS degree in Beijing Institute of Technology in 2024, respectively. Now she is a Ph.D. candidate in School of Mechatronic Engineering, Beijing Institute of Technology. Her research interests include communication network simulation, radio fuse effectiveness evaluation and so on.



Piao He received the BS degree in Aerospace Engineering from Beijing Institute of Technology in 2023, and now she is a MS candidate in School of Mechanical Engineering, Beijing Institute of Technology. Her research interests include wireless network simulation and emulation, wireless communication and so on.



Jianing Ji received the BS degree in School of Mechanical and Electrical Engineering from North University of China in 2024, and now she is a Master candidate in School of Mechanical Engineering, Beijing Institute of Technology. Her research interests include wireless network simulation and emulation, wireless communication and so on.



Peng GONG received the BS degree in Mechanical Engineering from Beijing Institute of Technology, Beijing, China, in 2004, and the MS and Ph.D. degrees from the Inha University, Korea, in 2006 and 2010, respectively. Now he is a professor in Beijing Institute of Technology. His research interests include link/system level performance evaluation and radio resource management in wireless systems, information security, and the next generation wire-less systems such as UWB, MIMO, Cognitive radio, IoT and so on.