

Design of Communication Countermeasure Simulation Model and Data Interaction Interface for Battlefield Network Based on QualNet

Wenyi LI*, Peng GONG*, Weidong WANG*, Yu LIU*, Jianfeng LI*, Xiang GAO*

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

18215621889@163.com, penggong@bit.edu.cn, 3220185030@bit.edu.cn, 67577335@qq.com, lidanhai@sina.com, bitxianggao@bit.edu.cn

Abstract—The performance analysis of battlefield communication network has been more and more complex and difficult with its increasing scale, heterogeneity and geographical distribution of nodes. Computer simulation technology is considered as a potential technology to efficiently and accurately solve this problem. This paper focuses on the simulation requirements of anti-interference performance of battlefield communication networks in complex electromagnetic environments, and designs reconnaissance interference and frequency hopping models based on QualNet simulation software. The model introduces scout and jammer nodes in the communication network, which can conduct reconnaissance and directional interference on communication nodes in the network. Other nodes can set frequency hopping parameters to achieve anti-interference. In addition, a data interaction interface for the distributed simulation system is designed based on the DDS specification, and a structure definition file is designed according to the data interaction requirements to achieve dynamic control of the QualNet simulation model by external control modules. Finally, this article tested the functionality of the communication countermeasure model and conducted a delay test on the data interaction interface. The experimental results verify the functionality of the designed model and the high real time of the interface, which is of great significance to the anti-interference performance assessment of the battlefield communication network.

Keywords—Battlefield network; QualNet; Communication countermeasure; DDS; Data interaction interface



Wenyi Li received the BS degree in Mechatronic Engineering from Beijing Institute of Technology in 2021, and now he is a MS candidate in School of Mechatronic Engineering, Beijing Institute of Technology. His research interests include wireless network simulation and emulation, wireless communication and so on.



Peng Gong received the BS degree in Mechatronic 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. In July 2010, he joined the School of Mechatronic Engineering, Beijing Institute of Technology, China. His research interests include link/system level performance evaluation and radio resource management in wireless systems, information security, and the next generation wireless systems such as 3GPP LTE, UWB, MIMO, Cognitive radio and so on.



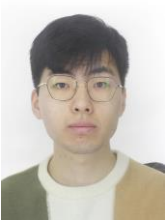
Weidong Wang received his B.S degree in electronic and communication engineering from Harbin Institute of Technology, Harbin, China in 2001. And he received the M.S degree in Information Technology & Telecommunications from Inha University, Incheon, South Korea in 2005. He worked for Huawei Technologies, ZTE Corporation and Samsung electronics. He is currently the GM of Wuxi Junction Information Technology Incorporation Company.



Yu Liu received the BS degree from National University of Defense Technology in June 2006 and the MS degree from Military Economy College of the CPCA in April 2009. He is currently working toward the Ph.D. degree with the School of Mechatronical Engineering, Beijing Institute of Technology. His research direction is Communication engineering.



Jianfeng Li received the BS degree in Computer Science and Technology from Equipment Command and Technology Academy, in 2001, the MS degrees in Military Equipment Science from Equipment Command and Technology Academy, in 2004. His research interests include equipment operation test, in-service assessment, test data management and so on.



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