A Novel Gateway Deployment Solution for MANETs Interconnecting with Internet

DanMeng*, Yonghang Yan**, LunXia*, Zhijia Li*, Xuewen Xia*, Chen Chen*

**School of Computer Science and Information Engineering, Henan University, KaiFeng, China*

***School of Computer Science and Information Engineering, Henan University, KaiFeng, China, **corresponding author*

mengdantxt@gmail.com, yanyonghang@henu.edu.cn, xl786254792@gmail.com, lizhijialzj@gmail.com, xiaxuewena@gmail.com, littletomchenchen@gmail.com

***Abstract*—Mobile ad hoc networks (MANETs) have recently evoked much research attention as a challenge technology that nodes are interconnected to the Internet through gateways. However, due to the limited coverage of every gateway, a gateway may not be able to provide full coverage to the whole network area. To address this problem, this paper proposes a new gateway deployment method. Firstly, the gateway deployment problem is modelled as an art gallery problem, and then a three-stage gateway deployment algorithm is proposed. The first stage is the quadrilateral division based on distribution area of mobile nodes, the second stage is a four-dye scheme based on the quadrangular division, and the third stage is the gateway location deployment, where nodes in any one of the four colours are selected as the gateway. Finally, each phase of the algorithm is analysed and proved, and the results show that the algorithm can accurately determine the upper limit of the maximum number of gateways that meet nodes coverage requirements.**

***Keyword*—Art gallery problem, Gateway deployment, MANETs, Coverage area, Network connectivity**

Dan Meng, born in 1995, graduate student of computer technology, School of computer science and information engineering, Henan University, from 2019 to 2022, the main research directions include mobile ad hoc networks, wireless sensor networks.

Yonghang Yan (Kaifeng, 1981) is an associate professor in the School of Computer and Information Engineering at Henan University, Kaifeng, China. He is the head of Mobile Computing and Network Technology Laboratory. His research interests include computer network, Mobile Ad hoc and Sensor Netowrk, UAV network, mobile computing network and QoS..

Lun Xia, born in 1996, graduate student of computer technology, School of computer science and information engineering, Henan University, from 2019 to 2022, the main research directions include mobile ad hoc networks, wireless sensor networks.

Zhijia Li, born in 1998, graduate student of computer technology, School of computer science and information engineering, Henan University, from 2020 to 2023, the main research directions include mobile ad hoc network, UAV network.

Xuewen Xia, born in 1998, graduate student of computer technology, School of computer science and information engineering, Henan University, from 2020 to 2023, the main research directions include UAV network, wireless sensor networks.

Chen Chen, born in 1997, graduate student of computer technology, School of computer science and information engineering, Henan University, from 2021 to 2