GEERM: An Improved Grid-based Energy-Efficient Routing Method for WSN with Single Controlled Mobile Sink

Qi Liu*, Kai Zhang*, Jian Shen*, Zhangjie Fu**, Nigel Linge***

*College of Computer and Software, Nanjing University of Information Science and Technology, Nanjing, Jiangsu, China

**Jiangsu Engineering Centre of Network Monitoring, Nanjing University of Information Science and Technology, Nanjing, Jiangsu, China

***The University of Salford, Salford, Greater Manchester, UK

qi.liu@nuist.edu.cn, 270163739@qq.com, s_shenjian@126.com, wwwfzj@126.com, n.linge@salford.ac.uk

Abstract—**Different from the previous cluster-based structure, in this paper, we present a grid-based energy-efficient routing method (GEERM) that aims to balance energy dissipation in a non-uniform distributed network. The GEERM employs a controlled mobile sink with two antennas to collect sensing data, which enable two cluster heads to upload data in each time by utilizing multi-user multiple-input and multiple-output (MU-MIMO) technique. Cluster-head election of each grid is based on three parameters, i.e. the number of data packets that nodes need to relay, the Euclidean distance to the mid-point of cells and residual energy of each node, respectively. The GEERM also considers other factors that waste battery power, such as packet collision and latency. Simulation results demonstrate that our routing method has shown better performance when compared with existing work.**

Keyword—**Wireless Sensor Network, Energy Efficiency, Sink Mobility, GEERM, MU-MIMO**

Qi Liu (M'11) received his BSc degree in Computer Science and Technology from Zhuzhou Institute of Technology, China in 2003, and his MSc and PhD in Data Telecommunications and Networks from the University of Salford, UK in 2006 and 2010. His research interests include context awareness, data communication in MANET and WSN, and smart grid. His recent research work focuses on intelligent agriculture and meteorological observation systems based on WSN.

Kai Zhang received his bachelor's degree in Software Engineering from Nanjing University of Information, Science and Technology in 2014, and he is currently pursuing a master's degree in computer science and technology at the Nanjing University of Information Science and Technology. His research interests include wireless sensor networks and wireless body area networks.

Jian Shen received his bachelor's degree in Electronic Science and Technology Specialty from Nanjing University of Information, Science and Technology in 2007, and he received his masters and PhD in Information and communication from CHOSUN University, South Korean in 2009 and 2012. His research interests include Computer network security, information security, mobile computing and network, wireless ad hoc network.

Zhangjie Fu received his BS in education technology from Xinyang Normal University, China, in 2006; received his MS in education technology from the College of Physics and Microelectronics Science, Hunan University, China, in 2008; obtained his PhD in computer science from the College of Computer, Hunan University, China, in 2012. Currently, he works as an assistant professor in College of Computer and Software, Nanjing University of Information Science and Technology, China. His research interests include cloud computing, digital forensics, network and information security.

Nigel Linge received his BSc degree in Electronics from the University of Salford, UK in 1983, and his PhD in Computer Networks from the University of Salford, UK, in 1987. He was promoted to Professor of Telecommunications at the University of Salford, UK in 1997. His research interests include location based and context aware information systems, protocols, mobile systems and applications of networking technology in areas such as energy and building monitoring.