Performance comparison of data compression algorithms for environmental monitoring wireless sensor networks

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Abstract: Wireless sensor networks (WSNs) have serious resource limitations ranging from finite power supply, limited bandwidth for communication, limited processing speed, to limited memory and storage space. Data compression can help reduce memory and storage space requirements on sensor node. In WSNs, radio communication is the major consumer of energy. Therefore, applying data compression before transmission will significantly and directly help in reducing total power consumption of a sensor node thereby extending the network lifetime. In this article, we propose a simple lossless data compression algorithm designed specifically to be used by environmental monitoring sensor nodes for the compression of environmental data which are characterise by significant fluctuations in entropy. To verify the effectiveness of our proposed algorithm, we compare its compression performance with two existing WSNs compression algorithms using real-world environmental datasets. We show that our algorithm outperforms the other two algorithms when the entropy of the dataset is large.

Keywords: wireless sensor networks; WSNs; data compression; energy efficient; Huffman coding.

Reference to this paper should be made as follows: Kolo, J.G., Ang, L-M., Seng, K.P. and Prabaharan, S.R.S. (2013) 'Performance comparison of data compression algorithms for environmental monitoring wireless sensor networks', *Int. J. Computer Applications in Technology*, Vol. 46, No. 1, pp.65–75.

Biographical notes: Jonathan Gana Kolo is currently a PhD research student in the University of Nottingham Malaysia Campus. He completed his Bachelor of Engineering degree at Ahmadu Bello University Zaria, Nigeria in 1994 and Master of Science degree in Electrical and Electronics Engineering at the University of Lagos, Nigeria in 2002. Since 1995, he has been with the Federal University of Technology Minna as an Academic Staff. His research interests are in the fields of signal processing, data compression, embedded system and wireless sensor networks.