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Survey of Networking Techniques for Wireless Multimedia Sensor Networks

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Abstract— This paper discusses some interesting aspects of wireless multimedia sensor networks, such as security, energy consumption and QoS. It can serve as an introductory material for new researchers.

Index Terms—wireless multimedia sensor networks, Quality of Service, energy consumption, and security.

I. INTRODUCTION

Wireless multimedia sensor networks have drawn extensive interested recently [1]-[9] because they can be used in many areas, such as video surveillance, traffic monitoring and health care setting. Extensive research has been done for traditional wireless sensor networks [10]-[24]. However, traditional wireless sensor networks cannot meet the new challenges in wireless multimedia sensor networks. This paper will survey some interesting research areas in wireless multimedia sensor networks. It is not intended to be an exhaustive survey but only provides some interesting aspects of wireless multimedia sensor networks.

II. QOS OF WIRELESS MULTIMEDIA SENSOR NETWORKS

In traditional sensor networks, sensors are powered by batteries. Therefore, saving energy is a primary goal in network protocol design [2]. However, in wireless multimedia sensor networks, image or video may need to be transmitted through the network. Usually, video or image is time sensitive data and requires QoS guarantee. Therefore, QoS has been an important research area in wireless multimedia sensor networks [1]-[4].

In wireless multimedia sensor networks, sensors may be densely deployed and data from close sensors may have strong correlations. It is well-known that transmitting correlated data wastes precious communication resources and sensor energy. In [1], authors presented a correlation-aware QoS routing method. In this method, to reduce the data traffic from correlated sensors, a coding scheme is used. Then, a traffic load balancing method is used to split correlated traffic. At last, to maintain QoS, a QoS routing scheme is used in together with the correlation-aware scheme. Details about this scheme can be found in [1].

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In [3], to address the unique problems posed by video streaming, authors proposed a dynamic path formation algorithm. In this algorithm, the path is estimated using a path throughput estimation model. The authors designed some mobile base stations. Usually, base stations have much more resources, such as power, computation capacity, and communication resources to help sensors to relay data from sensors. Also, the dynamic path formation algorithm is used in together with the distributed packet scheduling scheme to help stream routing. Details can be found in [3].

To ensure QoS in the multimedia sensor networks, a QoS-aware routing mechanism is proposed in [4]. In [4], the authors used a multi-channel and multi-path routing protocol. Traditional sensor networks usually employ only single channel although some sensors with wireless transmitter are capable to use multi-channels. Multi-path can achieve better QoS because traffic loads can be distributed into different paths and also because multiple identical copies can be transmitted through multi-path to ensure reliability. The authors use multi-channel and multi-path routing protocol to ensure QoS. Furthermore, real-time data and non-real-time data are distinguished and the service rates for these types of data are dynamically adjusted. Simulation results showed the proposed algorithm can significantly improve network performance.

III. ENERGY OF WIRELESS MULTIMEDIA SENSOR NETWORKS

Energy consumption is an important concern in wireless multimedia sensor networks. Usually, sensors have to keep routing table and path information. This is inefficient and can waste energy. In [5], the authors proposed a robust and energy-efficient multimedia transmission method. In this method, a gradient is used to “pull down” data. The gradient also provides the forward path information. If sensors use gradients, they do not need to store the routing table or path information. Therefore, using gradients can save energy. Moreover, a distributed competition manner is used in [5] to make sure the optimal path is used for data transmission. More details can be found in [5].

IV. SECURITY OF WIRELESS MULTIMEDIA SENSOR NETWORKS

As wireless multimedia sensor networks become more widely used, security issue in multimedia sensor networks also becomes a problem. To enhance the security, watermark techniques have been used [6].

However, usually the enhanced security achieved by watermark techniques are at the cost of energy consumption because the computation calculation involved in watermark techniques cost energy, which is a precious resource for sensors. To address this problem, an adaptive energy-aware watermarking scheme was proposed in [6]. Details can be found in [6]. Another work about security in multimedia sensor networks can be found in [7].

V. RELIABILITY OF WIRELESS MULTIMEDIA SENSOR NETWORKS

Reliability is also an important requirement of wireless multimedia sensor networks. Reliability involves many aspects in wireless multimedia sensor networks, such as transportation reliability, sensor reliability, routing reliability. Interested readers can read some papers in this area, such as in [8][9].

VI. CONCLUSION

This paper surveyed some interesting aspects of wireless multimedia sensor networks. This can help newcomers be familiar with this topic.

REFERENCES

1. D. Ru, W. Pu, and I. F. Akyildiz, "Correlation-Aware QoS Routing for Wireless Video Sensor Networks," in *Proc. of 2010 IEEE Global Telecommunications Conference (GLOBECOM 2010)*, pp. 6-10 Dec. 2010.
2. M. Younis, K. Akkaya, M. Eltoweissy, and A. Wadaa, "On handling QoS traffic in wireless sensor networks," in *Proceedings of the 37th Annual Hawaii International Conference on System Sciences*, pp. 5-8, Jan. 2004.
3. S. Guo and T. D. Little, "QoS-enabled Video Streaming in Wireless Sensor Networks," in *Proc. of 9th IEEE International Symposium on Network Computing and Applications*, pp.214-217, 15-17 July 2010.
4. M. A. Hamid, M. Alam, and H. Choong-seon, "Design of a QoS-Aware Routing Mechanism for Wireless Multimedia Sensor Networks," in *Proc. Of IEEE Global Telecommunications Conference (GLOBECOM)*, pp.1-6, Nov. 30 2008-Dec. 4 2008.
5. H. Pei, X. Yang, and T. Yongdong, "A Robust and Energy-Efficient Approach for Image/Video Dissemination in WSNs," in *Proc. of the 5th IEEE Conference on Consumer Communications and Networking Conference (CCNC 2008)*, pp.665-669, 10-12 Jan. 2008.
6. H. Wang, D. Peng, W Wang, H. Sharif, and H. Chen, "Energy-Aware Adaptive Watermarking for Real-Time Image Delivery in Wireless Sensor Networks," in *Proc. of IEEE International Conference on Communications (ICC '08)*, pp.1479-1483, 19-23 May 2008.
7. H. Wang and D. Peng, W. Wang, H. Sharif, and H. Chen, "Image transmissions with security enhancement based on region and path diversity in wireless sensor networks," *IEEE Transactions on Wireless Communications*, vol.8, no.2, pp.757-765, Feb. 2009.
8. J. F. Mingorance-Puga, G. Macia-Fernandez, A. Grilo, and N. Tiglao, "Efficient multimedia transmission in wireless sensor networks," in *Proc. of 6th EURO-NF Conference on Next Generation Internet* (NGI), pp.1-8, 2-4 June 2010.
9. S. Qaisar, and H. Radha, "A reliability framework for visual sensor networks," in *Proc. of Picture Coding Symposium*, (PCS 2009), pp.1-4, 6-8 May 2009.
10. Z. X. Luo, "Parameter Estimation in Wireless Sensor Networks with Normally Distributed Sensor Gains", *International Journal of Soft Computing and Engineering*, vol. 2, no. 6, Jan. 2013.
11. Z. X. Luo, "Parameter Estimation in Wireless Sensor Networks Based on Decisions Transmitted over Rayleigh Fading Channels", *International Journal of Soft Computing and Engineering*, Vol. 2, No. 6, Jan. 2013.
12. Z. X. Luo, "Distributed Estimation and Detection in Wireless Sensor Networks", *International Journal of Inventive Engineering and Sciences*, vol. 1, no. 3, Feb. 2013.
13. Z. X. Luo, "Anti-attack and Channel Aware Target Localization in Wireless Sensor Networks Deployed in Hostile Environments," *International Journal of Engineering and Advanced Technology*, vol. 1, no. 6, Aug. 2012.
14. Z. X. Luo, "A New Direct Search Method for Distributed Estimation in Wireless Sensor Networks," *International Journal of innovative technology and exploring engineering*, vol. 1, no. 4, Sept. 2012.
15. Z. X. Luo and T. C. Jannett, "Performance comparison between maximum likelihood and heuristic weighted average estimation methods for energy-based target localization in wireless sensor networks," in *Proc. of the 2012 IEEE SoutheastCon*, Orlando, FL, Mar. 2012.
16. Z. X. Luo, "A censoring and quantization scheme for energy-based target localization in wireless sensor networks," *Journal of Engineering and Technology*, Vol.2, no.2, 2012
17. Z. X. Luo, "A coding and decoding scheme for energy-based target localization in wireless sensor networks", *International Journal of Soft Computing and Engineering*, Vol.2, no. 4, Sept. 2012
18. Z. X. Luo, "Distributed Estimation in Wireless Sensor Networks with Heterogeneous Sensors", *International Journal of Innovative Technology and Exploring Engineering*, Vol. 1, no.4, Sept. 2012
19. Z. X. Luo, "Overview of Applications of Wireless Sensor Networks", *International Journal of Innovative Technology and Exploring Engineering*, Vol. 1, no. 4, Sept. 2012
20. Z. X. Luo, and T. C. Jannett, "Modeling Sensor Position Uncertainty for Robust Target Localization in Wireless Sensor Networks," in *Proceedings of the 2012 IEEE Radio and Wireless symposium, Santa Clara*, CA, Jan. 2012.
21. Z. X. Luo, "Robust Energy-based Target Localization in Wireless Sensor Networks in the Presence of Byzantine Attacks," *International Journal of Innovative Technology and exploring Engineering*, vol. 1, no.3, Aug. 2012.
22. Z. X. Luo, and T. C. Jannett, "Energy-Based Target Localization in Multi-Hop Wireless Sensor Networks, in *Proceedings of the 2012 IEEE Radio and Wireless symposium*, Santa Clara, CA, Jan. 2012.
23. Z. X. Luo and T. C. Jannett, "Optimal threshold for locating targets within a surveillance region using a binary sensor network," in *Proc. of the International Joint Conferences on Computer, Information, and Systems Sciences, and Engineering (CISSE 09)*, Dec. 2009.
24. Z. X. Luo and T. C. Jannett, "A multi-objective method to balance energy consumption and performance for energy-based target localization in wireless sensor networks," in *Proc. of the 2012 IEEE SoutheastCon*, Orlando, FL, Mar. 2012.

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