Quality of Service Control in Wireless Sensor Networks Based on Energy Management

By

Eman Mohamed Ahmed Saad Elshahed

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of M. Sc. in Computer Physics

to

Physics Department
Faculty of Women for Art, Science and Education, Ain Shams University

2014

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Supervisors

Prof. Dr. Hayam A. Elzahed

Professor of Solid State,
Physics Department, Faculty of Women for Arts, Science, and Education,
Ain Shams University.

Dr. Shahinaz M. Al-Tabbakh

Lecturer of Computer Applications in Physics
Physics Department, Faculty of Women for Art, Science and Education,
Ain Shams University.

Dr. Rabie A. Ramadan

Lecturer of Computer Engineering
Computer Engineering Department, Faculty of Engineering, Cairo University

Supervision Committee Approval Sheet

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Approved by: ***Signature***

Prof. Dr. Hayam A. Elzahed

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Dr. Shahinaz M. Al-Tabbakh

Lecturer of Computer Application in Physics Department. Faculty of Women for Art, Science and Education Ain Shams University.

Dr. Rabie A. Ramadan

Lecturer of Computer Engineering Computer Engineering Department, Faculty of Engineering, Cairo University.

Date of research: / /

Post Graduate Studies Department

Approval Stamp **Approval Date: / /**

Faculty Council Approval **University Council Approval**

Date: / / **Date: / /**

Dedicated

To

My Parents &

Husband Parents,

My Sisters & Brother,

My professors,

My Friends,

My HUSBAND

And

My Sweet Daughter

Acknowledgement

*First and foremost I am kneeling obsequiousness to **ALLAH** thanking **HIM** for showing me the right way. Without **God** help and blessing I would not have been able to finish this work.*

*I would like to express my gratitude to **Prof. Dr. Hayam Elzahed** for encouraging me and giving me the guidance and unlimited support to me during my work.*

*Also, I wish to express all my deepest and sincerest gratitude to **Dr. Shahinaz Al-Tabbakh** and **Dr. Rabie Ramadan** for giving me an opportunity to work under their supervision. I am deeply indebted to them for their enormous patience, guidance, and support throughout the work program.*

*I'm grateful to the examiners **Prof. Dr. Mahmoud Marie** and **Prof. Dr. Fatthy Amer** for constructive suggestions and valuable comments, which improve the quality of the thesis.*

*I'm deepest grateful to my uncle **Dr. Mostafa Elshahed** for his fruitful and valuable assistance. He was very generous in his help and time.*

*Thanks to my dear **husband** for his patience and support. I would like to thank also all my family and my sisters and brother, whose hearts are always with me and whose light my way in this life.*

Abstract

Abstract

The QoS control problem in Wireless Sensor Networks (WSN) is discussed in this study in centralized and distributed network with clustering. The problem takes into consideration many of the performance metrics. For instance, convergence, network lifetime, QoS ratio, average residual energy per node, power depleted nodes, average received messages, and average rejected sensors are taken into consideration. The contributions of this study are:

(1) This work applies one of the game theory schemes which is Gur game. The Gur game is adapted to control the number of messages to be transferred to the sink node. However, it turns out that the Gur game convergence is taken too much time. Therefore, the study moved forward to the next contribution as follows.
(2) Adaptive Gur game (AGur) is proposed to speed up the convergence of the Gur game in the network.
(3) Periodic Gur game (PGur) is introduced to solve another problem noticed when applying Gur game in WSNs which is nodes' energy unbalance. The solution of this problem was inspired from Shuffle.
(4) Introducing Adaptive Periodic Gur game (APGur) as a combination between AGur and PGur game is investigated in order to enhance the convergence time of PGur game.
(5) Another game theory is utilized to solve the same problem which is Market Entry Game (MEG). The game seems beneficial and suitable to solve the QoS problem.

(6) Another contribution in this thesis is the consideration of the Centralized and Distributed Networks. In the distributed networks, a clustering techniques is used to divide the network into clusters. Each cluster applies the games on its nodes and the cluster head along with the sink node do the same.

These contributions are implemented and evaluated; the results presented in this study show the efficiency of the proposed methods in enhancing the QoS of the overall WSNs. From results it is concluded that the MEG increases the centralized network lifetime with percentage between 50% and 150% than Gur game and the APGur improves the QoS level with percentage between 0.2 % and 9% than Gur game. In addition, the APGur increases the distributed network lifetime with percentage between 13% and 18% than Gur game and the AGur improves the QoS level with percentage between 3% and 10% than Gur game.

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