

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

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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



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Dedicated To

My Parents &
Husband Parents,
My Sisters & Brother,
My professors,
My Friends,
My HUSBAND
And
My Sweet Daughter

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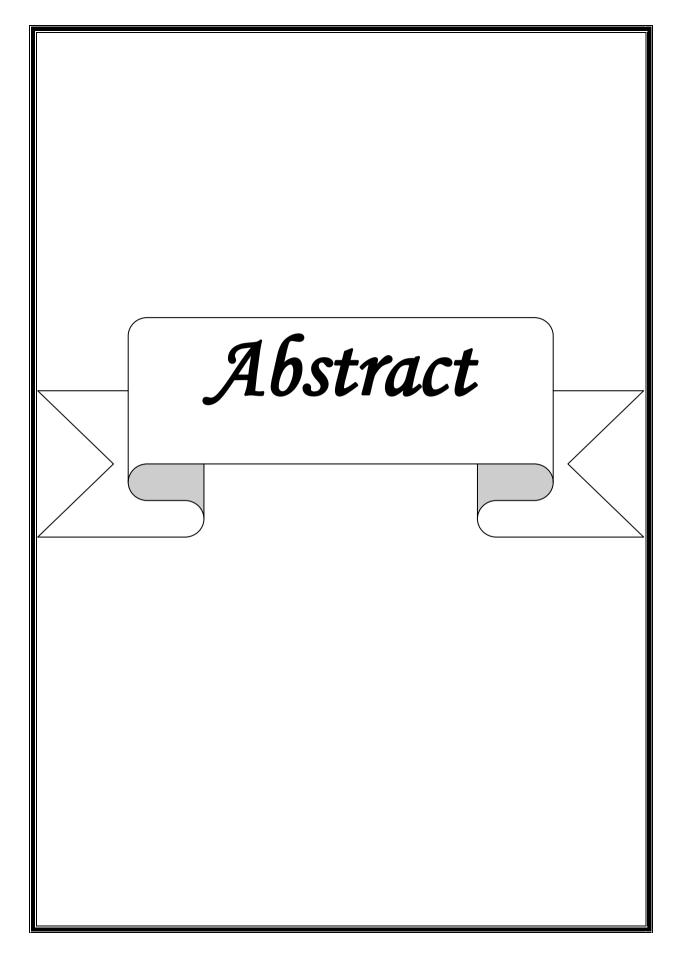
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Abstract

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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