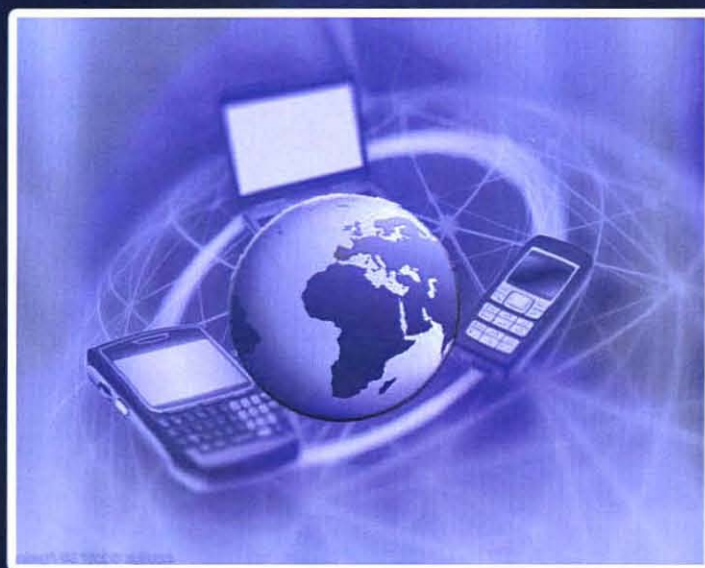


# Research Issues in Wireless

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## Communications and Networking

Farhat Anwar  
Wajdi Al-Khateeb



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# **Research Issues in Wireless Communications Networking**

Farhat Anwar & Wajdi Al-Khateeb



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## CHAPTER 19

### STATE-OF-THE-ART THEORETICAL MODELS FOR OPTIMIZING PROTOCOL PERFORMANCE IN WIRELESS SENSOR NETWORKS

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#### 19.1 CONVEX OPTIMIZATION BASED TECHNIQUES

Theoretical models for effective resource allocation have attracted a lot of research interests since the development of Lagrange duality and convex optimization. Current research works in this area are based on designing theoretical frameworks for Network Utility Maximization (NUM) [1, 2]. The efficiency of the NUM theoretical model has been critically examined by researchers to examine its capability for effective resource allocation and congestion control in wired and wireless networks [3, 4]. In order to foster better understanding of the NUM framework, a logical presentation of the research issues in different layers of WSN is given in Table 19.1 to highlight the importance and interdependence of the issues.

Table 19.1: Layers and Corresponding Research Areas in a Generic WSN

| Layer              | Research Issues   |
|--------------------|---|
| Data Link<br>(MAC) | Power Control/Topology Control<br>Channel Assignment/Bandwidth Allocation/Medium Access<br>Link Error Control |
| Network            | Routing<br>Mobility Management  |
| Transport          | Retransmission<br>Congestion Control (Flow Control/Adaptive Rate Control)                                     |
| Others             | Placement Control/Layout Optimization<br>Clustering Control   |
| Cross Layer        | Joint Rate and Power<br>Joint Routes and Flows<br>Joint Link Scheduling and Power<br>Joint Congestion and MAC |

##### 19.1.1 NUM and Rate Control