

## Mean Field Model Interaction for Computer and Communication Systems: Modeling and Analysis of Wireless Sensor Networks

**Authors :** Irina A. Gudkova, Yousra Demigha

**Abstract :** Scientific research is moving more and more towards the study of complex systems in several areas of economics, biology physics, and computer science. In this paper, we will work on complex systems in communication networks, Wireless Sensor Networks (WSN) that are considered as stochastic systems composed of interacting entities. The current advancements of the sensing in computing and communication systems is an investment ground for research in several tracks. A detailed presentation was made for the WSN, their use, modeling, different problems that can occur in their application and some solutions. The main goal of this work reintroduces the idea of mean field method since it is a powerful technique to solve this type of models especially systems that evolve according to a Continuous Time Markov Chain (CTMC). Modeling of a CTMC has been focused; we obtained a large system of interacting Continuous Time Markov Chain with population entities. The main idea was to work on one entity and replace the others with an average or effective interaction. In this context to make the solution easier, we consider a wireless sensor network as a multi-body problem and we reduce it to one body problem. The method was applied to a system of WSN modeled as a Markovian queue showing the results of the used technique.

**Keywords :** Continuous-Time Markov Chain, Hidden Markov Chain, mean field method, Wireless sensor networks

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