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Analysis of Reception Process for an Absorbing Receiver in Molecular Communication via Diffusion

Abstract
Nanotechnology is currently being applied to vast number of fields to overcome the challenges faced with existing technologies that cannot efficiently scale down to nano level. However, considering the limited processing and memory resources of nano-machines, performing complex tasks requires new communication mechanisms. Communication is one of the important issues to be addressed in nanoscale environment. Inspired by the nature, molecular communication via diffusion is a candidate to address this issue.

Although the reception process of the messenger molecules has a significant impact on the performance of molecular communication via diffusion, the factors that affect the received signal for an absorbing receiver have not been investigated in the literature. In this thesis, we first introduce methods for efficient simulation of molecular communication via diffusion to enable further analysis. We propose two novel simulation architectures; a dual-zone simulation model to decrease execution time while preserving simulation accuracy and an HLA based architecture for distributed simulation of molecular communication via diffusion. Then, we analyse different dimensions of reception process for an absorbing receiver to derive closed form formulations. The results presented enable optimizations that will have a direct effect on production costs of receptors and the receivers. Finally, we propose a new approach for demodulation of information for an absorbing receiver and analyse energy consumption and data rate for the proposed model.

PUBLICATIONS

Journals

Book Chapters

Conferences
1. A. Akkaya and T. Tugecu, “dMCS: Distributed Molecular Communication Simulator,” 8th International Conference on Body Area Networks (BODYNETS), Boston, USA, September 2013.
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