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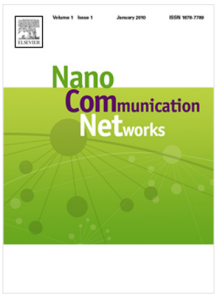

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Mustafa Can Gursoy, Ali Emre Pusane, Tuna Tugcu

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Molecule-as-a-Frame: A Frame Based Communication Approach for Nanonetworks

Mustafa Can Gursoy[a,*], Ali Emre Pusane[a], Tuna Tugcu[b]

[a]*Department of Electrical and Electronics Engineering, Bogazici University, 34342, Bebek, Istanbul, Turkey*
[b]*Department of Computer Engineering, NETLAB, Bogazici University, 34342, Bebek, Istanbul, Turkey*

Abstract

Molecular communications is a promising communications mechanism to enable information exchange between nano-machines using chemical signals. In molecular communication systems, data is transmitted using messenger molecules instead of electromagnetic carrier waves. In the literature, transmitted message is encoded in the quantity, type, time of release, or other properties of the molecular wave. In this paper, transmitting a complete data frame in a messenger molecule is envisioned by encoding frame identifier bits and information payload in the chemical structure of the molecule. The paper introduces the Molecule-as-a-Frame (MaaF) concept and discusses its main characteristics and benefits. Focusing on the existence of a trade-off between inter-symbol interference combating and number of transmitted molecules, the presence of an optimal allocation between the lengths of overhead and payload is shown with the objective of minimizing the frame error rate. A theoretical formula and a more tractable approximation for the frame error rate as a function of the overhead length is also provided. Furthermore, attaching destination address headers to the frame is proposed to eliminate co-channel interference for scenarios with multiple receivers. In such schemes, a solution to the problem of whether the interferer receivers should absorb or reflect to the molecules associated with the

*Corresponding author.
Email addresses: can.gursoy@boun.edu.tr (Mustafa Can Gursoy), ali.pusane@boun.edu.tr (Ali Emre Pusane), tugcu@boun.edu.tr (Tuna Tugcu)