
A New Degree of Freedom For Energy Efficiency of Digital Communication Systems

Abstract:

In this paper, a simple energy-efficient physical layer modulation scheme termed as random number modulation (RNM) is proposed. It is a class of new systems that harness the randomness of pseudo random number generators (RNGs) for efficient communication, and adds a new degree of freedom to digital communication systems. It is also highly adaptable to high-rate, low-latency, and low-rate, high-energy efficiency scenarios. This paper includes a detailed system model, preliminary performance analysis, and extended discussions. The performance of the proposed system is analyzed in terms of symbol and block error probabilities, energy efficiency, and latency. It is shown that there is a fundamental tradeoff between the energy efficiency and the latency of the proposed system, and they can be easily software programmable allowing devices to adapt to different circumstances and environments rapidly. Based upon the basic system model herein, it is anticipated that more sophisticated RNM systems can be developed.