Colloquium

Department of Computer Science

Dr. Koushik Sinha

Koushik Sinha is a Senior Software Engineer with the Social Computing Group of Qatar Computing Research Institute. He has over 10 years of experience in applied research. Before joining QCRI, Koushik was a Research Scientist at Hewlett-Packard Labs and a Visiting Scientist at the Indian Statistical Institute, India. He also spent 7 years with Honeywell Technology Solutions, where he worked as a Lead Research Scientist in the Advanced Technology Lab. He holds a PhD (2007) and MS (2003) in Computer Science from Jadavpur University, India and Clemson University, USA, respectively. He has 7 granted and 3 pending United States patents, and is the author of over 40 publications in international conferences and journals. Koushik received the Young Scientist Award from the Indian Science Congress in 2009. He also received the N. V. Gadadhar Memorial Award in 2011 from the Institution of Electronics and Telecommunication Engineers, India. His current research areas include social computing, ad hoc and sensor networks. He is a Senior Member of the IEEE.

March 24, 2015
11:00 a.m.
Morris Library 752/754

Communication through Silence: A New Approach to Energy Efficiency

Abstract

Most conventional communication strategies utilize energy based transmission (EbT) schemes, which require energy expenditure for transmitting both 0 and 1 bit values. We propose a redundant radix based number (RBN) representation for encoding and transmitting data for applications which typically require low data rates, utilize low cost devices and demand low power operations. Introducing the concept of using silent periods for communicating the digit zero, this new encoded communication scheme, called RBNSiZeComm, provides a highly energy-efficient technique for data transmission. Using this transmission protocol, the fraction of energy savings obtained on an average is $1 - (n+2)/(4n)$ which tends to 75% as n becomes large. Based on this transmission strategy, we have designed a new MAC protocol and efficient conversion algorithms from binary to RBN and vice versa, that would support the communication of such RBN encoded data frames. Furthermore, assuming a noisy channel with additive white Gaussian noise (AWGN), we have designed a hybrid modulation scheme and introduced a new concept of frame error rate (FER) instead of the conventional bit error rate (BER) for analysis of noise in the proposed communication scheme of RBNSiZeComm. We show that for a given FER, we get a savings in transmitter energy of about 53% when compared to binary FSK. Simulation results demonstrate that RBNSiZeComm can extend the battery life of devices by 33% to 62% on an average.