Signal Design and Network Architecture for Wireless Communications

Project Leader

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1. Objective

This project is aimed at creating a variety of new communication systems originating from innovative concepts that open up new vistas for work towards future generation wireless communications. Signals used in such systems must be chosen for the optimal transmission of given message data or packets, and a protocol must be defined that allows messages to be exchanged efficiently through an array of wireless links on the best network architecture. Decentralized wireless networks with no control station or base station are considered to be one of the important targets of such network topology work.

2. Project Outline

To that end, the project will consist of the following phases:

(a) Review of past investigations

(b) Creation of new systems

(c) Theoretical analysis, numerical analysis, and computer simulations

(d) Publication of academic papers

3. Expected Performance

In this project, the successful candidate would be expected to:

(a) Publish at least two research papers in top-tier journals

(b) Work as a research assistant

(c) Report the project progress in meetings

(d) Assist the laboratory members in research

4. Required Skills and Knowledge

The successful candidate for this project will have the following knowledge and skills:

(a) Communication systems, information theory, signal processing, statistics, etc.

(b) Programming skill (MATLAB, C)

(c) Experience of writing at least one technical paper in English as primary author

References

[1] M. Hamamura and J. Hyuga, Spectral efficiency of orthogonal set of truncated MC-CDMA signals using discrete prolate spheroidal sequences, Proceedings of the IEEE Wireless Communications and Networking Conference (WCNC 2008), pp.980-984, April 2008.

[2] S. Fukui and M. Hamamura, Approximately-zero correlation zone sequence set, IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences, vol.E99-A, no.1, pp.159-166, January 2016.

[3] K. Chiba and M. Hamamura, Multitone-hopping CDMA using feedback-controlled hopping pattern for decentralized multiple access, IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences, vol.E91-A, no.12, pp.3723-3730, Dec. 2008; Iterative algorithm for reducing the peak-to-average power ratio of feedback-controlled multitone-hopping CDMA signals, IEICE Transactions on Communications, vol.E93-B, no.11, pp.3072-3082, Nov. 2010.

[4] R. Hayashi and M. Hamamura, Continuous-phase, unmodulated parallel-combinatory high-compaction multicarrier modulation, IEICE Transactions on Communications, vol.E94-B, no.3, pp.802-805, March 2011.

[5] M. Mohri and M. Hamamura, ISI-free power roll-off pulse, IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences, vol.E92-A, no.10, pp.2495-2497, Oct. 2009.

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