COMPUTATIONAL PROBLEMS IN CODING AND COMMUNICATIONS

Project Code: MWH3b-06

Student: Wu Wei Hsiang

Supervisor: Prof. Mow Wai Ho
Introduction
- In the world of communications today, many fields adapt sequences with good aperiodic autocorrelation functions in synchronizing signals during data transmission
- In IEEE802.11b specification, the message is mixed with an 11-bit Barker sequence (10110111000) to spread the signal

Motivation
- The existence of Barker sequences has been found to be rare
- Implementation using the concept of correlation zone windows
- Periodic and odd-periodic autocorrelation functions are natural consequences of data modulation
- Using dual windows is crucial for searching the best index sequences
Key Results

Autocorrelation functions of the best quasi-Barker sequences

Relative window sizes versus the sequence lengths for quasi-Barker sequences
The following figure shows a special case for sequences of $L=6+4n$

By relaxing the Barker condition in the aperiodic autocorrelation function, the relative window size can be increased to meet the modified Barker bound without sacrificing the performance.

Concluding Remarks:
- Dual windows should be considered due to the presence of data modulation in many communication systems.
- The size of window maximizes the degree of tolerance of quasi-synchronization of the information transmission.
- A modification to the original proposed algorithm leads to a provably optimal performance and are shown to be more applicable in real practices.