Acquisition of Wideband Direct-Sequence Spread Spectrum Signals In System C

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Abstract: *Wideband (UWB) radio is gaining increasing attention thanks to its attractive features that include low-power low-complexity base band operation and ample multipath diversity. In another side using system C for implementing systems on a chip has a lot of advantages.*
The goal of this paper is to implement a proper algorithm for DS_UWB timing acquisition in system C.
In this paper we implement an algorithm for a direct sequence ultra wideband receiver with single user and we use IEEE standard channel model, therefore interference such as MUI and ISI are present. In this design data rate, chip rate and sampling rate are about 110Mb/s, 660Mchip/s and 4GS/s that are proper for DS_UWB and also the achieved BER is acceptable.

Keywords: Acquisition, DS_UWB, system C.

1 INTRODUCTION

A class of spread spectrum techniques known as ultra wideband (UWB) communication has recently received a significant amount of attention from academic researchers as well as from the industry.
UWB signaling is being considered for high data rate wireless multimedia applications for the home entertainment and personal computer industry, as well as for low data rate sensor networks involving low power devices. It is also considered a potential candidate for alternate physical layer protocols for the high-rate IEEE 802.15.3 and the low-rate IEEE 802.15.4 wireless personal area network (WPAN) standards [3].

In any communication system, the receiver needs to know the timing information of the received signal to accomplish demodulation.
The subsystem of the receiver which performs the task of estimating this timing information is known as the synchronization stage. Synchronization is an especially difficult task in spread spectrum systems which employ spreading codes to distribute the transmitted signal energy over a wide bandwidth.
The receiver needs to be precisely synchronized to the spreading code to be able to despread the received signal and proceed with demodulation. In spread spectrum systems, synchronization is typically performed in two stages.
The first stage achieves coarse synchronization to within a reasonable amount of accuracy in a short time, and is known as the acquisition stage.
The second stage is known as the tracking stage and is responsible for achieving fine synchronization and maintaining synchronization through clock drifts occurring in the transmitter and the receiver.
Tracking is typically accomplished using a delay locked loop. Timing acquisition is a particularly acute problem faced by UWB systems [3], and here we discuss a coarse synchronization algorithm.
This algorithm develops low-complexity training (data-aided) schemes for rapid timing acquisition in UWB. The novel approach relies on a special cross-correlation pattern among received waveforms, which is enabled by our training sequence design.
Similar to pilot waveform assisted modulation, and the so-termed transmitted reference approaches to