FINAL YEAR PROJECT REPORT

SIMULATION OF CDMA ON SIMULINK

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Abstract

In our project we have studied, simulated and analyzed CDMA based on spread spectrum technique as used in 3rd generation wireless networks using SIMULINK. We have studied the basics of spread spectrum technology and emerging third-generation CDMA-based mobile radio systems. We have tried to understand why CDMA has taken the mobile wireless world by storm and has become a major Second Generation (2G) technology and the dominant technology choice for Third Generation (3G) systems. We have learned about pseudo-random codes, their role in CDMA systems, and how they offer enhanced privacy, security, call quality, and coverage in comparison to other cellular technologies. We have gained experience on SIMULINK. Understand how CDMA offers increased capacity and improved performance.

Acknowledgements

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List of Abbreviations:

Code Division Multiple Access (CDMA)

Frequency Division Multiple Access (FDMA)

Time Division Multiple Access (TDMA)

Pseudo random Noise (PN)

Direct Sequence Spread SPECTRUM (DSSS)

Phase Shift Keying (PSK)

Frequency Shift Keying (FSK)

Binary Phase Shift Keying (BPSK)

Fast Fourier Transform (FFT)

Additive White Gaussian Noise (AWGN)

Global System for Mobile (GSM)

Linear-Feedback Shift Register (LFSR)

Maximal Ratio Combining (MRC)

Chapter 1 Introduction

1.1 Background

The CDMA history is directly linked to the 1940s when this form of transmission was first imagine. With the improvement in electronics technology, it was started to be used for military transmissions in view of the facts that the transmissions look like noise.

With the revolution in cellular telecommunications that occurred in the 1980s a company named Qualcomm working on DSSS transmissions started to look at this as the basis for a cellular telecommunications multiple access scheme - CDMA - code division multiple access. CDMA technique prove to be advantageous over other past techniques is becoming the preferred choice of multiple choice air interfaces in future generations of mobile technology. The IS-95 cellular mobile system form Qualcomm was the first system to use CDMA as the multiple access technique in mobile telephony.

The first CDMA system was launched in September 1995 by Hutchison Telephone Co. Ltd. in Hong Kong and SK Telecom in Korea soon followed along with networks in the USA. [1]

1.1.1 Different Multiple Access Schemes

In the field of communications, the term multiple access could be defined as a means of allowing multiple users to simultaneously share the finite bandwidth with least possible

degradation in the performance of the system. There are several techniques how multiple accessing can be achieved. Three Basic Schemes are:

1.1.1.1 FDMA

FDMA (Frequency Division Multiple Access) is one of the earliest Multiple-Access techniques. In this technique different users are allocated different frequencies.

The bandwidth is divided into a number of channels and distributed among users with finite bandwidth for permanent use. FDMA channels have narrow bandwidth and therefore they are usually implemented in narrowband systems.

1.1.1.2 TDMA

In TDMA, the entire bandwidth is available to the user but only for a finite period of time. In most cases the available bandwidth is divided into fewer channels compared to FDMA and the users are allotted time slots during which they have the entire channel bandwidth at their disposal. TDMA technique is used by GSM cellular systems.

1.1.1.3 CDMA

In CDMA, all the users occupy the same bandwidth; however they are all assigned separate codes, which differentiate them from each other. CDMA system utilizes spread Spectrum technique. Unlike FDMA and TDMA, it does not use frequency and time as discriminating factor. CDMA provides a new dimension in multiple access schemes. [2]

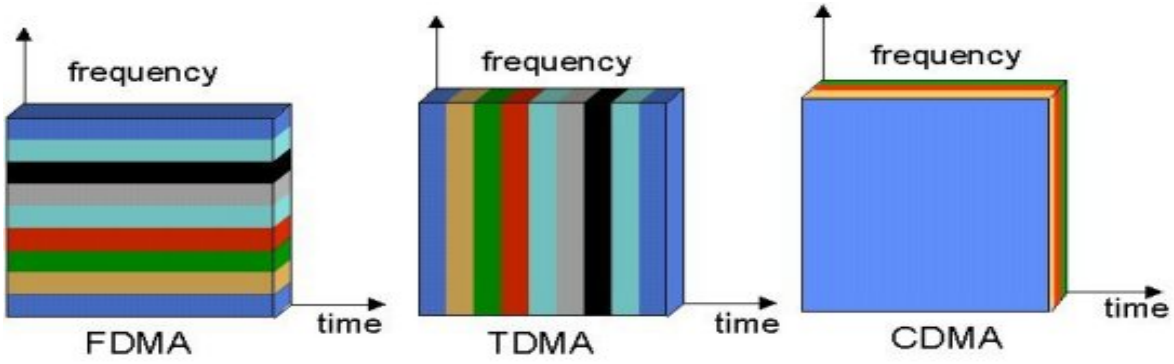

Figure 1.1 - Different Multiple access schemes

1.1 Objective

This Project aims at study, simulate, analyze and understand CDMA uses spread spectrum technique as used in 3rd generation wireless networks by using SIMULINK.

1.2 Methodology

The Implementation of CDMA was taken up in the following stages

- Implementation of Passband Model
  It involves the Implementation of CDMA with basic Spread Spectrum model without channel.

- Implementation of Baseband Model
  It involves implementation CDMA using Channel and Verify Multiple Access operation.

- Rake Receiver
  It involves Spread Spectrum with multipath

The Simulation of CDMA system involved development of theoretical model of CDMA system in MATLAB\SIMULINK. The simulation was run with different input conditions and different parameters and the results obtained were analyzed.

Block Diagram: