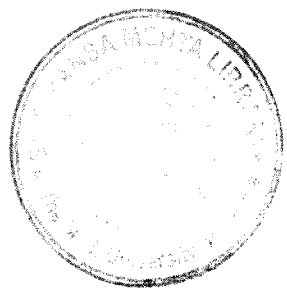

ABSTRACT

In wireless communication prime requirement is error free data reception and availability of system to more than no. of users or Multi-user detection (MUD) at a time. It requires more attention when number of users simultaneously accessing the system is large in number and system resources, such as bandwidth are limited. In this process error free communication is the final goal. So, there are many techniques which are employed to achieve the respected goal.

Particularly in CDMA receiver for MUD techniques, there are many algorithms in practice such as Z.F., MMSE, PDA and technique like MIMO-VBLAST etc. Genetic algorithm (GA) is one such algorithm which is employed to achieve the goal of error free communication for MUD. Since comparing with other algorithms GA provide better response in order to achieve the mentioned goal it is believed to be the next generation algorithm for MUD in CDMA based wireless communication. The proof of the statement is explored by comparing and analyzing MATLAB Simulated results for all above algorithms with different no. of users and varying the Modulation techniques such as GMSK, QPSK, 16-QAM and 64-QAM. BER is measured for performance evaluation in this research document

The communication system has challenge of accommodating many users in a small area. Multi-user detection (MUD) is the intelligent estimation/demodulation of transmitted bits in the presence of Multiple Access Interference (MAI). MAI occurs in multi-access communication systems (CDMA/ TDMA/ FDMA) where simultaneously occurring digital streams of information interfere with each other.

CDMA is a popular multiple access technology for wireless communication however its performance is limited by multiple access interference and multi-path distortion. Conventional detectors based on the matched filter just treat the MAI as additive white Gaussian noise (AWGN). With the advent of spread spectrum and hence CDMA, fixed bandwidth was used to accommodate many users by making use of certain coding properties over the bandwidth. Multi-user detection is a concept to make improvements over conventional CDMA receiver.

ABSTRACT

Multi-user detection technique employed to improve the performance of CDMA. MUD is basically the design of signal processing algorithms that algorithms take into account the correlative structure of the MAI.

MIMO (multiple-input multiple-output) systems that operate at high rates require simple yet effective space-time transmission schemes to increase capacity and performance with acceptable BER (Bit Error Rate) proportionally with the number of antennas that can handle the large traffic volume in real time.

MIMO - OFDM has become an important combination that seems to play an important role in the emergent and future wireless communications systems as well as in the so called 4G concept. These systems offer significant diversity advantages over traditional wireless communication systems by exploiting both transmit and receive diversity by employing the V - BLAST schemes. These have led to MIMO - OFDM being regarded as one of the most promising emerging wireless technologies.

With CDMA systems, all users transmit in the same frequency band using specialized codes as a basis of channelization. The transmitted information is spread in bandwidth by multiplying it by a wide bandwidth pseudo random sequence. Both the base station and the mobile station know these random codes that are used to modulate the data sent, allowing it to de-scramble the received signal. In this thesis we have also studied the performance of CDMA combined with MIMO and V-BLAST detection at receiver.

Efforts have been made to study transmit signal processing for the downlink of multi-user systems Using MIMO (Multiple-Input Multiple-Output) systems. We have implemented V-BLAST algorithm of the MIMO - OFDM multi-user Detection system as well as for MIMO -CDMA Multi-user detection.

We have also implemented and analyzed the performance of V-BLAST algorithm for ZF and MMSE Nulling Using modulation QPSK, 16 - QAM and 64 - QAM with fixed number of transmit antennas and receive antennas (i.e. 4 transmit antennas and 8 receive antennas) using MATLAB.