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Channel hopping Algorithm in Cognitive Radio Networks

V. Gopi[1], B. Ajay Kumar[2], R. Chandrasekhar[3]

Dept of Electronics and Communication Engineering, Gudlavalleru Engineering College, Gudlavalleru, India[1]

Assistant Professor, Dept of Electronics and Communication Engineering, Gudlavalleru Engineering College, Gudlavalleru, India[2, 3]

Abstract: Cognitive radio networks (CRNs) have been recognized as an advanced and promising paradigm to address the spectrum under-utilization problem. Cognitive Radio (CR) users improve spectrum efficiency by opportunistic spectrum access when the licensed spectrum is not occupied by the primary users (PUs). CR users also need to sense the spectrum and vacate the channel upon the detection of the PU's presence to protect PUs from harmful interference. this paper presents CH algorithm calculate the BER in cognitive radio networks different modulation techniques used in CH algorithm We evaluate the performance of our algorithm through analysis and MATLAB simulations.

Keywords: cognitive radio; quadrature amplitude modulation; bit error rate.

I. INTRODUCTION

In the past ten years, we have witnessed a dramatic growth in wireless communication due to the popularity of smart phones and other mobile devices Today's wireless networks are regulated by a fixed spectrum assignment policy.rapid growth in the wireless communication sector, increasing the number of users and the number new wireless applications being offered. Cognitive radios are widely viewed as the disruptive technology that can radically improve both spectrum efficiency and utilization. Cognitive radios are fully programmable wireless devices that can sense their environment and dynamically adapt their transmission waveform. A number of wireless applications have been growing over the last decade. Cognitive Radios (CRs) integrate radio technology and networking technology to provide efficient use of radio spectrum, a natural resource, and advanced user services to increase spectral utilization and to optimize the use of radio resources. A Cognitive Radio is an intelligent radio that can be programmed and configured dynamically. Cognitive Radio automatically detects available channels in wireless spectrum.

II. OVERVIEW OF VD ALGORITHM IN COGNITVE RADIO NETWORKS

In the context of CRNs, the owner of a licensed channel is referred to as a primary user (PU) and other users of the channel are referred to as cognitive radio (CR) users or secondary users (SUs). Cognitive Radio users also need to vacate the channel upon the detection of the PU's presence to protect PUs from harmful interference. the design of an algorithm which can allocate a channel to PU immediately when it returns on its assigned channel without letting it wait and move the CR user to some other vacant channel CH sequence for the CR users to get a new vacant channel will use the ranking table. The threshold level i.e. the channel number N/2 is the place where the CR users move eventually and starts hopping till the task of getting a vacant channel is accomplished The basic idea is whenever a PU returns on its assigned channel, the CR users will move to channel number N/2 and starts hopping one by one upwards and sense whether the channel is occupied or not. If already occupied, they continue hopping till they find a vacant channel up to channel number 3N/4. If a vacant channel is not found in this portion, they will start hopping downward from channel number N/2 in search of a vacant channel. By using VD algorithm how much time will get free channel in this algorithm result as relationship between the expected time to get free channel and number of hops to get a free channel.

III. PROPOSED ALGORITHM

In proposed algorithm is Channel hopping (CH) algorithm in cognitive radio networks. Channel hopping means change frequently from one television channel to another, using a remote control device. In this algorithm we can create a different nodes we can take ten nodes in this algorithm each node having a some data. Main antenna distributes a data to the channel in that channel gives data to the each node. Channel as like transmitter and receiver. Although cognitive radio was initially thought of as a software-defined radio extension (full cognitive radio), most research work focuses on spectrum-sensing cognitive radio. In previous algorithm we can calculate expected time to get free channel after we can calculate BER.
Basically the communication system having the transmitter channel and receiver. Generally transmitter gives the input and forward to channel in that channel

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adding some noise we have to remove that noise we can add AWGN noise to the channel after receiver receives the data. Transmitter means a set of equipment used to generate and transmit electromagnetic waves carrying messages or signals, especially those of radio or television. Receiver means which electrical signals are converted into sounds. Simple block diagram of communication system as shown in below fig 1.

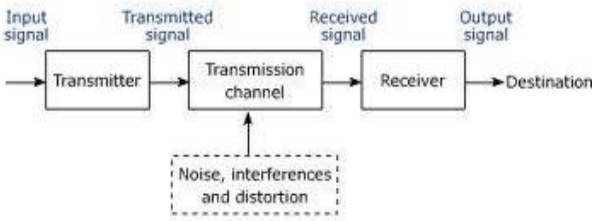

Fig. basic communication system

The proposed algorithm transmitter side QAM modulation and serial to parallel communication and channel side AWGN noise is added at the receiver side QAM demodulation parallel to serial communication

A. QAM modulation

In electronics and telecommunications, modulation is the process of varying one or more properties of a periodic waveform, called the carrier signal, with a modulating signal that typically contains information to be transmitted. Amplitude modulation is defines as the charcestices of the carrier signal is carried in accordance with the amplitude is called amplitude modulation. QAM means quadrature amplitude modulation it is both an analog and a digital modulation scheme. It conveys two analog message signals, or two digital bit streams, by changing (modulating) the amplitudes of two carrier waves, using the amplitude-shift keying(ASK) digital modulation scheme or amplitude modulation (AM) analog modulation scheme. The two carrier waves of the same frequency, usually sinusoids, are out of phase with each other by 90° and are thus called quadrature carriers or quadrature components. The modulated waves are summed, and the final waveform is a combination of both phase-shift keying (PSK) and amplitude-shift keying (ASK).

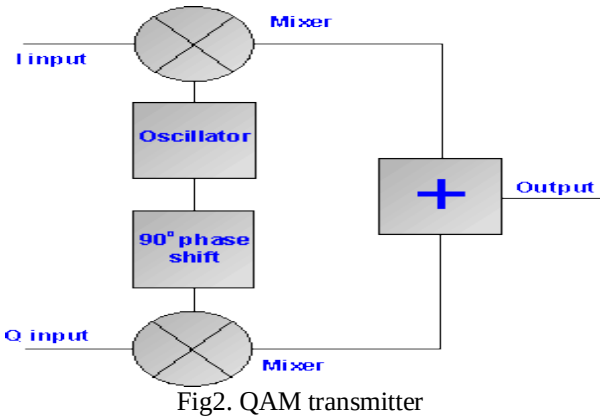

Fig2. QAM transmitter

B. Serial to parallel communcation

Serial communication is the process of sending data one bit at a time, sequentially, over a communication channel Serial communication is used for all long communications.

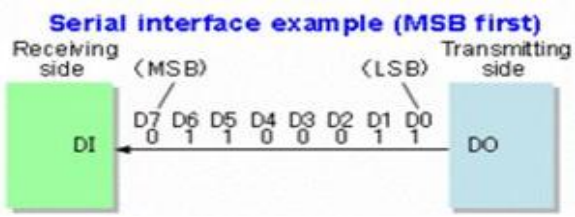

Fig3. Serial communication

In the serial communication data transferred to bit by bit.

Parallel communication is a method of conveying multiple binary digits (bits) simultaneously. The basic difference between a parallel and a serial communication channel is the number of electrical conductors used at the physical layer to convey bits. Parallel communication implies more than one such conductor. In parallel communication data transferred to byte by byte transfer it is a effective data communication. Parallel transmission requires a separate channel for each bit to be transmitted.

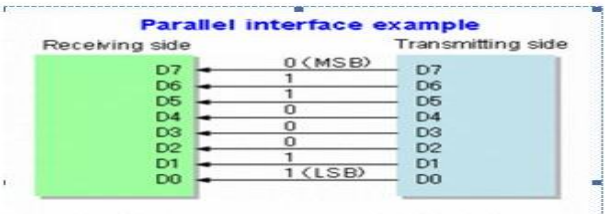

Fig4. Parallel communication

Therefore, to transfer a byte, eight channels will be required between the sender and receiver.

C. Channel

Communication system channel is the most concern channel is placed at the center of transmitter and receiver at channel is passing the information from transmitter section to receiver section. In this algorithm at the channel side we can add the some noise that noise called as AWGN Additive white Gaussian noise (AWGN) is a basic noise model used in Information theory to mimic the effect of many random processes that occur in nature. Additive White Gaussian Noise (AWGN) is common to every communication channels, which is the statistically random radio noise characterized by a wide frequency range with regards to a signal in the communications channel.The modifiers denote specific characteristics. Additive because it is added to any noise that might be intrinsic to the information system. White refers to the idea that it has uniform power across the frequency band for the information system Gaussian because it has a normal distribution in the time domain with an average time domain value of zero.

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D. QAM demodulation

QAM demodulation is the inverse operation of the QAM modulation. . Any frequency offset will be a change in the phase of the local oscillator signal with respect to the two double sideband suppressed carrier constituents of the overall signal.QAM demodulation as shown in below figure

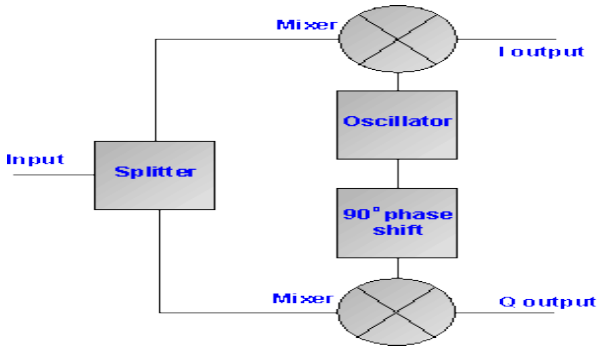
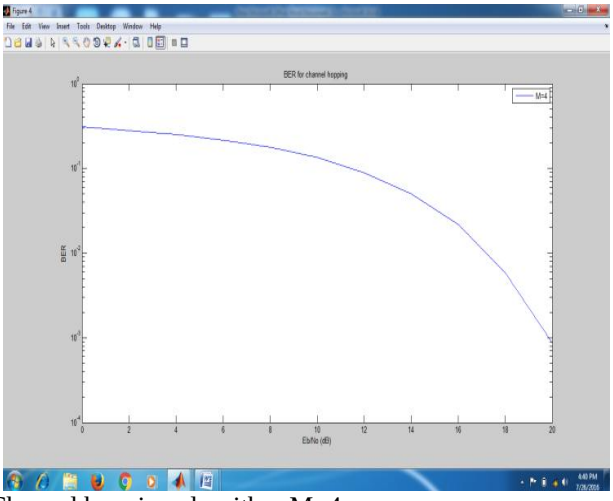


Fig QAM receiver

IV. PERFORMANCE ANALASIS

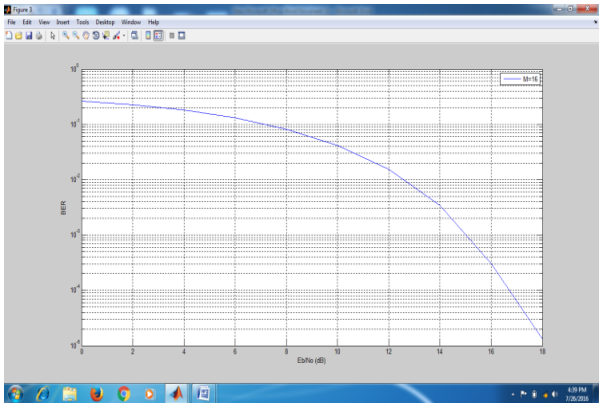
In the CH algorithm doing modulation and de modulation Technique by using QAM in this algorithm sending different number of bits M=4, 16, 64, 256. Channel hopping algorithm M=4 bits in graph represents BER and Signal to noise ratio



Channel hopping algorithm M=4

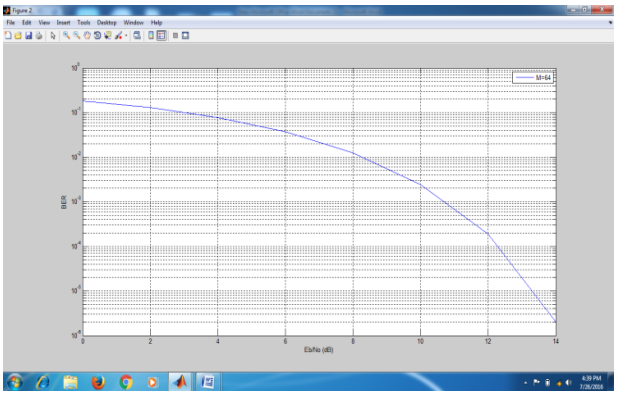
Bit error ratio (BER) is the number of bits received in error, divided by the total number of bits received. Bit error Rate, sometimes bit error ratio (BER) is the most fundamental measure of system performance. That is, it is a measure of how well bits are transferred end-to-end. While this performance is affected by factors such as signal-to-noise and distortion, ultimately it is the ability to receive information error-free that defines the quality of the link

Channel hopping algorithm M=16 bits in graph represents BER and Signal to noise ratio shows below graph



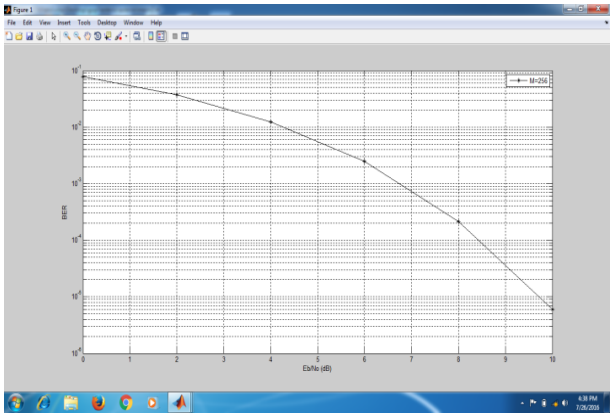
Channel hopping algorithm M=16

Channel hopping algorithm M=64 bits in graph represents BER and Signal to noise ratio. Shows below graph



Channel hopping algorithm M=64

Channel hopping algorithm M=256 bits in graph represents BER and Signal to noise ratio. Shows below graph



Channel hopping algorithm M=256

Signal-to-noise ratio is a term for the power ratio between a signal (meaningful information) and the background noise Signal-to-Noise (SNR) is probably the most common and well understood performance measure characteristic of a digital communication system.

Channel hopping algorithm M=4,16,64,256 bits in graph represents BER and Signal to noise ratio shows below

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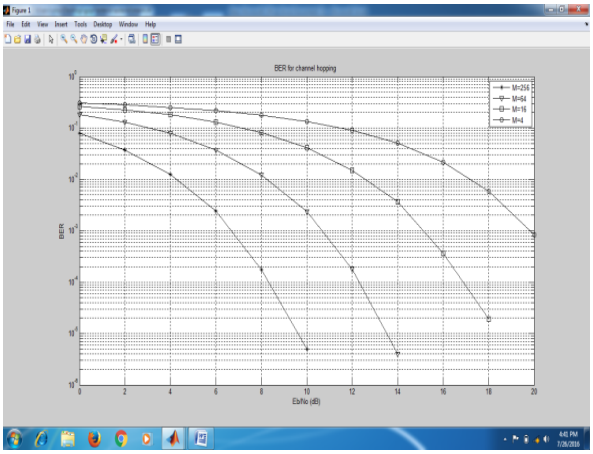
graph. All bits transmit at a time BER is gradually decreases. It can shown n below graph.



Channel hopping algorithm M=4, 16, 64, 256

V. CONCLUSION

BER calculated in the CH algorithm by using QAM modulation and demodulation technique we are applying different bits M =4 16 64 256 BER gradually decreases with respect to the number of bits. In this project we are doing bits estimation for each channel and each node and data bits spread free space also receive total data by using advanced VD algorithm finally we are calculate bits transmit for each channel calculate total bit error by using CH algorithm, the CH algorithm increases the bits.

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BIOGRAPHIES

V. Gopi is M.Tech student in Gudlavalleru Engineering College, Andhra Pradesh. He has complete B.Tech from sree chundi ranganaakulu Engineering college.

Sri B. Ajay Kumar is Assistant Professor in E.C.E department of Gudlavalleru Engineering College. He has about 3 years of teaching experience.

Sri R.Chandrasekhar is Assistant Professor in E.C.E department of Gudlavalleru Engineering College. He has about 3 years of teaching experience.