# Performance Evolution of Cognitive Radio System using MatLab

**Yuvraj Kasar, Ms. Mithra Venkatesan, Dr. A. V. Kulkarni**

***Abstract*— The 21st Century is the new era of the Digital Communication and Wireless Technologies Revolution that surrounds our everyday lives, Wireless Communications Technologies has been undergoing some crucial changes innovative technologies and innovative products such as Wi-Fi, WiMax, IEEE 802.20, IEEE 802.22, Wireless Sensor Network, Mesh Network, Software Defined Radio, Cognitive Radio Network[8] Such Technology built with intelligent System. The proposed work contributes in this direction, aiming to develop Cognitive Radio System and to integrate developed learning algorithms into it. PSD Plot help us to distinguish allocated and unallocated frequency bands and also we evaluate performance of channel in presence of SNR and attenuation.**

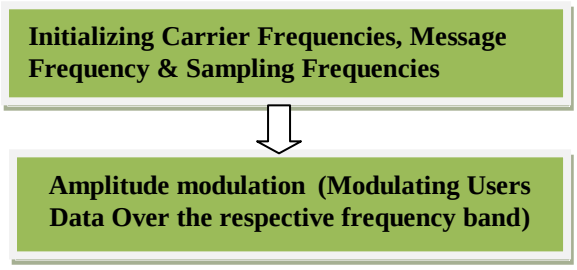
***Index Terms*—** RAT(Radio Access Techniques), CRN(Cognitive Radio Network), PSD(Power Spectral Density), Periodogram, MatLab

## I. INTRODUCTION

In Cognitive Radio Network, Dynamic Spectrum Access [3] allow an secondary users to use frequency bands which are statistically allocated to primary user i.e. licensed users. Spectrum Sensing[7] is very important task in order to use the free holes (spectrum) by secondary user. Cognitive Radio has The ability to sense and is fully aware of its surrounding environment, operating parameters. Main objective of any spectrum sensing technique is to identify PUs with a high Probability of detection and low probability of False alarm the approach that is adopted herewith is that we have investigated the idea of simulating Cognitive Radio system to use locally unused spectrum to increase the total capacity of system and Simulation is done in MatlabR2010.

In this paper section second describe the methodology, section third describe simulation results and section fourth describe conclusion & References.

## II. METHODOLOGY ADOPTED:



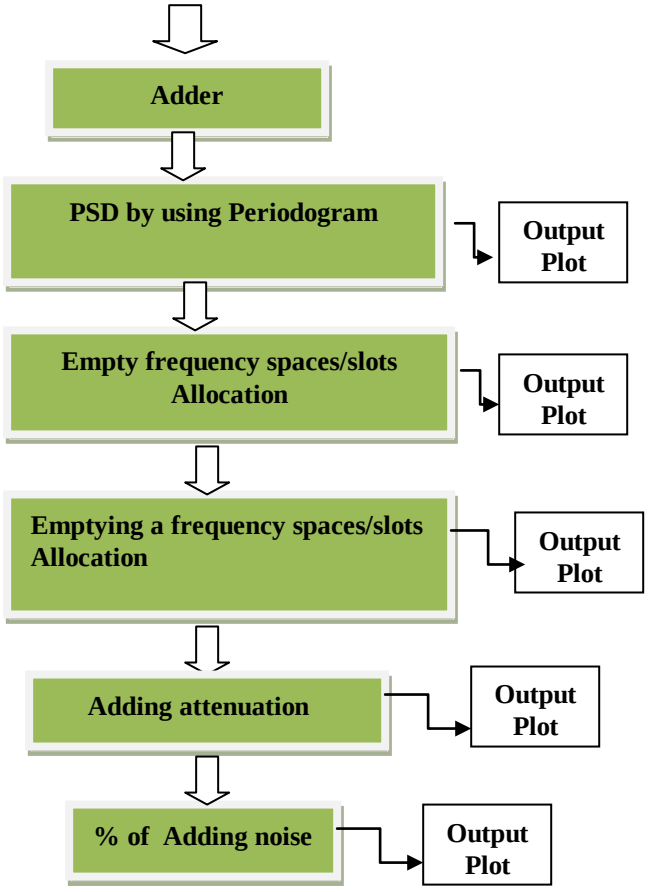




Figure 1: Proposed model our DSA Simulation scenario

In the above proposed model we have firstly initialized five carrier frequencies for the user, sampling frequency, data/message frequency. All the user data modulated by using amplitude modulation over the respective frequency band. In the next step we add all the modulated signals to produce transmitted signal and by using Periodogram [7] we estimates PSD of received signal further it looks for empty spaces and new users is allocated to free spaces further if all the slots are busy then used asked for empty a particular slots Performance is characterized by adding attenuation and percentage of noise.



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## III. RESULTS

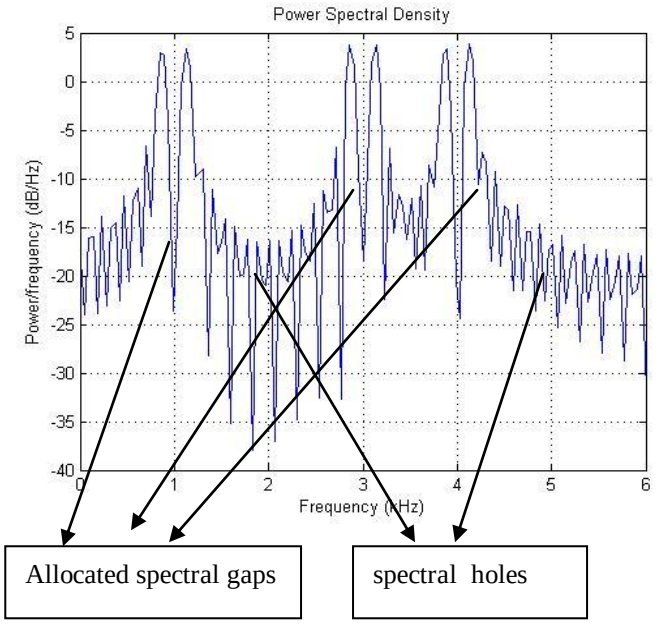


Figure 1.Used bands (1st, 3rd and 4th), Unused bands (2nd and 5th)

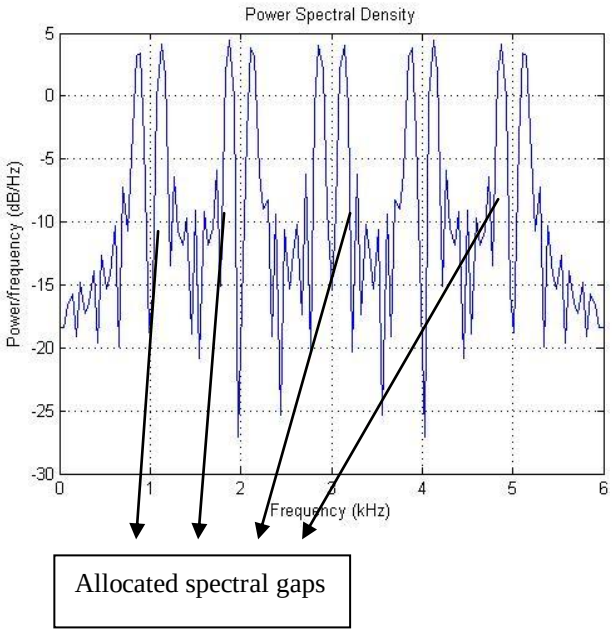


Figure 3.All of the bands are in Used

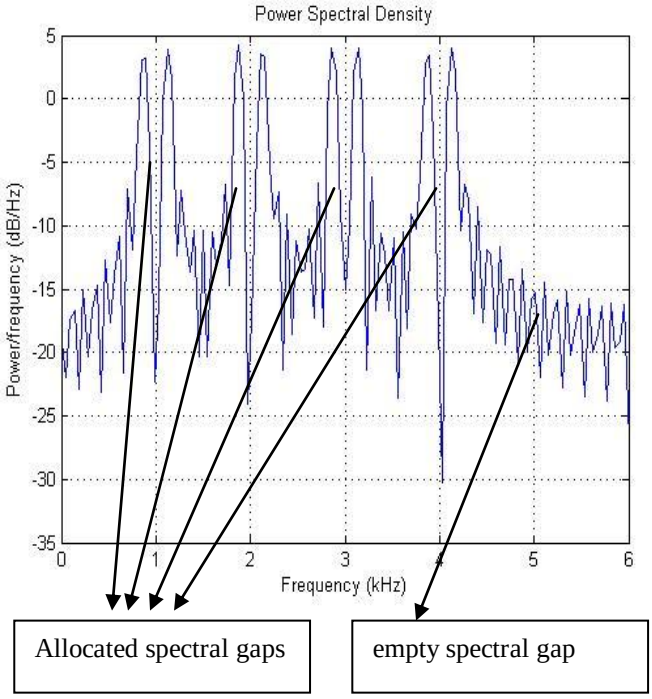


Figure 2. Used bands (1st,2nd, 3rd and 4th), Unused bands (5th)

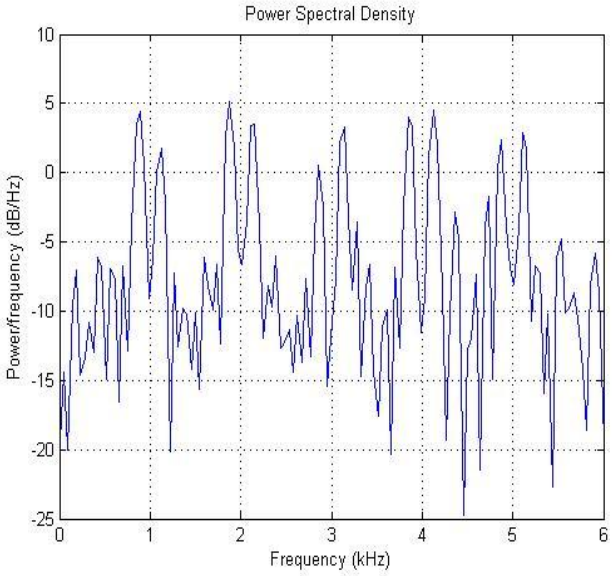


Figure 4. SNR= 6dB

 

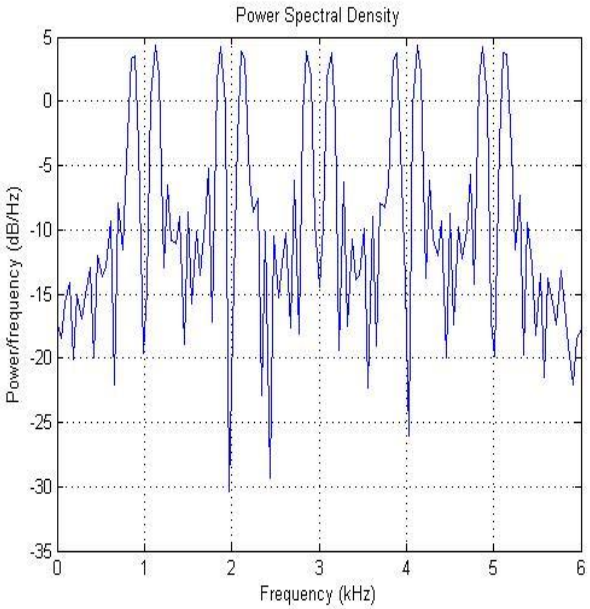


Figure 5. SNR= 22dB

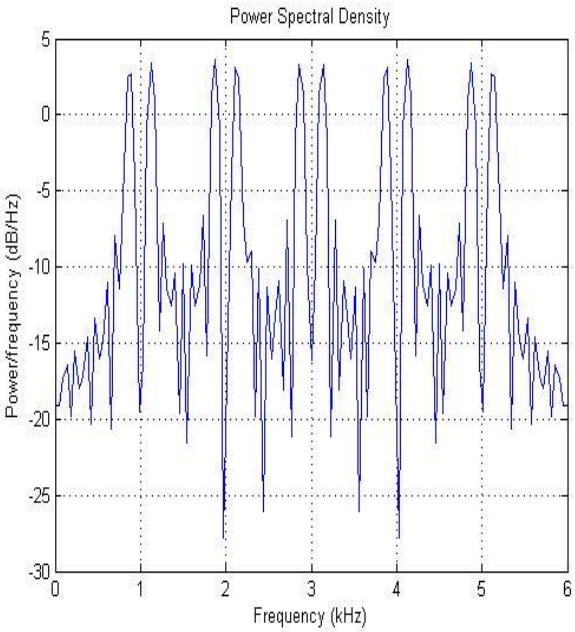


Figure 6. Attenuation 8%

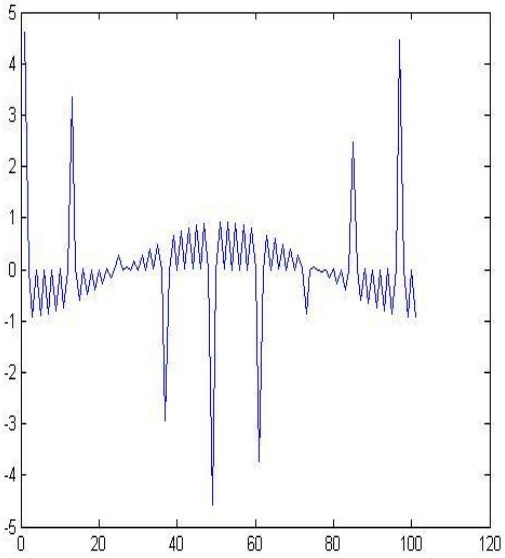

Figure 7. Noisy & Attenuated Carrier's Power Spectral Density Graph

We have designed cognitive radio system for five users that continuously search for free holes when primary users absents then this free holes are allocated to secondary users whenever primary user wants to occupy slots then it leaves immediately. In this simulation we used five carrier frequencies 1MHz, 2MHz, 3MHz, 4MHz, 5MHz . and sampling frequency is 12MHz. by using periodigram Power Spectrum Density (PSD) of signal is calculated, compared with the predefined threshold value and determined the presence of primary user signal.

In this paper it is assumed that 2nd and 5th user are absent that is shown in figure 1.cognitive radio system search for spectral gap and assigned to secondary user it is shown in figure 2. 2nd spectral hole occupied by secondary user and it again searches for empty spectral hole if any empty spectral gap then it is assigned to secondary user it is shown in figure 3. Spectral hole 4th is filled by secondary user

System performance observed by adding noise and attenuation .if the Signal to Noise Ratio (SNR) is 6dB, 22dB. Then, the following results are shown in the Figure 4 and Figure 5. The disturbance in the spectrum can be observed to decrease with the increase in SNR. This means that the noisy channel will increase the probability of error in the received signal. Figure 6 shows attenuation in the signal with increasing attenuation signal peaks are proportionately reduced thus attenuation in the channel will reduce the signal power. Noisy and Attenuated Carrier's Power Spectral Density Graph shown in figure 7.


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## IV. CONCLUSION

In this paper, we proposed system which take decision on the basis of PSD that improve overall channel performance and throughput our approach continuously searches for spectrum Holes it has been shown that that cognitive radio work with dynamically with change in the frequency bands Signal to Noise ratio (SNR) values are taken as 6dB, 22dB and Attenuation percentages is 12 has been used.

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