

## ➤ **Publications: Dr. Wasan Kadhim Saad**

### ***1- Survey of Adaptive Modulation Scheme in MIMO Transmission***

**Journal of Communications (JCM), VOL. 7, NO. 12, (Scopus indexed), December 2012**

**(Link)**

<https://pdfs.semanticscholar.org/a545/b0eb8c38141972ea5c4d129d45925b24fd2e.pdf>

**Abstract**—Adaptive modulation (AM) technique may make more promote in the execution of wireless communication systems through adaptively conformity transmitter parameters to fading channels; therefore, it has been taken as one of the key physical techniques in 3GPP Evolved Universal Terrestrial Radio Access (E-UTRA). This paper offers a general overview of the adaptive modulation scheme in wireless multiple-input multiple-output (MIMO) systems. Study a set of properties by which adaptive modulation systems are evaluated, and then apply this valuation method to survey a number of existing systems, also, discuss modulation schemes and channel modeling in detail since it is utilized in most current system or solutions, as well survey some MIMO models which are included in adaptive modulation activities in order to reproduce and corresponding MIMO system ratings. Comprehensive execution comparisons including, BER analysis, average spectral efficiency (ASE), modulation schemes, and channel model are presented.

### ***2- Throughput Performance of Adaptive Modulation and Coding Scheme with Link Adaptation for MIMO-WiMAX Downlink Transmission***

**Journal of Asian Scientific Research, 2(11):641-650, 2012, (Scopus indexed) & Conference on Engineering and Built Environment (ICEBE 2012), Malaysia, 2012**

**(Link)**

<https://pdfs.semanticscholar.org/e6e2/6a4749e30775e0306f61918a9c1776eddc69.pdf>

**ABSTRACT-** The mobile WiMAX system is based on the IEEE 802.16m standard which is used to develop an advanced air interface (AAI) to meet the requirements for IMT-Advanced next generation networks , which are able to provide high speed access and are used to provide a rate

of broadband data for low mobility scenarios up to 1 Gbit/sec. This paper investigates the application of link adaptation techniques (AM and AMC) to the downlink for the IEEE 802.16m depending on the mobile WiMAX networks to achieve spectral efficiency gain. Also, by use of link adaptation it is possible to combine the MIMO technique with link adaptation in order to maximize the throughput. This paper considers six various MCS for link adaptation in order to find the largest throughput improvement. The working thresholds of the SNR for the various combinations of modulation, coding and MIMO will be determined through utilizing the ITU pedestrian channel model. Therefore, through employing a system level simulation, the performance evaluation results explain that the adaptive modulation and coding (AMC) system is noticeably superior compared to the systems that utilize fixed modulation (FM) or adaptive modulation (AM) schemes with regard to the spectral efficiency.

### ***3- On the Performance of Cooperative Spectrum Sensing of Cognitive Radio Networks in AWGN and Rayleigh Fading Environments***

**KSII Transactions on Internet and Information Systems, vol. 7, no. 8, pp. 1754-1769, (ISI & Scopus indexed, Q3), (IF @ JCCR2012 = 0.560), August 30, 2013**

**(Link)**

[file:///C:/Users/user/Downloads/1.%20TIIS-RP-2013-Apr-0344.R1%20\(2\).pdf](file:///C:/Users/user/Downloads/1.%20TIIS-RP-2013-Apr-0344.R1%20(2).pdf)

**Abstract-** For the purpose of enhancing the spectrum efficiency, cognitive radio (CR) technology has been recently proposed as a promising dynamic spectrum allocation paradigm. In CR, spectrum sensing is the key capability of secondary users in a cognitive radio network that aims for reducing the probability of harmful interference with primary users. However, the individual CRs might not be able to carry out reliable detection of the presence of a primary radio due to the impact of channel fading or shadowing. This paper studies the cooperative spectrum sensing scheme as means of optimizing the sensing performance in AWGN and Rayleigh channels. Results generated from simulation provide evidence of the impact of channel condition on the complementary receiver operating characteristic (ROC). Based on the results, it was found that with constant local SNRs at the secondary users, the probability of missed detection ( $P_m$ ) of cooperative spectrum sensing in a cognitive radio network, calculated using a closed form expression, can be significantly minimized. Thus, the paper illustrates that improvement of the detection performance of the CR network can be achieved by establishing a centralized cooperation among neighboring cognitive radio users. Finally, verification of the validity of the fusion schemes utilized for combining the individual CR decisions is provided.

#### ***4- Improved Detection Performance of Cognitive Radio Networks in AWGN and Rayleigh Fading Environments***

**Journal of Applied Research and Technology, Volume 11, Issue 3, June 2013, Pages 437-446, (ISI & Scopus indexed, Q4), (IF. @ JCCR2012=0.335), 2013.**

**(Link)**

[https://ac.els-cdn.com/S1665642313715529/1-s2.0-S1665642313715529-main.pdf?\\_tid=fe89bdb6-3657-423a-b782-36dc180810e4&acdnat=1523732036\\_d72b3e9e81390ba6c48dad77be0ca713](https://ac.els-cdn.com/S1665642313715529/1-s2.0-S1665642313715529-main.pdf?_tid=fe89bdb6-3657-423a-b782-36dc180810e4&acdnat=1523732036_d72b3e9e81390ba6c48dad77be0ca713)

**ABSTRACT-** Cognitive radios (CRs) have been recently emerging as prime candidates to enhance spectral efficiency by exploiting spectrum-aware systems which can reliably monitor licensed users' activities. CR users monitor such activities by performing spectrum sensing to detect potential white spaces. However, this process of local sensing might be a challenging task in fading environments. The inefficiency of spectrum sensing might cause interference to licensees if they are miss-detected by CR users. Thus, cooperative spectrum sensing is proposed as a means to combat fading and improve the detection performance. However, the detection performance does not improve by such cooperation when low-SNR environment is considered. In this paper, cooperative spectrum sensing with PSO-based threshold adaptation is presented to address the aforementioned problem. Simulation results show that the detection performance with PSObased adaptive detection threshold is improved, particularly, in low-SNR environment.

#### ***5- Effect of Work Period of the Primary User on Spectrum Sensing Schemes Based on MDE-Dynamic Energy Detection***

**2nd International Conference on Electronic Design (ICED), IEEE Xplore, pp. 387-392, Penang, Malaysia, August 19-21, 2014**

**(Link)**

**DOI:** [10.1109/ICED.2014.7015836](https://doi.org/10.1109/ICED.2014.7015836)

**Abstract-** The idea of a PU work period is developed for analysing the performance of spectrum sensing through the use of energy detection to disclose for non-stationary PU signals. This paper is aimed to analysis the effect of the primary user work period on the performance of the energy detector when the state of the primary user is changed during the sensing period. For this paper,

the energy detector was modified to include the impact of the PU work period into the model according to the minimum decision error (MDE) method. Also proposes new detectors in order to enhance detection with regard to the work period displayed by the PU, where it is implemented for a sensing period in order to compute the minimum sensing period necessary to investigation the detection needs. The estimates indicate that the expected performance of the conventional energy detection does not indicate the true performance. In addition ...

### ***6- Spectrum sensing schemes for static primary user signal under AWGN and Rayleigh fading channels***

**Journal of Theoretical and Applied Information Technology (JATIT), Vol.79. No.2, (Scopus indexed), 20th September 2015**

**(Link)**

<http://www.jatit.org/volumes/Vol79No2/12Vol79No2.pdf>

**Abstract-** This paper taught the performance of the proposed sensing models, namely, constant false alarm rate-dynamic waveform detector (CFAR-DWD) are categorized as dynamic threshold (DT), two-stage (TS), and adaptive two-stage (ATS) detection for accurately detecting of the static-primary user (PU) signals, where the state of the PU signal not change during the sensing duration. Whereby it is carried out by deriving a closed-form expressions for the average detection probability for the proposed models over AWGN and Rayleigh fading channels under low signal-to-noise ratio (SNR) environments. In addition, complete mathematical analysis for the normalized throughput and average channel capacity of the secondary network are developed over AWGN and Rayleigh fading channels to demonstrate the impact of the opportunistic spectrum access. Comparison based on simulation was performed of the detection ...

### ***7- Spectrum Sensing Schemes for Dynamic Primary User Signal under AWGN and Rayleigh Fading Channels***

**Journal of Communications (JCM), Vol. 11, No. 3, (Scopus indexed), March 2016**

**(Link)**

<https://pdfs.semanticscholar.org/6857/936ca0a5169e75059ccced17e45b837c96fc.pdf>

**Abstract** —In this paper, the performance of spectrum sensing is analysed while taking into account the effect of Primary User (PU) activities. A PU work period is defined and formalized to practically realize the PU activities when dynamically changing between ON and OFF transmission scenarios. In reality, it is important to consider such work period as the PU will only active for certain fraction of the total frame time. A new sensing model, namely, Constant False Alarm Rate-Dynamic Energy Detection (CFAR-DED) is introduced for dynamic-PU signal state scenario. The CRAF-DED model is then further categorized into three scenarios; Dynamic Threshold (DT), Two-Stage (TS), and Adaptive Two-Stage (ATS) detection algorithms. Closed-form expressions for the average detection probability have been mathematically derived when the PU is partially present within the observed period under AWGN and Rayleigh fading environments. Simulation results show that the proposed algorithms provide detection improvement as compared with conventional energy detection. In particular, ATS represents the most effective sensing algorithm of the CFAR-DED model. In addition, the results show that the probability of detection degrades severely when the PU work period and sensing time are reduced regardless of the method of detection used. Furthermore, it has been found that the detection performance of the proposed algorithms under Rayleigh fading with low-SNR is significantly deteriorated.

### ***8- Multi-Stage Cross Entropy Optimization Algorithm for Hard Combining Schemes in Cognitive Radio Network***

**12th IEEE Malaysia International Conference on Communications (MICC2015),  
IEEE Xplore, pp. 113-118, Malaysia, 2015**

**(Link)**

**DOI: [10.1109/MICC.2015.7725418](https://doi.org/10.1109/MICC.2015.7725418)**

**Abstract-** Spectrum sensing optimization is the process of finding the optimal set of sensing parameters in order to maximize the optimization objective while meet the restrictions imposed. The detection accuracy of a cognitive radio network (CRN) improves through using a cooperative spectrum sensing (CSS) scheme. However, increasing the number of SU necessitates a growth in the cooperation overhead of the system leading to degradation the throughput of the CRN. Multi stage-cross entropy (MSCE) optimization algorithm has been proposed to optimize the trade-off between global probability of detection at fusion center (FC) and achievable throughput in cooperative CRNs, and then compared the results with genetic algorithm (GA) and particle swarm optimization (PSO) algorithms. The proposed approach is based on cross entropy (CE) optimization method. A bi-objective (BO) function have been formulated for static ...

## ***9- Optimality of the HDC Rules in Cooperative Spectrum Sensing for Cognitive Radio Network***

**1st IEEE International Conference on Telematics and Future Generation Networks (TAFGEN), IEEE Xplore, Malaysia, 08 October 2015.**

**(Link)**

DOI: [10.1109/TAFGEN.2015.7289569](https://doi.org/10.1109/TAFGEN.2015.7289569)

**Abstract-** Cognitive Radio (CR) sensing has been widely considered as a spectrum scanning mechanism that allows secondary users (SUs) or cognitive radio users to use detected spectrum holes caused by primary user (PU) absence. Hard decision combining (HDC) schemes are proposed to combine the sensing decisions of the collaborated users to come out with a global binary decision on the presence or absence PUs. This paper presents an analytical study on the optimality of HDC rules at which the Bayes risk function is minimized. In this work, the sensing performance of energy detection (ED) is also evaluated in two cases; when the estimated noise power is perfectly known at the SU receiver and when noise uncertainty is present at the SU receiver. The sensing performance of the ED and likelihood ratio test (LRT) of local spectrum sensing (SS) is first compared. Then, the performance of cooperative spectrum ...

## ***10- Face Recognition Approach using an Enhanced Particle Swarm Optimization and Support Vector Machine***

**Journal of Engineering and Applied Sciences 14 (9): 2982-2987, 2019**

**Abstract:** Face recognition is one of the most promising research area in the last decades. The SVM approach is one of the famous approaches in machine learning fields because it can determine the global optimum solutions with lesser number of training samples especially, complex non-linear challenges such as in face recognition applications. Though, there is an important issue that can affects the whole classification process which is picking the optimum parameters of SVM. Recently, Particle Swarm Optimization (PSO) is used to discover the optimal parameters of SVM and many versions of PSO are used for this purpose, like: PSO-SVM technique, opposition PSO and SVM which called (OPSO-SVM) technique and AAPSO-SVM technique which represents adaptive acceleration PSO and SVM. In this study, a new hybrid technique based on the combination of “Accelerated PSO” and “OPSO-SVM” is introduced for face recognition applications. The hybridization can improve the convergence speed in PSO in order to find the optimal parameters of SVM. In the feature extraction process, the PCA algorithm is used for that purpose and the resulted features are delivered to the proposed technique in order to classify the face images. Two human face datasets are used in the experimentation stage such

as, SCface dataset and CASIA face dataset in order to validate the performance of the proposed technique. The comparison process for proposed technique with the other recent technique, like: PSO-SVM, OPSO-SVM and AAPSO-SVM is done as an assessment process. The proposed technique provided high accuracy for recognition when we compared it with the other techniques and it was robust in finding the optimal parameters of SVM.

### ***11- Optimal Nano-Dimensional Channel of GaAs- FinFET Transistor***

**2018 IEEE Student Conference on Research and Development (SCOREd)**

**Abstract**— This paper investigates the optimal nano-dimensions channel for Gallium Arsenide Fin Field Effect Transistor (GaAs-FinFET) based on ION/IOFF ratio and subthreshold swing (SS). The impact of reducing channel dimensions (length, width, and oxide thickness) on GaAs- FinFET performance has been evaluated in terms of various electrical characteristics (ION/IOFF, SS, VT and DIBL). The MuGFET simulation tool is used in this study to simulate the current-voltage characteristics for different dimensions of channel. According to highest ION/IOFF ratio, and nearest SS to the ideal SS, the best channel dimensions of GaAs-FinFET are designed. The results show that the best performance can be achieved with the lowest scaling factor, K of 0.25, when the length is 40 nm, the width is 3 nm, and the oxide thickness is 1 nm.

### ***12- Arduino-based Buck Boost Converter for PV Solar System***

**2018 IEEE Student Conference on Research and Development (SCOREd)**

**Abstract**— Recently, photovoltaic systems (PV) have gained tremendous attention as one of the most promising technology for harnessing renewable energy sources. However, the fluctuation of output voltage with time due to irradiance variation is one of the major drawback of PV solar system. Thus, in this paper, we propose a buck-boost converter based on Arduino microcontroller to maintain the output voltage of PV system at a desired value by controlling the duty cycle of the converter using pulse width modulator (PWM). The proposed system has been tested using both simulation and prototype to prove effectiveness of our design and obtain a fixed voltage at the output of solar panel regardless of irradiation conditions. The obtained results show that the developed converter performed well and attained 12 V constant output voltage in both modes (buck and boost).

### ***13- Adaptive Modulation and Superposition Coding for MIMO Data Transmission Using Unequal Error Protection and Ordered Successive Interference Cancellation Techniques***

**Journal of Communications Vol. 14, No. 8, August 2019**

**Abstract**—This paper proposes and discusses an efficient multiple input multiple output (MIMO) system for adaptive modulation coding (AMC) based on unequal error protection (UEP) and superposition coding (SPC) by exploiting the features of sub channel partitioning. Using AMC, an appropriate order of modulation and code rate to suit the channel state information (CSI) can be selected. The realization of UEP is achieved through adaptive allocation and transmission of high and low-priority data signals over high and low quality sub channels respectively. A multistage decoding (MSD) receiver with the ordered successive interference cancellation (OSIC) technique is employed in the receiver by using two linear receiver signal combiner (RSC) techniques: zero-forcing (ZF) and minimum mean square error (MMSE). The data priority can be distinguished by the signal-to-noise ratio (SNR) and can be categorized as mode-B and mode-G. The simulation results show that the SNR performance enhancement for the UEP- MIMO scheme is approximately 9.4 dB compared to the others schemes. In addition, for the UEP-MIMO scheme, the overall data system transmission from mode-B outperforms that of mode-G with SNR gains of 8.2 dB compared to the 7.5 dB for the UEP-SISO scheme. Also, MMSE-SPC also outperforms the ZF-SPC with a 3 dB SNR at a bit error rate (BER) of  $10^{-3}$ .

### ***14- MEQSA-OLSRv2: A Multicriteria-Based Hybrid Multipath Protocol for Energy-Efficient and QoS-Aware Data Routing in MANET-WSN Convergence Scenarios of IoT***

**IEEE Access, 2018**

**ABSTRACT-** Convergence of typical wireless networks [mobile ad hoc network (MANET) and wireless sensor network (WSN)] is paving the way toward brand-new cooperative platforms for Internet of Things (IoT) communications. The IoT enables the global connectivity of a wide variety of heterogeneous objects in accordance with their battery capacity, processing capabilities, and mobility to serve people in a collaborative manner automatically and intelligently. In such ubiquitous smart environments, efficient and effective data routing among IoT devices represent a real challenge due to nodes heterogeneity. Thus, this paper proposes a hybrid multipath energy and quality of service (QoS)-aware optimized link state routing protocol version 2 (MEQSA-OLSRv2), which is developed to cope with the challenges presented by limited energy resources,



mobility of nodes, and traffic congestion during data transmission in the MANET-WSN convergence scenarios of IoT networks. This protocol uses a node rank according to multi criteria node rank metric (MCNR). This MCNR aggregates multiple parameters related to energy and QoS into a comprehensive metric to dramatically reduce the complexity of multiple constrained considerations and avoid the control overhead caused by separately broadcasting multiple parameters. These metrics are the node's lifetime, residual battery energy, node's idle time, node's speed, and queue length. The MCNR metric is utilized by a new link quality assessment function for multiple-route computation. It is also adopted to select a multipoint relay (MPR) set of nodes by using an energy and QoS-aware MPR selection mechanism for flooding topological information. The simultaneous consideration of energy and QoS parameters can benefit the tradeoff between QoS and energy awareness. The performance of the MEQSA-OLSRv2 is evaluated through EXata-based simulations, and its effectiveness is validated by comparing it with the conventional routing protocols. The MEQSA-OLSRv2 is found to outperform existing schemes even in heavy traffic load and high-mobility scenarios. Furthermore, the MEQSA-OLSRv2 considerably enhances QoS, reduces energy consumption, and decreases the energy cost per packet.

### ***15- Performance Analysis of Image Transmission with Various Channel Conditions / Modulation Techniques***

**TELKOMNIKA, vol, 18, no.3**

**ABSTRACT-** This paper investigate the impact of different modulation techniques for digital communication systems that employ quadrature phase shift keying (QPSK) and quadrature amplitude modulation (16-QAM and 64-QAM) to transmit images over AWGN and Rayleigh fading channels for the cellular mobile networks. In the further steps, wiener and median filters has been adopted to the simulation are used at the receiver side to remove the impulsive noise present in the received image. This work is perform to evaluate the transmission of two dimensional (2D) gray-scale and color-scale (RGB) images with different values from signal to noise ratios (SNR), such as; (5,10 and 15) dB over different channels. The correct conclusions are made by comparing many of the observed Matlab simulation results. This is perform through the results that measure the quality of received image, which is analyzes in terms of SNRimage peak signal to noise ratio (PSNR) and mean square error (MSE).

### ***16- Effect of Fiber Composition on Material Dispersion***

**1st Scientific Conference Technical College-Najaf, Iraq, 2008**

***17- Method for Detection and Diagnosis of the Area of Skin Disease Based on Color by Wavelet Transform and Artificial Neural Network***

**Journal of Al-Qadisiya for Engineer Science, Iraq, 2009**

***18- Comparison the Performance Evaluation of XGPON-ROF System with WDM and SCM for Different Modulation Schemes***

**Al-Qadisiyah Journal for Engineering Sciences, vol. 12, no. 4**