



Pranav Patel

# **Energy Detection Based Spectrum Sensing In Cognitive Radio**

Performance analysis of Energy Detection Spectrum  
Sensing Using RTL-SDR & GNU Radio



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# Energy Detection For Spectrum Sensing In Cognitive Radio

**Jiasong Mu, Qilian Liang, Wei  
Wang, Baoju Zhang, Yiming Pi**



## **Energy Detection For Spectrum Sensing In Cognitive Radio:**

**Energy Detection for Spectrum Sensing in Cognitive Radio** Saman Atapattu,Chintha Tellambura,Hai Jiang,2014-02-15 This Springer Brief focuses on the current state of the art research on spectrum sensing by using energy detection a low complexity and low cost technique It includes a comprehensive summary of recent research fundamental theories possible architectures useful performance measurements of energy detection and applications of energy detection Concise practical chapters explore conventional energy detectors alternative forms of energy detectors performance measurements diversity techniques and cooperative networks The careful analysis enables reader to identify the most efficient techniques for improving energy detection performance Energy Detection for Spectrum Sensing in Cognitive Radio is a valuable tool for researchers and practitioners interested in spectrum sensing and cognitive radio networks Advanced level students studying wireless communication will also benefit from this brief

**Energy Detection Based Spectrum Sensing in Cognitive Radio** Pranav Patel,2015-06-25 The rapid usage of wireless communications in personal commercial and governmental capacities efficient spectrum utilization has become a prime topic of interest Most of the licensed bands suffer from under utilization and less spectral occupancy of spectrum Cognitive radio technology promising solution to the problem of low spectral occupancy and inefficient utilization of the licensed radio spectrum A prime constituent of the cognitive radio technology is spectrum sensing Energy detection ED is one of the popular spectrum sensing technique for cognitive radio In this work I Proposed RTL 2832U SDR stick is suitable for energy detection based spectrum sensing method In this experiment we capture the real time signal coming from the BTS over the different city in rural urban area using an RTL 2832U SDR stick to decide the frequency band available or not The GNU Radio software allows for the implementation of Energy detection spectrum sensing technique using the RTL SDR

Improve Performance Analysis of Energy Detection in Spectrum Sensing of Cognitive Radio Muhammad Syahmi Syazwan Abdul Halim,2012

Analysis of Energy Detection in Cognitive Radio Networks Saman U. B. Atapattu,2013 Cognitive radio is one of the most promising technologies to address the spectrum scarcity problem Cognitive radio requires spectrum sensing which is used by unlicensed users to opportunistically access the licensed spectrum Spectrum sensing using energy detection offers low cost and low complexity In this thesis a comprehensive performance analysis of energy detection based spectrum sensing is developed Detection performance over composite fading and shadowing channels is first investigated using the K and K\_G channel models To further facilitate analysis of energy detection over different wireless channels a unified channel model based on a mixture gamma distribution is developed The unified model can accurately represent most existing channel models A single value performance metric the area under the receiver operating characteristic curve is proposed to measure the overall detection capability and is investigated over various wireless fading channels The energy detection based cooperative spectrum sensing is also studied which can largely improve the detection performance Since spectrum sensing is required to identify

activities of licensed users at a very low signal to noise ratio SNR performance of energy detection with low SNR is also analyzed in this thesis *Implementation of Energy Detector for Cognitive Radio* Zahir A. Hussein Alsulaimawi, 2013

Cognitive radio is a technology that provides a promising new way to improve the efficiency of the use of the electromagnetic spectrum that available Spectrum sensing helps in the detection of spectrum holes unused channels of the band and instantly move into vacant channels while avoiding occupied ones A brief overview of the energy detection based spectrum sensing for cognitive radio technology is introduced An energy detector with baseband sampling for cognitive radio is presented with mathematical analyses for an additive white Gaussian noise AWGN channel Practical implementation issues on Texas Instruments TMS320C6713 floating point DSP board are presented A new multiple antenna technique based energy detector is proposed As well as several algorithms for generating white noise are implemented **Spectrum sensing techniques in**

**cognitive radio** Joydeep Dutta, 2022-05-09 Document from the year 2022 in the subject Physics Technical Physics grade A language English abstract Cognitive Radio offers non interfering use of spectrum which requires three main tasks Spectrum Sensing Spectrum Analysis and Spectrum Allocation The aim of this study is to focus on spectrum sensing in cognitive radio which is a recently introduced technology in order to increase the spectrum efficiency Increasing efficiency of the spectrum usage is an urgent need as the number of wireless users is increasing rapidly Cognitive radio arises to be a good solution to spectral crowding problem by introducing the opportunistic usage of frequency bands that are not heavily occupied by licensed users Primary user since they cannot be utilized by users other Secondary user than the license owners at the moment Cognitive radio can sense the spectrum and detect the idle frequency bands thus secondary users can be allocated in those bands when primary users do not use those in order to avoid any interference to primary user by secondary users Several Spectrum Sensing Methods proposed in the literature are theoretically analyzed and interpreted in the sense of advantages and drawbacks Spectrum Sensing for Cognitive Radio Kamal M. Captain, Manjunath V. Joshi, 2021-12-30 This comprehensive reference text discusses concepts of cognitive radio and the advances in the field of spectrum sensing This text discusses the concept of cognitive radio for next generation wireless communication and a very critical aspect of cognitive radio that is spectrum sensing in detail It covers important topics including narrowband spectrum sensing wideband spectrum sensing cooperative spectrum sensing system and channel models detection algorithms approximation of decision statistics and theoretical analysis of detection algorithms in detail Separate chapters are dedicated to discussing the analysis and use of detection algorithms for narrowband spectrum sensing wideband spectrum sensing and cooperative wideband spectrum sensing Aimed at graduate students and academic researchers in the fields of electrical engineering and electronics and communication engineering this text Discusses concepts of cognitive radio and research in spectrum sensing Presents mathematical analysis of algorithms considering practical environment Explains novel wideband spectrum sensing algorithms with detailed analysis Provides mathematical derivations to help readers Discusses basic spectrum sensing

algorithms from narrowband spectrum sensing to the more advanced wideband spectrum sensing      **Introduction to Cognitive Radio Networks and Applications** Geetam Tomar,Ashish Bagwari,Jyotshana Kanti,2016-10-03 Cognitive radio is 5 G technology comes under IEEE 802 22 WRAN Wireless Regional Area Network standards It is currently experiencing rapid growth due to its potential to solve many of the problems affecting present day wireless systems The foremost objective of Introduction to Cognitive Radio Networks and Applications is to educate wireless communication generalists about cognitive radio communication networks Written by international leading experts in the field this book caters to the needs of researchers in the field who require a basis in the principles and the challenges of cognitive radio networks

Security-aware Cooperation in Cognitive Radio Networks Ning Zhang,Jon W. Mark,2014-01-29 This brief investigates spectrum efficient and energy efficient strategies known as cognitive radio networks CRNs to ensure secure cooperation between licensed and unlicensed users The authors address issues of spectrum scarcity spectrum sensing transmission performance trust aware cooperation and secure communications Two security aware cooperation based spectrum access schemes are presented The first is a trust aware cooperative framework for CRNs to improve the throughput or energy efficiency of licensed users and offer transmission opportunities to unlicensed users taking into consideration the trustworthiness of unlicensed users The second scheme is a cooperative framework to enhance secure communications of licensed users An introduction to CRNs and literature survey enhance the discussion while numerical results are provided to demonstrate the viability of the proposed schemes The brief is designed for researchers and professionals working with cognitive radio networks or interested in cooperation based access Advanced level students studying computer communication networks and communications engineering will also find this brief useful      Energy Based Spectrum Sensing for Enabling Dynamic Spectrum Access in Cognitive Radios Samson Sequeira,2011 Spectrum scarcity is increasingly becoming an obstacle for the implementation of new wireless technologies On the contrary recent studies have discovered considerable under utilization of the allocated spectrum by the licensed users This suggests that the solution to the problem is a transition from static spectrum allocation policies to dynamic spectrum access methodologies This can be accomplished through the use of Cognitive Radio technology Cognitive Radio is considered as an intelligent radio which is capable of altering its transmission or reception parameters in accordance to the radio environment and the network state to use the available spectrum optimally Significant research efforts have furthered Cognitive Radios since the idea was first conceived by Joseph Mitola in 1998 Cognitive Radio technology allows for the licensed spectrum of the primary users to be used on an opportunistic basis by unlicensed secondary users A vital requirement of such an opportunistic scheme is that the licensed primary users be protected from detrimental interference from the secondary users while at the same time optimizing the performance for the secondary users Thus the reliable detection of primary users offers better secondary system throughput via increased spectral efficiency in addition to safeguarding the primary system Spectrum sensing is a technique used to

detect the presence of primary users in the licensed spectrum It is the estimation of the instantaneous occupancy of the frequency spectrum and is a key enabling factor for Cognitive Radios Various techniques exist for performing spectrum sensing In addition to primary user detection spectrum sensing can also be employed for secondary detection and co existence interference analysis in multi radio environments etc In this thesis we study adaptive spectrum sensing based on energy detection with a purpose of demonstrating Dynamic Spectrum Access The major focus has been to evaluate algorithms that can allow for estimation of noise in the presence of the signal which is essential for energy detection based schemes We also present the system level implementation and evaluation of a Dynamic Spectrum Access setup developed using the USRP2 GNU Radio platform on the ORBIT Wireless Testbed at WINLAB as part of the WINLAB NEC Collaborative Cognitive Radio Project

**Adaptive Spectrum Sensing for Cognitive Radio Networks** Arash Vakili, 2011 Spectrum sensing is an important functionality of cognitive radio as a means to detect the presence or absence of the primary user PU in a certain spectrum band Energy detection is a widely used spectrum sensing technique based on the assumption that the PU is either present or absent during the whole sensing period However this assumption is not realistic in a dynamic environment where the PU could appear or disappear at any time The performance of the conventional energy detector ED actually deteriorates in the scenario where the PU activity status changes during the sensing period Therefore it is crucial to design a detector which can adapt to such an environment and reliably detect a change in the PU activity Several sequential change detection techniques already exist in the literature however change detection in a fixed sensing duration has not been given enough attention In this dissertation three adaptive EDs are proposed to improve the

*Proceedings of the International Conference on Advanced Intelligent Systems and Informatics 2020* Aboul Ella Hassanien, Adam Slowik, Václav Snášel, Hisham El-Deeb, Fahmy M. Tolba, 2020-09-19 This book presents the proceedings of the 6th International Conference on Advanced Intelligent Systems and Informatics 2020 AISI2020 which took place in Cairo Egypt from October 19 to 21 2020 This international and interdisciplinary conference which highlighted essential research and developments in the fields of informatics and intelligent systems was organized by the Scientific Research Group in Egypt SRGE The book is divided into several sections covering the following topics Intelligent Systems Deep Learning Technology Document and Sentiment Analysis Blockchain and Cyber Physical System Health Informatics and AI against COVID 19 Data Mining Power and Control Systems Business Intelligence Social Media and Digital Transformation Robotic Control Design and Smart Systems

Power Energy and Secure Smart Technologies Thanikanti Sudhakar Babu, Mallala Balasubbareddy, Subramaniam M, Nnamdi Nwulu, Vigna Kumaran Ramachandaramurthy, Renu Sharma, 2025-07-16 This Book of Proceedings presents the collective research and insights shared at the conference on Power Energy and Secure Smart Technologies The event brings together leading minds from academia industry and research to explore innovations and address challenges in modern power systems sustainable energy solutions and secure smart technologies The papers compiled here reflect the latest developments case

studies and forward looking ideas that contribute to the evolving landscape of intelligent and resilient energy systems We trust this volume will serve as a valuable resource for researchers professionals and students committed to advancing technology for a sustainable and secure energy future *Signal and Information Processing, Networking and Computers* Songlin Sun,Na Chen,Tao Tian,2017-12-16 This proceedings book presents the latest research in the fields of information theory communication system computer science and signal processing as well as other related technologies Collecting selected papers from the 3rd Conference on Signal and Information Processing Networking and Computers ICSINC held in Chongqing China on September 13 15 2017 it is of interest to professionals from academia and industry alike 5G and Beyond Wireless Systems Manish Mandloi,Devendra Gurjar,Prabina Pattanayak,Ha Nguyen,2020-08-11 This book presents the fundamental concepts recent advancements and opportunities for future research in various key enabling technologies in next generation wireless communications The book serves as a comprehensive source of information in all areas of wireless communications with a particular emphasis on physical PHY layer techniques related to 5G wireless systems and beyond In particular this book focuses on different emerging techniques that can be adopted in 5G wireless networks Some of those techniques include massive MIMO mm Wave communications spectrum sharing device to device D2D and vehicular to anything V2X communications radio frequency RF based energy harvesting and NOMA Subsequent chapters cover the fundamentals and PHY layer design aspects of different techniques that can be useful for the readers to get familiar with the emerging technologies and their applications **Intelligent Energy Management Technologies** Mohammad Shorif Uddin,Avdhesh Sharma,Kusum Lata Agarwal,Mukesh Saraswat,2020-12-01 This book is a collection of best selected high quality research papers presented at the International Conference on Advances in Energy Management ICAEM 2019 organized by the Department of Electrical Engineering Jodhpur Institute of Engineering Technology JIET Jodhpur India during 20 21 December 2019 The book discusses intelligent energy management technologies which are cost effective compared to the high cost of fossil fuels This book also explains why these systems have beneficial impact on environmental economic and political issues of the world The book is immensely useful for research scholars academicians R D institutions practicing engineers and managers from industry Communication, Signal Processing & Information Technology Faouzi Derbel,2020-02-10 The volume is dedicated to fields related to design modeling fundamentals and application of communication systems Focusing on wireless technology it covers content based video retrieval B4G wierless communication systems and their application data fusion and pattern recognition It also discusses the influences of coding compression and e mobility on information and communication technology Applied Computing to Support Industry: Innovation and Technology Mohammed I. Khalaf,Dhiya Al-Jumeily,Alexei Lisitsa,2020-01-07 This book constitutes the refereed proceedings of the First International Conference on Applied Computing to Support Industry Innovation and Technology ACRIT 2019 held in Ramadi Iraq in September 2019 The 38 revised full papers and 1 short paper were carefully reviewed and selected from

159 submissions The papers of this volume are organized in topical sections on theory methods and tools to support computer science computer security and cryptography computer network and communication real world application in information science and technology     The Proceedings of the Third International Conference on Communications, Signal Processing, and Systems Jiasong Mu,Qilian Liang,Wei Wang,Baoju Zhang,Yiming Pi,2015-06-12 The Proceedings of The Third International Conference on Communications Signal Processing and Systems provides the state of art developments of Communications Signal Processing and Systems The conference covered such topics as wireless communications networks systems signal processing for communications This book is a collection of contributions coming out of Third International Conference on Communications Signal Processing and Systems held on July 2014 in Hohhot Inner Mongolia China

Artificial Intelligence and Evolutionary Algorithms in Engineering Systems L Padma Suresh,Subhransu Sekhar Dash,Bijaya Ketan Panigrahi,2014-11-25 The book is a collection of high quality peer reviewed research papers presented in Proceedings of International Conference on Artificial Intelligence and Evolutionary Algorithms in Engineering Systems ICAEES 2014 held at Noorul Islam Centre for Higher Education Kumaracoil India These research papers provide the latest developments in the broad area of use of artificial intelligence and evolutionary algorithms in engineering systems The book discusses wide variety of industrial engineering and scientific applications of the emerging techniques It presents invited papers from the inventors originators of new applications and advanced technologies



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