

بسم الله الرحمن الرحيم

قال:

(1) (2) (الرحمن)

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صدق الله العظيم

Dedication

¹ سورة الرحمن.

To my Family

To my Teachers

To my friends

To everyone who helped me

ACKNOWLEDGEMENT

I thank Almighty ALLAH for reconciling me complete this project

I would like to express MY great thanks

To my supervisor:

Dr. JACQUELINE JOHN GEORGE

for her support and advice

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ABSTRACT

With the recent boom in the cellular networks, and personal wireless technologies, the frequency spectrum have become crowded . The most important technology that will be used to overcome this crowdedness of the spectrum is the cognitive radio technology, this technology will automatically, and dynamically enable access to radio frequencies.

In this thesis the cognitive radio spectrum sensing techniques are presented which are the key feature for cognitive radio networks. its main objective is to provide more spectrum access opportunities to cognitive radio users without interfering with the operations of the licensed network. The Interference Temperature Access Technique Model (ITM) was investigated which is the viable approach for dynamic spectrum access, that will control the use of the spectrum use, and define the occupancy and availability of a channel. Finally the NS2 software was used for the simulation of cognitive radio mesh network.

In the simulation the assignment of the channels was based on the numbers of the available channels and the priority of the cognitive radio node which led to better utilization of available spectrum.

المستخلص

أدى النمو المتسارع في الشبكات الخلوية والاتصالات الشخصية إلى ازدياد الحاجة إلى النطاقات الترددية، فكان لابد من إيجاد تقنية جديدة توفر مزيداً من المرونة والتدسين في الكفاءة وتمثل هذه التقنية في النظام الراديوي الإدراكي (Cognitive Radio system). فهو نظام لديه القدرة على إدراك أو استشعار بيئته التشغيلية، ويقوم بضبط معاملات تشغيله الراديوية دينامياً وبصورة ذاتية طبقاً لبيئة التشغيل، وهذا لا يجعل استعمال الطيف الراديوي أكثر كفاءة فحسب، وإنما يساعد أيضاً في تجنب التداخل مع المستخدمين الآخرين.

في هذه الرسالة قدمت الأساليب الراديوية الإدراكية لاستشعار الطيف الترددي والتي هي الميزة الأساسية للشبكات الراديوية الإدراكية، والتي من أهدافها الأساسية توفير المزيد من فرص الوصول لمستخدمي النظام الإدراكي الراديوي دون إحداث تداخلات على الشبكات المرخصة.

ومن ثم قدمت نموذج تقنية الوصول عن طريق قياس درجة حرارة التداخل (Interference Temperature access technique model (ITM وهو نهج عملي يمكن من الوصول إلى الطيف دينامياً، ويتحكم في استخدام الطيف، ويحدد شغلية وتوفر القنوات الترددية.

وأخيراً استخدم برنامج الـ NS2 لمحاكاة النظام الإدراكي الراديوي. وفي عملية المحاكاة تم تخصيص القنوات الراديوية بناءً على عددها وأولوية المستخدم الإدراكي الراديوي، مما قاد إلى استغلال أمثل للطيف الترددي.

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List of Abbreviations

AP	Access Point
AWGN	Additive White Gaussian Noise
BS	Base Station
CCCH	Common Control Channel
CR	Cognitive Radio
CRBS	Cognitive Radio Base Station
CRMS	Cognitive Radio Mobile Station
CRN	Cognitive Radio Network
DSA	Dynamic Spectrum Allocation
DSP	Digital Signal Processor
ETT	Expected Transmission Time
ETX	Expected Number of Transmission
FCC	Federal and Communication Commission
FPGA	Field Programmable Gate Array
ISM	Industrial Scientific and Medical
ITMA	Interference Temperature Multiple Access
MAC	Media Access Control
MCR	Multi Channel Routing
MS	Mobile Station
NAT	National Allocation Table
NetIf	Network Interface
NS2	Network Simulator Number 2
OSA	Opportunistic Spectrum Access
PC	Personal Computer
PDA	Personal Digital Assistant
PU	Primary User
QoS	Quality of Service
RTP	Real Time Transport Protocol
SC	Switching Cost
SCF	Spectral Correlation Function
SDR	Software Defined Radios
SU	Secondary Users
TCH	Traffic Channel
TCL	Tool Command Language
TTL	Time To Leave
UNII	Unlicensed National Information Infrastructure

WCETT	Weighted Cumulative Expected Transmission Time
WLAN	Wireless Local Area Networks