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ENERGY EFFICIENT CHANNEL ALLOCATION FOR COGNITIVE RADIO IN TELEVISION SYSTEMS

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Abstract

Energy-efficient resource assignment for cognitive radios operating in television systems (TV white spaces) presents a different challenge compared with other cognitive radios because the interference constraint is for the whole frequency band rather than per carrier. In this work, Cognitive radio has been proposed as a general approach for higher EE in wireless communication systems.To Maximize the Energy efficiency in resource Allocation of Cognitive base station operating in Television System(TV white spaces) based on Frequency and Power Allocation protocol. It is to be proposed, a design for routing and resource distribution for cognitive radio in television networks.

Keywords-Tvwhitespace, cognitiveradio(CR),Energy efficiency(EE),OFDMA.

Introduction

TV white spaces are empty frequencies made available forunlicensed use at locations where spectrum is not being usedby licensed facilities, such as television broadcasting. This spectrumis located in the very high frequency (54–216 MHz) andultrahigh frequency (470–698 MHz) bands and has characteristicsthat make it highly desirable for wireless communications. A cognitive radio standard, IEEE 802.22 has been releasedas early as 2009 to guide the design of devices operating inTV white spaces the frequencyand power allocation that maximizes the bit/joule/hertz EEof orthogonal frequency division multiple access (OFDMA)-based transmissions from a cognitive base station operating inthe TV white spaces. Energy consumption is one of the most important aspects of wireless communications. It has significant financial implications for communications facility providers, and decreasing it will have a direct impact on operational expenditure as well as decreasing Co2 emissions. (11) The increasing interest in multimedia applications and high data rate services has led to a extension in the development of wireless communications. Multicarrier

communication methods such as OFDM (Orthogonal Frequency Division Multiplexing) (1) and its multiuser extension OFDMA (Orthogonal Frequency Division Multiple Access) widely accepted as a suitable solution for the high speed and broadband wireless system due to their resilience to from inter-symbol-interference (ISI) (11). In this paper Cognitive radio has been proposed as a general approach for higher EE in wireless communication systems.To Maximize the Energy efficiency in resource Allocation of Cognitive base station employing in Television System(TV white spaces) based on Frequency and Power Allocation protocol. It is proposed that a design for routing and resource allocation for cognitive radio in television networks, a subchannel and protocol of power allocation that increases the EE of transmissions that operates in the TV white spacesfrom a cognitive base station. The protocol consists of a two-step approach where a near-optimal but low difficulty subchannel assignment is followed by an optimal power allocation. A low-complexity subchannel allocation is used because an optimal one would be prohibitively computationally expensive. The EE is maximized subject to the constraints, namely, minimum acceptable user rates, a total power constraint, and an interference constraint to protect the primaries or other devices operating in nearby areas. We compare the difficulty of our protocol with that of modified and improved versions of existing resource allocation protocols that maximize EE of OFDMA downlinks. We provide support for the analysis using simulated numerical results and demonstrate that our protocol achieves higher EE when compared with improved and modified versions of existing protocols. Spectrum usage can be improved significantly by making it possible for a another user (who is not being serviced) to access a spectrum hole unoccupied by the primary user at the correct location and the time in question. *Cognitive radio* inclusive of software-defined radio, has been proposed as the means to encourage the efficient use of the spectrum by exploitingthe existence of spectrum holes.

Methodology

Threshold Algorithm

In the threshold approach, a candidate trace will be an anomaly if the conformance between the logand the model mined from the same log, but without instances of the trace under analysis, is lowerthan a given threshold provided as input for the algorithm. For each candidate anomalous trace, the algorithm is executed as follows: (i) it gets a new logremoving occurrences of the candidate trace from the original log; (ii) it creates a process model forthis new log; (iii) evaluates the conformance between the model and the original log, that is, the log with occurrences of the candidate anomalous trace;

and (iv) test if the conformance is lower than a given threshold. Anomalous traces are those traces that has a conformance value below a threshold provided as input for algorithm. The conformance check metrics available on ProM assess different characteristics of a model, for example, since the degree of complexity of a model until the degree of completeness of a model for a log. Therefore, the use of an appropriate metric is important for the accuracy of detection, as well as the process discovery tool. Other parameter that may impact the accuracy of detection is the threshold factor. Lower values indicate lower tolerance for the degree of conformance – there may have normal traces classified as anomalous (False Positive). On the other hand, higher values indicate higher tolerance there mayhave anomalous traces classified as normal (False Negative). Therefore, to choose a good value to the threshold is not easy. Following, we propose an extension to the idea of threshold algorithm that does not consider the threshold value as input, but it dynamically evaluates it.

Algoritham1:

Dyanamic Threshold Algoritham

Input:A log L,Which is a set of traces generated by a PAS.

Input: A process discovery algorithm PD.

Input: A conformance assessment algorithm CA.

Output: A set of traces T^M that was classified as anomalous traces.

Step1: Define a set T with all classes of traces from the log L;

Step2: Define a set T^A={}used to contain the anomalous candidate traces;

Step3: Define a set A on formances={}used to contain the evaluated conformances;

Step4: foreach

t belongs to T do

Step5: if

Frequency of t into the log<=2%

then

Step6: Include t into set T^A;

Step7: model←Miner(L,PD);

//30 samplings

Step8:numbersOFSamplings←30;

// each sampling has at least 10 traces

Step9: if

Size of L*2%>=10

then

Step10:numberOFTraces←Size of L*2%>=10;

Step11:else

Step12:numberOFTraces←10;

Step13:whilenumberOFSamplings>0 do

Step14:sampling←Sampler(L,numberOFTraces);

Step15:tempValue←Conformance(model,sampling,CA);

Step16:IncludetempValue into set Conformances;

Step17:numberOFSamplings←numberOFSamplings-1;

Step18:threshold←Mean(Conformances)-1*Std(Conformances);

Step19:foreach

t belongs to T^A

do

Step20:tempValue←Conformances(model,t,CA);

Step21:if

tempValue<threshold

then

Step22:Include t into set T^M;

Related Work

Cong Xiong et al (1) proposed the energy-efficient resource allocation in both download and upload cellular networks with orthogonal frequency division multiple access (OFDMA). For the downlink transmission, the generalized energy

productivity(EP) is maximized while for the uplink case the minimum individual EE is maximized, both under certain ordered per- UE quality-of-service (QoS) requirements. For both transmission scenarios, we first provide the bestsolution and then develop a suboptimal but low-complexity approach by exploring the inherent structure and property of the energy-productivity design. For the downlink case, by modifying the original problem, we also find a computationally effective and numerically tractable upper bound on the EE, which indicates the performance limit and is established to be quite tight if the number of subcarriers is larger than that of UEs and motivates us to find a near optimal approach relying on the synthetic relation between the modified EE and transmit power. Simulation results show that the energy-productivity design greatly improves EP compared with the conventional spectral-efficient design and the less-complexity suboptimal approaches can accomplish a promising tradeoff between performance and complexity. Carl R. Stevenson et al [2] propose the developing IEEE 802.22 standard will allow broadband access to be provided in sparsely populated areas that cannot be inexpensive served by wire line means, or other wireless solutions at higher frequencies, by using cognitive radio techniques to allow action on a noninterfering basis in the VHF/UHF TV broadcast bands. This will increase the efficiency of utilization of that spectrum, and provide large economic and societal benefits.(3)an energy-efficient power allocation algorithm for the equal channels of an OFDM system. This algorithm provides the optimum solution to a impartial fractional program involving an objective function called energy per-good bit(EPG). The EPG objective function models the collision of both transmit power and constant circuit power consumption. The energy minimization problem formulation is quite common and subsumes both maximize rate (MR) and maximize margin (MM) problems as specific cases. As a result, the energy productivity viewpoint provides a convenient and unified perspective of the various water-filling solutions. Using a numerical example, we show that the energy-productivity solution is quite different from the MM or MR solutions and can provide more dBs of performance improvement. We also study the impact of rounding to discrete constellation sizes.(4) Energy efficiency is becoming increasingly important for small form factor mobile devices, as battery technology has not kept up with the growing needs stemming from ubiquitous multimedia applications. This paper addresses link adaptive transmission for increasing energy efficiency, as measured by the "throughput per Joule" metric. In contrast to the existing water-filling power appropriation schemes that maximize throughput subject to a fixed overall transmit power constraint, our scheme increasing energy efficiency by adapting both overall transmit power and its allocation, according to the channel states and the circuit power used. We

demonstrate the existence of a unique globally optimal link adaptation explanantion and evolve iterative algorithms to obtain it. We further consider the special case of flat-fading channels to develop an upper bound on energy productivity and to characterize its variation with bandwidth, channel gain and circuit power. Our outcomes for OFDM systems demonstrate improved energy savings with energy optimal link adaptation as well as clarify the fundamental tradeoff between energy-efficient and spectrum-efficient transmission.(5) The AB for up-link can spatially distinguish the receiving signals of CR users from LU and consequently alleviate cochannel interferences for CR BS by directing the main beam towards the CR users while nulls are directed towards others. For the down-link, NB method was introduced to display spread nulls in a certain range of directions. A new NB method, called VDA was proposed, which is based on the MVDR beamformer. The VDA guarantees deeper nulls than CMT, while keeping the same width, and consequently decreases the interference which is caused by spectrum reusing between LU and CR. By adopting AB, I-WiMAX, as a green communication system, improves the spectrum efficiency significantly. Liying Li et al (6) investigate how a CR user senses more channels and determine the optimal transmission duration and power allocation. When performing optimization, we take energy productivity, throughput, and interference with the primary users into consideration and find a closed-form solution for transmission period for chosen channels. It is shown that the proposed optimization approach significantly upgrade energy efficiency and throughput of CR networks.(7) Energy-efficient link adaptation is studied for transmission on a frequency-selective equivalent AWGN channel. The total power dissipation model includes a circuit power that differ with the sum rate and a power amplifier effective that varies with the bandwidth used. The mathematical estimate present insight into how the subcarrier rates should be select for optimal energy efficiency and propose a simple fixed-point algorithm that recognized the solution in few iterations. Moreover, ways of improving the energy efficiency are consider source on the dependence on bandwidth and distance between transmitter and receiver. KandasamyIllanko et al (8)advances common knowledge by introducing three significant steps in finding a solution. First, we show for transceivers operating that are under a full power constraint, the high sum rate occurs at the boundary of the practicable set formed by the hyper plane representing the power constraint. This conclusion is nontrivial considering that we deals with an interference limited system. Second, we prove that the duality gap is zero for this problem, inspite of the lack of concavity of the objective. We do this by showing that the maximum sum rate is concave in the power constraint. Third, we have proposed an iterative algorithm which finds the optimal power allocation by

solving the dual problem. Simulation outcomes are provided to support the theorems demonstrated in the paper as well as to demonstrate the convergence of the algorithm to the global increase sum rate. Results of the algorithm are also comparedwith solutions based on Game theory. (9) The cognitive radio, built on a software-defined radio, is defined as an intelligent wireless communication system that is familiar of its environment and uses the methodology of understanding- by-building to learn from the environment and alter to statistical variations in the input stimuli, with two primary objectives in mind 1.highly reliable communication where ever and whenever it is needed;2.efficient utilization of the radio spectrum. Following the discussion of interference temperature as a new metric for the quantification and management of interference, the paper addresses three fundamental cognitive performances.1) Radio-scene analysis.2) Channel-state estimation and predictive modeling.3) Transmit-power dominance and dynamic spectrum management.(10)The benefits of green wireless communications outweigh the disadvantages for the mobile operators. The research for green communications is an interdisciplinary field since it depends on proceeds in myriad areas from computer architecture to networking/communications standards. It requires the equal effort of optimizing cognitive networks and optimization of other systems via cognitive networks and cognitive abilities in general. CRs are supposed to couple energy efficiency with efficient spectrum usage for supporting green communications. The vast applicability of CR based optimization in home, enterprise and data center environments brings up many chances as well as challenges and open problems towards these goals. It should be noted that "to absorb only when needed" (spectrum, energy, hardware) is in contrast with the consumer society tendencies promoted by the cultural logic of late capitalism. However, this approach is crucial to cope with global warming and to enable global sustainable development. Amir Akbari, et al (11)addresses downlink energy-efficient transmission in OFDMA systems and maximizes the overall bits impart per joule of energy. In addition to the transmit power, circuit power is also accounted for in the energy-efficient model, which is tackled using both standard optimization methods and a frame work depends on time-sharing. Simulation results show similar presentation for both cases with the latter having lower complication and taking less CPU time to run.

Survey

Sl No	Algorithm	Drawbacks	Description
1	Power allocation optimization	Less Energy Efficient not Reliable Increase Delay and	Energy-efficient based transmission duration design and power allocation methods. Compared with the transmission optimization scheme to

		Routing overhead	maximize the throughput, our idea can improve energy efficiency greatly while the target throughput is also achieved
2	CONSTRAINED ENERGY-EFFICIENT LINK ADAPTATION	No secure data communication Not reliable cooperative spectrum sensing	Proposed technique is illustrated using frequency selective OFDM as an example, the solution developed is applicable to more general transmission scenarios where transmission occurs over resources experiencing different channel conditions. Joint circuit and transmit power consumptions are taken into account to maximize energy efficiency rather than throughput
3	Adaptive beam-forming	Discovered routes by these algorithms may neither be energy-efficient nor be reliable. This can increase the overall energy consumption in the network. The network lifetime may be reduced.	Adaptive beam-forming (AB) techniques are used for interference reduction by null broadening (NB) of the beam patterns of a CR base station in down-link operations. In this way by steering those NB angular sectors towards selected regions the LU's will experience less interference
4	ENERGY-EFFICIENT BANDWIDTH ALLOCATION	Limited work has been done to address the energy-efficient communication for OFDM systems.	Addresses downlink energy-efficienttransmission in OFDMA systems and maximizes the overall bits transmitted per joule of energy. In addition to the transmit power, circuit power is also accounted for in the energy-efficient design, which is tackled using both standard optimization techniques.
5	Energy-efficient Water-filling Algorithm	Limited work has been done to address the energy-efficient communication for OFDM systems. This can increase the overall energy consumption in the network.	Objective function called energy-pergoodbit (EPG) for an OFDM system. We have developed an optimal power allocation that minimizes EPG or maximizes energy efficiency. This paper has shown that energy efficient loading is more general than and potentially different from maximum rate or maximum margin power loading

Conclusion

Operating in the TV white spaces has been presented. The protocol satisfies users' minimum rate requirements, adheres to a total power constraint, and keeps the interference to the primary users in the neighbouring areas below a specified

threshold. After a low-complexity sub channel assignment, A frequency and power allocation protocol that maximizes the EE of a cognitive base station Charnes–Cooper transformation was applied to the power allocation problem to obtain an optimal solution.

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