ISSN 2347-4289

Adaptive Layer Approach For Power Management In Wireless Communication

Mr. J.Purushothaman, Ms.S.Suganthi AP/ECE, Mr.G.Parameswaran AP/ECE

Department of Information and Communication Trichy Engineering College Trichy, Tamilnadu India
Department of Information and Communication Trichy Engineering College Trichy, Tamilnadu India

Abstract: In this method we only use joint physical layer method it gives physical information(graphical analysis) only. Here we develop **Cross layer** method with the joint physical layer method. Cross-layer optimization shall contribute to an improvement of quality of services under various operational conditions. Such management is currently subject of various patent applications. The cross-layer control mechanism provides a feedback on concurrent quality information for the adaptive setting of control parameters. Cross layer optimization removes strict boundaries to allow communication between layers by permitting one layer to access the data of another layer to exchange information and enable interaction. For example, having knowledge of the current physical state will help a channel allocation scheme or automatic repeat request (ARQ) strategy at the MAC layer in optimizing tradeoffs and achieving throughput maximization. Our results show that the proposed learning algorithms can converge up to two orders of magnitude faster than a state-of-the-art learning algorithm for physical layer power-control and up to three orders of magnitude faster than conventional reinforcement learning algorithms.

Index Terms: Energy-efficient wireless communications, dynamic power management, power-control, adaptive modulation and coding, Markov decision process, reinforcement learning.

1 INTRODUCTION

Nowadays, most of the leading wireless technologies are widely deployed at the last mile – connecting end-user to the core of the network, and follow infrastructure network organization, where wireless links are mostly used to connect end user equipment to the base station which in turn provides connectivity to the fixed network. Indeed, last mile is the most critical issue in today's network architectures. The characteristics of the last mile links often determine the performance of the overall network, representing the actual capacity bottleneck on the entire path from the data source to the destination and influencing the characteristics of traffic patterns flowing through the network. In addition, wireless networks suffer from several performance limitations, in some cases related to excessive burden deriving from the layering paradigm employed for the TCP/IP protocol stack design. In fact, TCP/IP originally designed for wired links (characterized by high bandwidth, low delay, low packet loss probability - high reliability, static routing, and no mobility) performs poorly in wireless domain. *The main reasons for poor performance are in the very nature of wireless technologies and come from the advances their enable:*

Mobility*.* One of the main advances offered by wireless networks corresponds to user terminal mobility, which allows network access from different locations while maintaining uninterrupted service. However, mobility - an essential requirement for network provisioning on anytime, anywhere basis - comes at a price.

Data transfer performance in wireless networks suffers from several performance limitations such as limited capacity, high propagation delay, static routing, and high error rate. High bit error rates (BERs), which vary from 10-3 up to 10-1 for wireless links while staying between 10-8 to 10-6 for wired channels, have high impact on data transfer performance using TCP protocol, which supports the vast majority of Internet connections.

Energy efficiency*.* Mobile terminal equipment relies on battery power, which imposes energy efficient operation to increase the device lifetime. Traditionally, power efficient design attempted to increase capacity of the battery and decrease the amount of energy consumed by the terminal. However, physical limitations of battery power units and high energy consumption of wireless interfaces position the main challenge of energy efficient communications into the system management domain.

PHY-Centric solution-*A PHY centric solutions* focus on optimal single-user power-control (also known as minimum energy transmission or optimal scheduling) with the goal of minimizing transmission power subject to queuing delay constraints. It is well known that transmitting with more power in good channel states, and with less power in poor channel states, maximizes throughput under a fixed energy budget. Other PHY-centric solutions are based on adaptive modulation, adaptive coding. Techniques are typically used to tradeoff throughput and error-robustness in fading channels , they can also be exploited to tradeoff delay and energy as in , where they are referred to as dynamic modulation scaling, dynamic code scaling, and dynamic modulation-code scaling, respectively. Offline and online techniques for determining optimal scaling policies are proposed in , however, these techniques cannot be extended in a manner that tightly integrates PHY-centric and system-level power management techniques. Although PHY-centric solutions are effective at minimizing transmission power, they ignore the fact that it costs power to keep the wireless card on and ready to transmit; therefore, a significant amount of power can be wasted even when there are no packets being transmitted. System-level solutions address this problem.

System-level solutions rely on DPM, which enables system components such as the wireless network card to be put into low-power states when they are not needed . A lot of work has been done on DPM, ranging from rigorous work based on the theory of Markov decision processes (MDPs) to low-complexity work based on heuristics. In the optimal DPM policy is determined offline under the assumption that the traffic arrival distribution is known a priori. In an online approach using maximum likelihood estimation to estimate

Copyright © 2014 IJTEEE.

ISSN 2347-4289

the traffic arrival distribution is proposed. This approach requires using the complex value iteration algorithm to update the DPM policy to reflect the current estimate of the traffic distribution. In a supervised learning approach is taken to avoid the complex value iteration algorithm. However, this approach incurs large memory overheads because it requires many policies to be computed offline and stored in memory to facilitate the online decision making process. Unfortunately, due to their high computational and memory complexity, the aforementioned online approaches are impractical for optimizing more complex, resource-constrained, and delay-sensitive communication systems.

Virtual experience we take advantage of the fact that the unknown dynamics are independent of certain components of the system's state. We exploit this property to perform a batch update on multiple PDSs in each time slot. We refer to this batch update as virtual experience learning. Prior to this work, it was believed that the PDS learning algorithm must necessarily be performed one state at a time because one learns only about the current state being observed, and can, therefore, update only the corresponding component.

Postdecision state We propose a decomposition of the (offline) value iteration and (online) RL algorithms based on factoring the system's dynamics into a priori known and a priori unknown components. This is achieved by generalizing the concept of a postdecision state (PDS) which is an intermediate state that occurs after the known dynamics take place but before the unknown dynamics take place. PDS can be a nondeterministic function of the current state and action, and it can be used in any MDP in which it is possible to factor the transition probability and cost functions into known and unknown components. The advantages of the proposed PDS learning algorithm are that it exploits partial information about the system, so that less information needs to be learned than when using conventional RL algorithms.

Ease of Use

PREPARE YOUR PAPER BEFORE STYLING

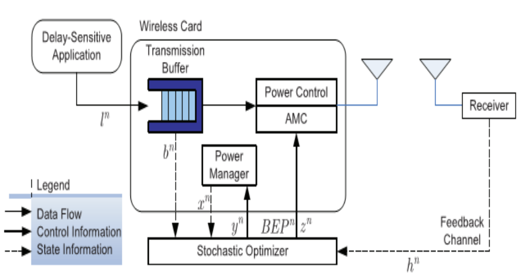

Fig. 1.1 Wireless transmission system

The primary concern has typically been the reliable delivery of data to the receiver within a tolerable delay. Increasingly, however, battery-operated mobile devices are becoming the primary means by which people consume, author, and share delay-sensitive content (e.g., real-time streaming of multimedia data, videoconferencing, gaming etc.Consequently, energy-efficiency is becoming an increasingly important design consideration.To balance the competing requirements of energy-efficiency and low delay, fast learning algorithms are needed to quickly adapt the transmission decisions to the time-varying and a priori unknown traffic and channel conditions. Existing research that addresses the problem of energy efficient wireless communications can be roughly divided into two categories: physical (PHY) layer-centric solutions such as power-control and adaptive modulation and coding. (AMC) and system-centric solutions such as dynamic power management (DPM). DPM enables system components such as the wireless network card to be put into low power states when they are not needed. Although these techniques differ significantly, they can all be used to tradeoff delay and energy to increase the lifetime of battery operated mobile devices. An online approach using maximum likelihood estimation to estimate the traffic arrival distribution is proposed. This approach requires using the complex value iteration algorithm to update the DPM policy to reflect the current estimate of the traffic distribution. In, a supervised learning approach is taken to avoid the complex value iteration algorithm. However, this approach incurs large memory overheads because it requires many policies to be computed offline and stored in memory to facilitate the online decision making process. Unfortunately, due to their high computational and memory complexity, the aforementioned online approaches are impractical for optimizing more complex, resource-constrained, and delay-sensitive communication systems. In this Concept a rigorous and unified framework, based on Markov decision processes and reinforcement learning (RL), for simultaneously utilizing both PHY centric and system-level techniques to achieve the minimum possible energy consumption, under delay constraints, in the presence of stochastic traffic and channel conditions. This is in contrast to existing work that only utilizes power-control, AMC or DPM to manage power.

2 CROSS LAYER APPROACH

Cross-layer optimization shall contribute to an improvement of quality of services under various operational conditions. Such management is currently subject of various patent applications. The cross-layer control mechanism provides a feedback on concurrent quality information for the adaptive setting of control parameters. The control scheme apply the observed quality parameters,

- a fuzzy logic based reasoning about applying the appropriate control strategy
- the statistically computed control input to parameter settings and mode switches
- Finally, it will present some concerns and precautionary considerations regarding cross-layer architectures.
- A cross-layer solution, in fact, generally decreases the level of modularity, which may loosen the decoupling between design and development process, making it more difficult to further design improvements and innovations.
- Moreover, it increases the risk of instability caused by unintended functional dependencies, which are not easily foreseen in a non-layered architecture.

Copyright © 2014 IJTEEE.

ISSN 2347-4289

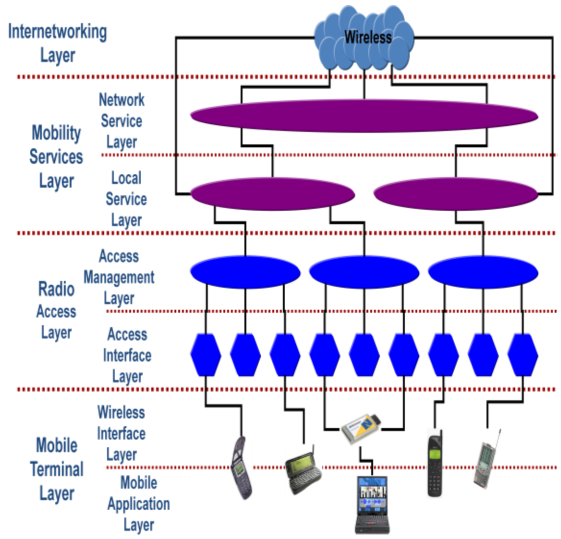

Fig:1.1 Cross layer architecture

In fig 2.4 Mobile terminal layer consist of two kind of layers ie.,1) Wireless interface layer, 2) Mobile application layer. By using the mobile application layer I can select the number of wireless device based on the node strength. *Wireless interface layer* used to interface with the mobile terminal layer into Radio access layer. *Radio access layer* consist of two layers they are, 1.Access management layer 2. Access interface layer. *Access interface layer* allows the mobile terminal to verify the node status for the transmission purpose. In *existing* approach they failed to verify the node status, so it will create more congestion in online and offline network data transmission. If don't have prior knowledge about the node status then our transmission data will be lost because of node's low capacity of carrying data to the destination , low buffer capacity, bandwidth of the communication channel .That's why here in proposed system I must verify he node status through the handshaking signal then it will send the whole status of the node is busy or idle based on this I can save my energy of wireless communication device. So node verification is must before selecting the node for the particular transmission. *Access management layer* is used here to verify the authorized and un authorized person can communicate for the particular data transmission time. *Adhoc network* can communicate in a particular region only , so it can accept only a targeted number of users for then must ensure that the arrived user at any particular node is already registered with the node or not.Finally the *Mobility service layer* can also consist of two layers they are ,1. Network service layer 2. Local service layer. Both these layers are based on the protocol presented in the network .They used to maintain and provide the Routing information for the data packet transmission.

3 MODIFIED QUEUE LEARNING ALGORITHM

Q-learning is a model-free reinforcement learning technique. Specifically, Q-learning can be used to find an optimal action-selection policy for any given (finite) Markov decision process (MDP). It works by learning an action-value function that ultimately gives the expected utility of taking a given action in a given state and following the optimal policy thereafter. When such an action-value function is learned, the optimal policy can be constructed by simply selecting the action with the highest value in each state. One of the strengths of Q-learning is that it is able to compare the expected utility of the available actions without requiring a model of the environment. Additionally, Q-learning can handle problems with stochastic transitions and rewards, without requiring any adaptations. It has been proven that for any finite MDP, Q-learning eventually finds an optimal policy. *Learning* is nothing but to know the information about the node which they are as a data transmission communication medium and the mobile terminal. In wireless communication system it's very difficult to find the actions present in the nodes. So before selecting the node for the transmission must ensure the node density, mobility and etc. This process is called as Learning approach. There are two kinds in his learning approach , *Supervised learning ie.,* must ensure the input and output actions based on this the node selection should be occurs. *Reinforcement learning ie,.*don't need to know the information of input and output actions also the status of the node. In RL method they can't accurately predict the node due to these memory requirements for the selection of a node in analytical manner will be large. So I just modify the RL method of Queue learning process as to learn the node about is capacity and their strength. For this purpose here I am going to implement a Queue learning algorithm such as K-NN approach (cluster based node to node approach).Based on these cluster nodes, the nearest neighbor node can easily identified by this QL method. In this way QL can uses the energy consumption formula,

$$E_{N/M} = \mathbb{1}_{n>0}(\mathbb{1}_{M=N} E_{T_{ack}} + \mathbb{1}_{M\neq N} E_{R_{ack}}) + \mathbb{1}_{m>0}(\mathbb{1}_{M=N} E_{T_{pck}} + \mathbb{1}_{M\neq N} E_{R_{pck}})$$

N-Node; M-Module; E-Energy; Tack-Transmitter acknowledgement; Rack-Receiver acknowledgement. Transmitter acknowledgement obtained when M=N, Receiver acknowledgement can be obtained when M#N.

- Queue learning, update the process for each state will leads to more delay in the communication.
- So, by proposing a PDS(Post Decision State) and VL(Virtual Learning) will be more advantage.
- PDS is an intermediate state which occurs after the known dynamics and before the unknown dynamics.
- In existing PDS used for Specific problem setting, partial information needed.
- But in proposed PDS less information is enough,VL used to perform a batch update on multiple PDS in each time slot.

4 ENERGY MODULE

The Dynamic Power Management (DPM) project explores technologies to improve power conservation capabilities of platforms based on open source software. Of particular interest are techniques applicable to running systems, adjusting power parameters on-the-fly while ensuring real-time deadlines of running software are met. DPM software exploits recent advances in hardware to scale clocking information (such as CPU and core bus frequencies) and core voltages with low latency. This allows these parameters to be adjusted very frequently in order to realize power savings during brief idle periods or execution of tasks with lower performance and power demands. Our work so far targets the Linux operating system and the characteristics of hardware used for embedded Linux. Ongoing DPM investigations are

Copyright © 2014 IJTEEE.

ISSN 2347-4289

attuned to the requirements of vendors of consumer electronics devices, such as the members of the Consumer Electronics Linux Forum, and embedded silicon vendors who have requested enhanced power management capabilities for Linux. Then compare our proposed solution to the network energy saving solution which combines transmission scheduling with DPM, but uses a fixed BEP. Like our proposed solution, the DPM and packet scheduling solution uses a buffer to enable power-delay tradeoffs.

5 RESULT AND IMPLEMENTATION

Simulation setup NS2 is an open-source event-driven simulator designed specifically for research in computer communication networks. NS2 has continuously gained tremendous interest from industry, academia, and government. Having been under constant investigation and enhancement for years, NS2 now contains modules for numerous network components such as routing, transport layer protocol, application, etc. To investigate network performance, researchers can simply use an easy-to-use scripting language to configure a network, and observe results generated by NS2. Undoubtedly, NS2 has become the most widely used open source network simulator, and one of the most widely used network simulators.

NAM (Network Animator) NAM provides a visual interpretation of the network topology created. The application was developed as part of the VINT project. Its feature is as follows.

- Provides a visual interpretation of the network created
- Can be executed directly from a Tcl script
- Controls include play; stop fast forward, rewind, pause, a display speed controller button and a packet monitor facility.
- Presented information such as throughput, number packets on each link**.**

X Graph-X- Graph is an X-Window application that includes: Interactive plotting and graphing Animated and derivatives To use Graph in NS-2 the executable can be called within a TCL script. This will then load a graph displaying the information visually displaying the information of the file produced from the simulation. The output is a graph of size 800 x 400 displaying information on the traffic flow and time**.**

Simulation tool NS2 are often growing to include new protocols. LANs need to be updated for new wired/wireless support. ns are an object oriented simulator, written in C++, with an OTcl interpreter as a front-end. The simulator supports a class hierarchy in C++ and a similar class hierarchy within the OTcl interpreter (also called the interpreted hierarchy). The two hierarchies are closely related to each other; from the user's perspective, there is a one-to-one correspondence between classes in the interpreted.

NS2 uses two languages because simulator has two different kinds of things it needs to do. On one hand, detailed simulations of protocols require a systems programming language which can efficiently manipulate bytes, packet headers, and implement algorithms that run over large data sets. For these tasks run-time speed is important and turn-around time (run simulation, find bug, fix bug, recompile, re-run) is less important**.**

On the other hand, a large part of network research involves slightly varying parameters or configurations, or quickly exploring a number of scenarios. In these cases, iteration time (change the model and re-run) is more important. Since configuration runs once (at the beginning of the simulation), run-time of this part of the task is less important. *Ns* meets both of these needs with two languages, C++ and OTcl. C++ is fast to run but slower to change, making it suitable for detailed protocol implementation. OTcl runs much slower but can be changed very quickly (and interactively), making it ideal for simulation configuration. NS (via tclcl) provides glue to make objects and variables appear on both languages. The goal of the ns-3 project is to create an open simulation environment for networking research that will be preferred inside the research community:

- It should be aligned with the simulation needs of modern networking research.
- It should encourage community contribution, peer review, and validation of the software.

Since the process of creation of a network simulator that contains a sufficient number of high-quality validated, tested and actively maintained models requires a lot of work, ns-3 project spreads this workload over a large community of users and developers. The core of ns-2 is also written in C++, but the C++ simulation objects are linked to shadow objects in OTcl and variables can be linked between both language realms. Simulation scripts are written in the OTcl language, an extension of the Tcl scripting language.

5 SIMULATION RESULTS

Primary comparison

Tab:5.1 Energy Information

PARAMETERS	EXISTING	PROPOSED
When Throughput=0.4,Energy consumption	7J	5J
Average error	0.42	0.3
Packet drop	Constant for n nodes	Varies
Power level	25dB	15 dB

6.1 IMPLEMENTATION RESULTS

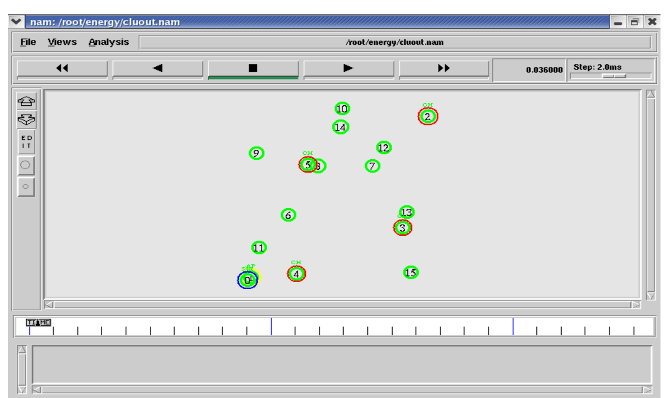

Fig: 5.1 Node Creation

Copyright © 2014 IJTEEE.

ISSN 2347-4289

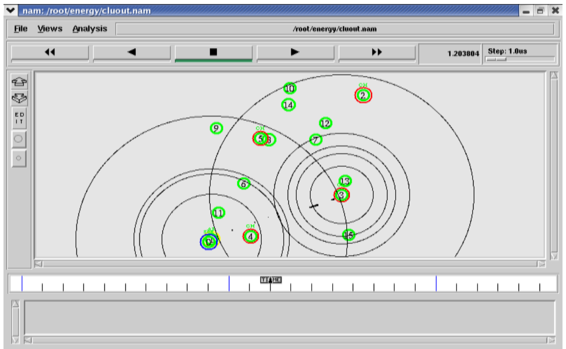

Fig: 5.2 Communication between the nodes

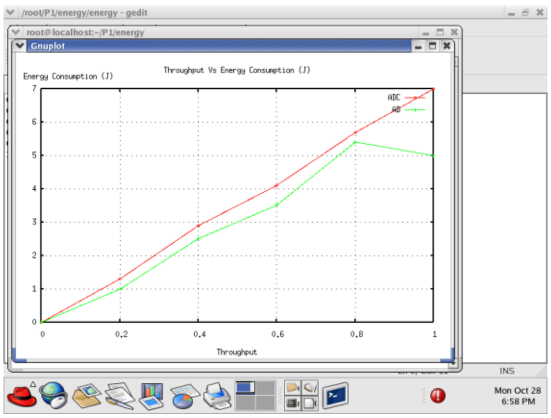

Fig: 5.3 Throughput VS Energy consumption

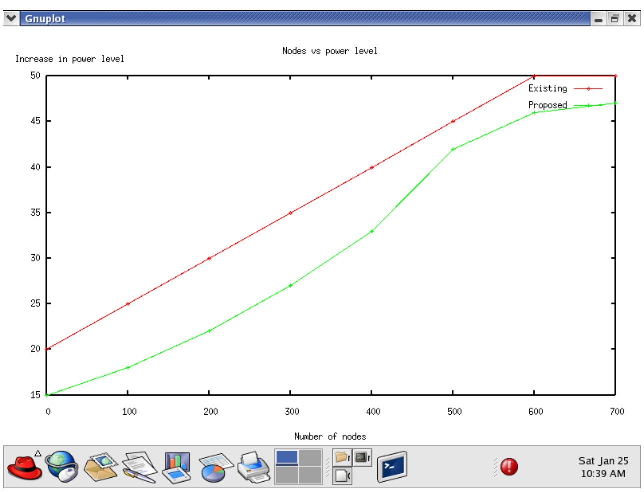

Fig: 5.4 Nodes VS Power level

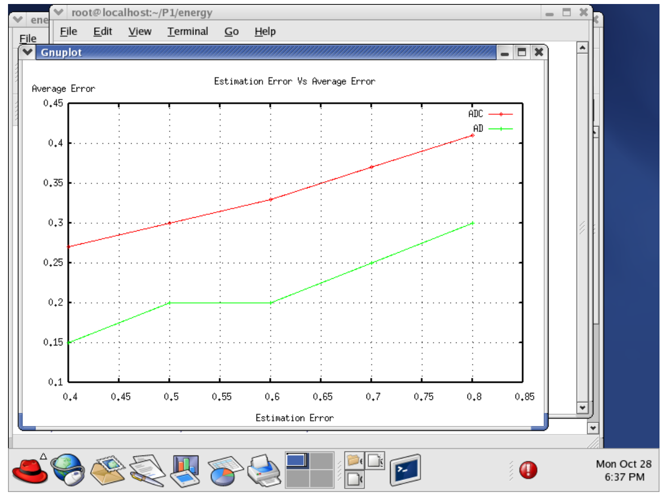

Fig: 5.5 Estimated error VS Average error

CONCLUSION

A reinforcement learning solution for finding the jointly optimal power-control AMC and DPM with cross layer to provide better Qos and power consumption in point to multipoint transmission in both single and multiple user environment. The proposed framework can be applied to any network or system resource management problem involving controlled buffers. In existing approach they only identified it's possible to implement both physical centric and system level functions and they are proved only in a analytical manner which causes more energy consumption and leads to the more complex function. But in this proposed system joint physical layer and system level function by using a cross layer approach in MAC layer is implemented . By applying this cross layer approach the verification of packet transmission ,average delay, throughput based on the error and the energy consumption is done. This project is extended to identify which network protocol will provide the minimum energy consumption. With the help of cross layer approach, is to be implemented by using a various protocol for the future work.

REFERENCES

[1]. D. Rajan, A. Sabharwal, and B. Aazhang, "Delay-Bounded PacketScheduling of Bursty Traffic over Wireless Channels," IEEE Trans. Information Theory, vol. 50, no. 1, pp. 125-144, Jan. 2004.

[2]. R. Berry and R.G. Gallager, "Communications over Fading Channels with Delay Constraints," IEEE Trans. Information Theory, vol. 48, no. 5, pp. 1135-1149, May 2002.

[3]. L. Benini, A. Bogliolo, G.A. Paleologo, and G. De Micheli, "Policy Optimization for Dynamic Power Management," IEEE Trans. Computer-Aided Design of Integrated Circuits, vol. 18, no. 6, pp. 813-833, June 1999.

[4]. E.-Y. Chung, L. Benini, A. Bogliolo, Y.-H. Lu, and G. De Micheli, "Dynamic Power Management for Nonstationary Service Requests," IEEE Trans. Computers, vol. 51, no. 11, pp. 1345-1361, Nov. 2002

Copyright © 2014 IJTEEE.

ISSN 2347-4289

[5]. N. Mastronarde and M. van der Schaar, "Fast Reinforcement Learning for Energy-Efficient Wireless Communications," technical report, http://arxiv.org/abs/1009.5773, 2012.

[6]. N. Salodkar, A. Karandikar, V.S. Borkar, "A Stable Online Algorithm for Energy-Efficient Multiuser Scheduling,"IEEE Trans. Mobile Computing,vol. 9, no. 10, pp. 1391-1406, Oct. 2010.

[7]. Goldsmith and S.-G. Chua, "Adaptive Coded Modulation for Fading Channels,"IEEE Trans. Comm.,vol. 46, no. 5, pp. 595-602, May 1998.

[8]. D. Krishnaswamy, "Network-Assisted Link Adaptation with Power Control and Channel Reassignment in Wireless Networks," Proc. 3G Wireless Conf.,pp. 165-170, 2002.

Copyright © 2014 IJTEEE.