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Reliable Transmission of Packets using Multiple Channels

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Abstract - *Optimal control problem for networks subjected to time-varying channels, reconfiguration delays, and interference constraints. The simultaneous presence of time-varying channels and reconfiguration delays significantly reduces the system stability region and changes the structure of optimal policies. The effects of reconfiguration delays have not been considered in the context of networks subject to interference constraints and time-varying channel conditions. Frame-based dynamic control (FBDC) policy is applicable to a broad class of network control systems, with or without reconfiguration delays, and provides a new framework for developing throughput-optimal network control policies using state-action frequencies. Finally, proposed Myopic policies that are easy to implement and have better delay properties as compared to the FBDC policy.*

Key Words: **Throughput guarantee, Scheduling, Fairness, Multipath routing, Wireless networks, Maximal scheduling**

1. INTRODUCTION

The effects of reconfiguration delays have not been considered in the context of networks subject to interference constraints and time-varying channel conditions. Reconfiguration delay is a widespread phenomenon that is observed in many practical telecommunication systems. In satellite networks where multiple mechanically steered antennas are providing service to ground stations, the time to switch from one station to another can be around 10ms. similarly, in optical communication systems, laser tuning delay for transceivers and optical switching delay can take significant time ranging from microseconds to tens of milliseconds depending on technology. In wireless networks, delays for electronic beam forming or channel switching that occurs in phased-lock loops in oscillators can be more than 200 s. Worse yet, such small delay is often impossible to achieve due to delays incurred during different processing tasks such as channel estimation, signal-to-interference ratio, transmit diversity and power control calculations in the physical layer, and stopping and restarting the interrupt service routines of various drivers in upper layers. Moreover, in various real-time implementations, channel switching delays from a few hundreds of microseconds to a few milliseconds have been observed. Scheduling under reconfiguration delays and time-varying channels calls for novel control algorithms that take advantage of the channel memory to improve performance.

2.RELATED WORK

In [1] the optimal scheduling problem for systems in the presence of time-varying channels, reconfiguration delay, and interference constraints, here Myopic policies are used because these are easy to implement and have better delay properties as compared to the FBDC policy. First considered the memory less channel process to characterize stability region in closed form, frame based Max weight (VFMW) algorithm that make scheduling decisions. Markov modulated channel processes with memory and developed a novel methodology to characterize stability region of system using state-action frequencies, the steady state solutions to Markov Decision Process (MDP). So they showed that stability region enlarges with the memory. Fair resource allocation is one of the major consideration for improved throughput its is observed in [2] for fair allocation and to improve the throughput developed a scheduling algorithms and showed the channel coding improve the network performance. Channel coding is mainly used for errors at link-level. The algorithm used is Decentralized online scheduling and flow control algorithm this determines scheduling at each time slot. and in wireless network packet scheduling with time and energy constraints is one of the major concern for throughput maximization in [3] for throughput maximization and successful data transmission the throughput maximization can be solved by using Kechn-Tucker conditions. They proposed an iterative algorithm to tackle the throughput maximization. In [4] throughput guarantee through distributed scheduling problem is addressed in this paper the guaranteed fraction depends on the "interference degree" of the network. Maximal scheduling policy is considered, this policy schedules a subset S.

a).Every session S has a packet to transmit
b).No session in S interferes with any other session in S.

They addressed the long-standing open question of attaining throughput guarantees with distributed scheduling in wireless networks.

Renewable energy source in distributed network has been observed in [5] this work has given a linear programming approach the aim of this proposed method is to ensure that the net grid energy is optimized through the use of the battery storage during the day.

The concept is based on utilization of renewable energy sources usage of photovoltaic (PV) energy. It is found that with an initial storage of 0 & 2.5kwh the daily electricity cost

is €0.44 and € manages 0, respectively, the algorithm to keep the daily cost of electricity and the net-grid power as minimum as possible, by optimally charging /discharging the battery, throughput the day, even with a high amount of initial storage. In [6] the Optimality of Myopic sensing that maximizes the immediate one-step reward is optimal when the state transitions are positively correlated over time. They showed that same policy is optimal when the number of channels is limited to two or three, while presenting a counterexample for the case of four channels. The general problem of opportunistic sensing and access arises in many multichannel communication context. Renewable Energy Source in distributed network has been observed in [7] opportunistic spectrum there are many stochastic control problems. In a system consists of n channels where state of each channel is distributed Markov processes for channels sensed to be in the "good" state the user makes the channels and collects one unit of reward for each such channel, if none is sensed good the user does not transmit, collect no reward, and waits until t+1 to make another choice. This process repeats sequentially until the time horizon expires. This model captures some of essential features of multi channel opportunistic access. This model allows to obtain analytical insights into the problem and some insights into the more general problem of restless bandit with multiple plays. In this paper they showed under the same condition the greedy policy is optimal for the case of K≥1. In [8] Iterative optimization of context divergence is used as measure of independence for ICA algorithms. The speed is faster than logarithmic methods. The obtained algorithms are tested using fMRI. Transferring optimization to the divergence gives effective tools. In [9] in the presence of interference constraints and switchover delay scheduling problem for network is considered. Max-Weight Scheduling algorithm is throughput optimal VFMW algorithm dynamically adopt the frame sizes to the stochastic arrivals and provide throughput optimality. This scheme gives reconfiguration decisions for large queue lengths.

3. RESULTS AND DISCUSSIONS

In Fig.1 Data transmission through different channels the noise introduction is high when data transmission is from memoryless channels and through memory channels noise introduction is less compared to memoryless channels and joint and uniform scheduling has totally 0% of noise introduction.

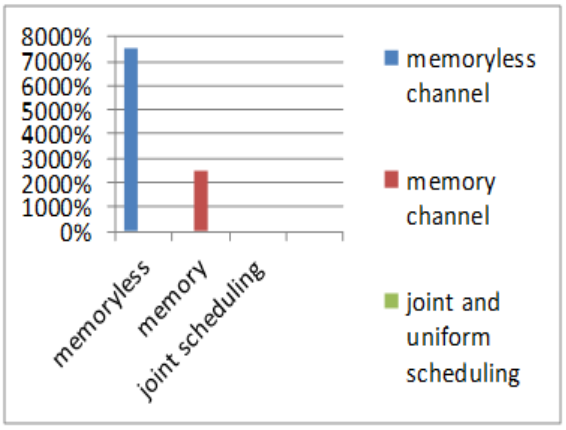

Fig. 1 Noise Ratio of all three channels

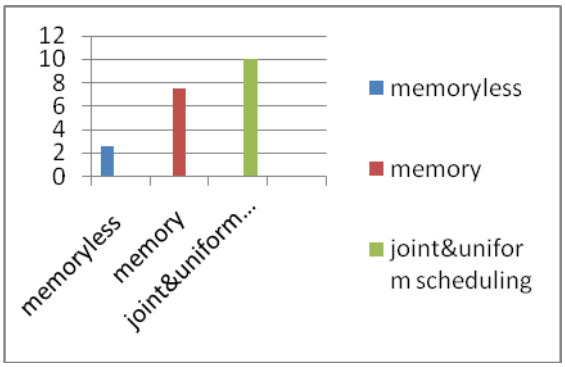

Fig.2. Throughput for all three channels

In Fig.2 Joint and uniform scheduling has a high throughput than the memory and memoryless channels but considering delay variant the joint and uniform scheduling has high delay. By considering delay factor memory channels have a good throughput with less delay constraint.

4. CONCLUSION

Simultaneous presence of time-varying channels and reconfiguration delays significantly reduces the system stability region. By considering arbitrary Markov-modulated channel processes and show that memory in the channel processes can be exploited to improve the stability region. This work Stabilize the network using different scheduling policies, algorithms and markov chain efficient decisions to achieve greater throughput and reduces delays.

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