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ON OPTIMAL CONTROL OF ADAPTIVE MULTIMEDIA SERVICES TRANSMISSION IN WIRELESS CELLULAR NETWORK

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Abstract. One of the key challenges in the optimal control of adaptive multimedia services transmission in wireless cellular network is to balance user satisfaction and fairness among all users, while at the same time ensuring that the scarce bandwidth be utilized efficiently. We propose a novel Adaptive Multimedia Control Strategy ($AMCS$) which could solve the conflicting relationship between user satisfaction and fairness. The $AMCS$ includes specific Bandwidth Allocation Control Strategy ($BACS$) and Handoff Control Strategy (HCS), which employ degradation policies to accommodate more users and compensation mechanisms to maintain fairness among all users, and meanwhile increasing the user satisfactions and the whole network revenue. We have measured the system performance and user satisfaction related parameters, and devised Satiation Rate (SR), which describes to what extent the system could fulfill the adaptive multimedia services. Finally we compare our $AMCS$ with other strategies in the literature through both of the analytical results and simulation results. The presented extensive simulation results in three diversified scenarios with concerns of mobility validate our analysis.

Keywords. Adaptive Multimedia Control Strategy ($AMCS$) ; Adaptive Multimedia Services; Wireless Cellular Network; Satiation Rate (SR); Bandwidth Utilization Rate (BUR).

1 Introduction

The scarcity and extreme fluctuation of available link bandwidth in wireless cellular networks leads to adaptive multimedia services, where the bandwidth of an ongoing multimedia call can be dynamically adjusted [8]. For adaptive multimedia services in wireless cellular networks, the multimedia bit streams are compressed in the form of layered (scalable) coding to adapt the fluctuation in resource availability in wireless cellular networks and accommodate diverse user access devices [3, 8]. The layers could be classified into two categories: the *basic layer* and the *enhancement layers*. The *basic layer* probably means the most important part which should be delivered first and given higher priority. Additionally, the data in the *enhancement layers*