

OFDM 멀티캐스팅 시스템에서 단말의 전력 소모를 줄이기 위한 자원 할당 방안

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OFDM Resource Allocation Scheme for Minimizing Power Consumption in Multicast Systems

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요 약

This paper introduces a resource allocation strategy which focuses on minimizing power consumption in Orthogonal Frequency Division Multiplexing(OFDM) systems. The current Mobile Stations(MSs) require much power, because MSs play various roles, such as organizer, camera, video play, and gaming which cause additional power consumption. In case of multicasting systems, it is appropriate to allocate resource with power saving strategy, since the effect of frequency selective channel is ignorable. By this strategy, the number of OFDM symbols MSs receive is minimized. Great amount of power can be saved, because the radio frequency and baseband processes are the dominant factors of power consumption. This paper also proposes a heuristic algorithm for finding the suboptimal solution of resource allocation with low complexity. By this algorithm, resource allocation process requires $O(n^3)$ computations with little performance degradation.

1. Introduction

Many services use multicasting schemes recently, such as digital broadcasting services, local advertisement, white board, and net chatting. Multimedia Broadcasting and Multicasting Services(MBMS) were already treated as an important issue and have been studied in 3rd Generation Partnership Project(3GPP), and many contribution documents are proposed for Multimedia Broadcast Service(MBS) in IEEE 802.16e standards. In addition, multicasting systems such as Digital Video Broadcasting-Handhelds (DVB-H) and media Forward Link Only(mediaFLO) systems will be in service in this years.

One of the problems in multicasting system is the great amount of power consumption of Mobile Stations(MSs). Many multicasting applications need streaming services which produce real-time traffics. They consume much power, because they generate small packets frequently, and MSs should access to the wireless channel frequently. This causes to shorten the lifetime of MSs since MSs rely on a battery with limited capacity. Moreover, power shortage problem is serious to current MSs, because they play various roles, such as gaming, camera, and playing music or movie, and each of them requires additional processing power.

Current mobile communication systems apply various schemes to save the power of MSs. These schemes are well described in [1]. One of the famous power saving schemes is sleep mode: MSs shut down their receiving function for certain interval when they have no packet to send or receive [2]. The broadcasting systems also employ power saving schemes. DVB-H systems slice time and send data on the slice. An MS gets the slice which contains its data, and rests when the other slices are transmitted [3].

MediaFLO systems employ clipcasting scheme, which multicasts packets when traffic load is light. Since the time duration of data receiving will be reduced, the power consumption will be reduced [4].

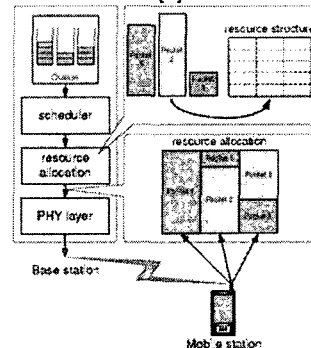


Fig. 1 Flowchart of transmitting processes in OFDM system

In Orthogonal Frequency Division Multiplexing(OFDM) systems, well constructed MAC frames can contribute to power saving. An OFDM symbol is constructed by processing Fast Fourier Transform(FFT), and several OFDM symbols form a MAC frame, as shown in Fig. 1. Power consumption is proportional to the number of symbols an MS receives. For an MS, it is wasting of power to receive whole frame, because only some of OFDM symbols contain its data in the frame. Moreover, power waste still exists when the number of OFDM symbols an MS receive is not minimum. For example, when the black MS wants to get the packet 1 and 3 in the frame as shown in Fig. 1, it should receive three symbols. However, if the resource allocation is done optimally, the black MS receives