

Optimum Power Distribution for Cellular CDMA Downlinks

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Abstract. Power distribution on cellular CDMA downlinks in a slow fading channel environment is studied. We first derive the minimum required power for each connection in order to guarantee its required signal-to-interference ratio (SIR). By comparing the required transmission power for a connection in soft handoff and in hard handoff, we find an optimum area for performing soft handoff in order to best utilize the BS transmission power and maximize the system capacity. Numerical results show that performing soft handoff with properly chosen soft handoff boundary can improve the system capacity.

Keywords. Cellular, CDMA, soft handoff, power distribution, quality-of-service.

1 Introduction

As the wireless access to the Internet becomes increasingly popular, the downlink may have to transport a lot more traffic than ever before. In a CDMA system where the available radio spectrum is shared by all active users, appropriate power distribution is critical to provide satisfactory quality-of-service (QoS) for mobile users while maximizing the system capacity. In the downlink transmissions, each connection needs a sufficient amount of power to overcome the interference from the transmissions of the base stations (BSs) for all other connections sharing the same system. On the other hand, because the total transmission power of a BS is limited, it is important to distribute only the minimum amount of power to each connection, so that the total number of supportable connections in the system can be maximized. The power distribution for downlink channels in CDMA has been studied in the literature. Distance-based power control [1]-[4] is an easy way to distribute the power resource for homogeneous traffic, where a connection closer to the BS is allocated lower transmission power. When heterogeneous traffic with different transmission rates and signal-to-noise ratio (SIR) requirements is considered, power distribution is not only related to the location of a mobile station (MS), but also specific traffic parameters. A higher level of power