Wireless network power optimization using relay stations blossoming and withering technique

ABSTRACT

Power consumption of wireless network is increasing as the demands in wireless data rates are escalating in modern life. Base stations are the major power consumption component in the wireless network. Therefore, the main challenge is to reduce the total power consumed in the network while maintaining the network coverage and its capacity. In this paper, a new relay switching perspective is introduced for relay blossoming and withering algorithm. First, relay switching is considered as a function of time representing the rate of active relays. The effect of the rate of active relays, arrival rate and average load factor of relays on the total network power consumption is modelled. It is found that the rate of active relay function that optimises the network power consumption obeys linear first-order ordinary differential equation. The effect of different synthesised arrival rate profiles on the rate of active relay is presented. Moreover, relative relay to base station capacity parameter is defined, and its effect on the power optimisation is investigated. Based on the solutions of the ordinary differential equation, an approximate fuzzy-based relay sleeping mode is introduced. The fuzzy logic sleeping mode utilises the arrival rate and its derivative as inputs. The solution of the differential equations shows that power saving up to 45 and 30 per cent can be achieved in sleeping and idling modes, respectively, in contrast to 42 per cent achieved from the fuzzy sleeping mode. The increasing slope of the arrival rate results in less power saving.

Keyword: Wireless network; power optimization; relay stations; blossoming and withering technique