ABSTRACT

Massive device connectivity is a key requirement for next cellular network technology with many devices, but few devices are active at the same time. It is important to know how many optimal active UEs that can be served at the same time taking into account many factors. The optimal number of UEs is required to guarantee the rate requirement and fairness among UEs. To fulfill the requirements of high data rate, massive MIMO with multiantenna BS can simultaneously serve multiple user equipments (UEs) has been widely envisaged as one of the major candidate technologies for the fifth-generation (5G) cellular networks owing to its favorable features. User selection is critical to optimizing the overall performance of MIMO systems in various scenarios and has been extensively studied in cellular networks to guarantee user service. In the previous study, Location-dependent User Selection (LUS) had extremely low computational complexity, which are capable of significantly enhancing the system sum rate performance, but there are many environmental condition assumptions that make this algorithm does not reflect real conditions and has poor fairness performance.

In this research, we proposed modified location-dependent user selection by adding sum ergodic of distance from one user to another using approximations of sum rate in large system regimes, which are capable of significantly enhancing the sum rate performance. In addition, we changed the environmental conditions of users who were ignored in previous research. In this research, we focus modify on sub-urban areas with each UEs having different environmental conditions, which is represented by path loss exponent. The selection scheme is equipped with spatial correlation fading on the transmitter side MIMO antenna so as to accurately reflect the relevant phenomenon of propagation in real life. At the last, the scheme will be modified with waterfilling power controlling to achieve high fairness.

The simulation results show that in special case, LUS modified can improve sum rate until 0.3935 bps/Hz with 30 dBm if compared with LUS in previous research. In imperfect CSI, maximum sum rate is 23.4207 bps/Hz with 14 optimal UEs. For cases where the user is located in different positions with different environmental circumstances and 40 dBm, showing the highest sum rate is 24.8436 bps/Hz with 17 optimal UEs. Sum rate increase when the power increase and performation decreases when correlation is present. With waterfilling can improve fairness performance by $\pm 33.3333\%$ in average and sum rate by $\pm 9.8043\%$ in average compare with LUS modifications.

Keywords: Fairness, Location-dependent User Selection, Massive MIMO, Sum Rate, Waterfilling.