A Dissertation submitted in fulfillment of
the requirements for the degree of Doctor of Philosophy

Link Adaptation with Limited Feedback for Future Wireless Networks

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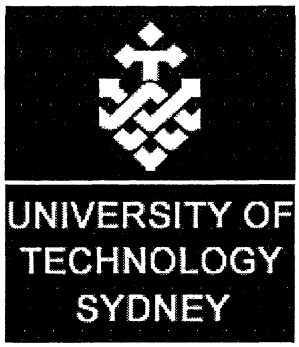

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Certificate of Originality

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

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Abstract

Link adaptation technique (LAT) is one of the radio resource management (RRM) functions necessary for future wireless network to enhance the system capacity and provide an adequate quality of service to the end users.

LAT requires knowledge of users' received singal-to-noise ratio so that scheduling and adaptive modulation and coding scheme (MCS) can be performed to optimise the system performance. The received SNR is measured by the mobile users in the downlink transmission and converted to channel state information (CSI), which is sent via feedback channel in the uplink direction to the base station. The amount of feedback required for adaptive MCS and scheduling at the BS increases with the number of users which consumes significant amount of system resources. It is critical to provide an efficient feedback algorithm for LAT to achieve high utilisation of the system resources while maintaining the system performance close to the system with perfect knowledge of CSI.

This thesis attempted to answer the following questions related to LAT with reduced CSI feedback load:

a) Based on our current knowledge of feedback reduction techniques, can the feedback load be further reduced without scarifying the system performance?
b) Do multiple threshold schemes perform better than single threshold schemes?
c) How is it possible to develop a feedback technique(s) that can self-adjust the parameters associated with CSI reporting to suit the system conditions?
d) Provided that a well-known scheduling technique creates significant delays in the scheduling process, is it possible to mitigate the delays without any need for additional feedback resources?
e) Based on our current knowledge of CSI transmission on the uplink, can a more efficient media access control scheme for CSI reporting be developed?

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