The development of an intelligent ray launching algorithm for wireless networking planning

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Abstract	Current propagation models are no longer sufficient for wireless network planning. They are neither accurate (empirical) nor fast enough (deterministic) to be applicable in the applications of Automated Cell Planning. This thesis focuses on the development of a new method, namely Intelligent Ray Launching Algorithm (IRLA), which is based on fast, accurate and robust algorithm that is especially suitable for wireless network planning. The infrastructure of IRLA is thoroughly analysed in this thesis and results are presented. Foster's design methodology has been used to parallelise the new model. Various scenarios for outdoor, indoor, indoor-to-outdoor, outdoor-to-indoor settings have been employed to test the effectiveness and efficiency of IRLA. The field strengths (path loss) and multipath information were calculated, which were used to present the application of IRLA. The accuracy of IRLA is guaranteed via the use of a meta-based heuristics calibration procedure. In order to achieve a simulation within a realistic time scale, acceleration techniques such as avoid double marking, multi-threading and the use of Parallel Object-Oriented Programming C++ have been employed. Since multipath for a large number of receiver locations can be easily obtained via IRLA, the study of delay spread has been presented. The success of the integration with wireless network planning platform has been an example to show that IRLA is suitable for wireless network planning and optimisation, which is beneficial to relevant academics and industries. Testing demonstrated that depending on various scenarios, IRLA obtains industrially-recognised accuracy ranging from 5 to 8 dB Root-Mean-Square-Error. This model is highly-efficient because its required runtime for most simulations is from a few seconds to a few minutes.
Further Reading	Zhihua Lai, The Development of an Intelligent Ray Launching Algorithm for Wireless Network Planning, PhD in Computer Science and Wireless Telecommunication, University of Bedfordshire, September 2010. Zhihua Lai, Nik Bessis, Pierre Kuonen, Guillaume de la Roche, Jie Zhang and Gordon Clapworthy, A performance evaluation of a grid-enabled object-oriented parallel outdoor ray launching for wireless network coverage prediction, The Fifth International Conference on Wireless and Mobile Communications, ICWMC 2009, Cannes/La Bocca, French Riviera, France, August 23-29, 2009, ISBN: 978-0-7695-3750-4. Zhihua Lai, Nik Bessis, Guillaume de la Roche, Hui Song, Jie Zhang and Gordon Clapworthy, An intelligent ray launching for urban propagation prediction, The Third European Conference on Antennas and Propagation, EuCap, Berlin, Germany, March 23-27, 2009, ISBN: 978-3-8007-3152-7.
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