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


Type of Contribution

PhD Project Abstract

Strand Contribution

Wireless Communications and Telecommunications

Keywords

propagation simulation, path loss prediction, ray tracing, ray launching, discrete, multipath, delay spread, wireless network planning, parallel, POP-C++