Convergence Evaluation of Deterministic 3D Ray Launching Approach in Complex Environments

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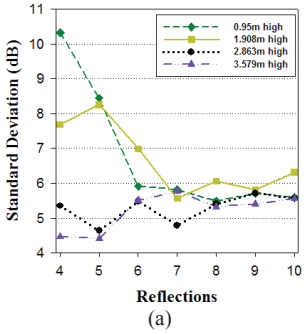
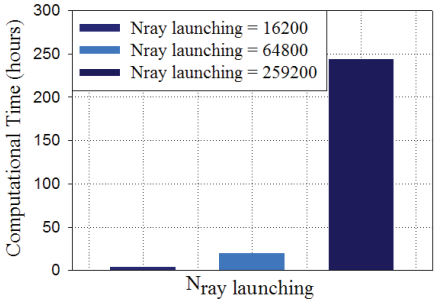
With the growing demand for wireless communication systems in the last two decades a radio electrical planning of wireless communication systems is highly required. Thus, an in-depth investigation of indoor propagation channel characteristics represents a fundamental step toward the design and the implementation for an efficient setup of an indoor wireless network. Deterministic models potentially represent the most accurate and versatile methods for urban and indoor, multipath propagation prediction. In this work, a convergence analysis of an in-house 3D Ray Launching code is presented, with the aim of minimizing computational cost and acceptable accuracy in the obtained estimations. For that purpose, the influence of considering different number of reflections and number of launched rays has been analyzed. Figure 1a shows the convergence results versus the number of reflections and Figure 1b represents the computational time versus the angular resolution. With these results, the optimal parameters for the 3D Ray Launching code can be achieved. Figure 2 represents the complex environment which has been assessed with the predicted received power for the considered height. The analysis provides adequate simulation parameters to obtain an optimal tradeoff between computational cost and accuracy.

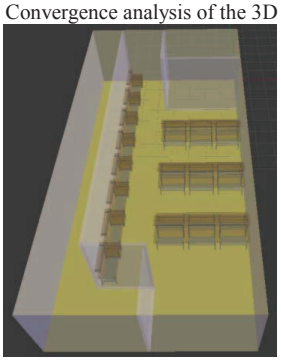


(a)

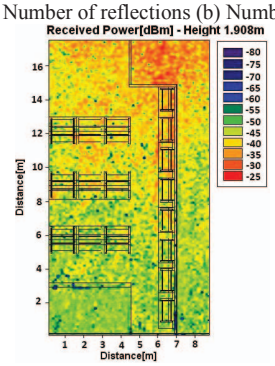


(b)

Figure 1. Convergence analysis of the 3D Ray Launching algorithm (a) Number of reflections (b) Number of rays



(a)



(b)

Figure 2. (a) Schematic view of the considered scenario (b) Estimated received power for 1.908 height