

Comparative Study between Kriging and Genetic Algorithms for Optimal Transmitter Location in an Indoor Environment Using Transmission Line Modeling Method

ABSTRACT

Widespread expansion of communications systems in urban environments has triggered a substantial effort to understand and predict the indoor channel propagation in different architectural buildings. This kind of study requires the use of efficient numerical tools for evaluate the electromagnetic fields propagation as well as suitable techniques to realize the optimization.

This work deals with a study between two different optimization techniques (Kriging and Genetic Algorithms) for optimal transmitter location in an *indoor* environment. Both techniques were applied for the same test function (objective function) which is computed from the TLM evaluations of the fields scattered in the environment.

The aim of this work is to compare *Accuracy* (capability of predicting the systems responses over the design space of interests), *Robustness* (capability of achieving good accuracy of different problems), *Efficiency* (computational efforts to construct the model), *Transparency* (capability of illustrating systems responses) and *Conceptual Simplicity* (ease of implementation) between Kriging and Genetic Algorithms.

For the tests, two different environments were simulated. Each one was modeled by a two-dimensional TLM mesh with different constitutive materials and geometry. Both methods were applied to search the position where the transmitter should be placed to provide the best environment illumination.

From the simulations, it was possible to identify the weakness and the strengths for each method in each application. As a final conclusion, we noticed that Kriging is a helpful tool in the search for indoor optimal transmitter location, given worthily results in a reasonable time allowing transparency to investigate the optimal indoor channel propagation.

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