

A 2-D INDOOR RADIO PROPAGATION MODELING BY USING MATLAB FOR CLASSROOM INSTRUCTION.

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Abstract - The paper presents the development of a Matlab simulator for the indoor radio propagation models, used as a teaching aids. The software application is designed to allow the user to select the propagation models, characteristics of the building, transmitter and receiver systems, etc.

Index Terms – Wireless communication, indoor propagation models, empirical/statistical model, ray tracings, Matlab simulation.

An approach to demonstrate indoor radio propagation in wireless communication is presented here, wherein the basic concepts are reinforced by means of a series of MATLAB simulations. Following a brief introduction of to radio propagation in generals, the indoor radio propagation models (ray-tracing and empirical approaches) are developed and simulated using MATLAB package.

Wireless communications is one of the fastest growing areas in electrical engineering. As a result, courses in wireless communications are being offered as a part of the electrical engineering curriculum at both undergraduate and graduate level. With the spreading of the computer use, in classrooms and laboratories, becomes much easier to bring to the students the concepts of this exciting field of wireless communications, or to set up new experiments into the laboratory. There has been considerable interest in the last two decades in propagation prediction for indoor environments, due to the extended use of indoor wireless communication for a large variety of applications [2], [3]. This made naturally for us to include such experiments and applications, involving indoor radio propagation into electronic/wireless communication courses and laboratories.

This paper presents a software application, with a friendly graphical user interface (developed by using Matlab) that uses ray tracing and statistical/empirical algorithms to simulate and predict the radio propagation in the indoor radio channel from the layout of the floor plan.

We would like to remember that the models proposed to characterize indoor radio propagation could be classified into two major classes: statistical/empirical models and site-specific models [1], [3]-[5]. In our simulation, both categories, empirical and ray-tracing indoor propagation models are included. We also included one, which uses a mixed approach, ray tracing and statistical models, so-called

semi-empirical propagation model. The software application will allow to the student/user to interactively select a specific model of propagation, customize the layout of the indoor environment (numbers and shape of the rooms of the building), specify the location of the walls in the floor plan, select the dielectric properties of the walls, and the location of radio transmitter and receivers, including the setting of the power of the transmitting antenna. The propagation algorithms determine the magnitude, phase, time of arrival, and direction of every signal path between the specific radio transmitter and receiver when a RF pulse is transmitted. The data of the simulation could be collected in files for later processing. Before the delving into the details of the indoor radio propagation modeling, the students will have possibility to learn and understand the principles of indoor radio propagation in wireless systems. The authors suggest that the use of MATLAB exercises will assist the students in gaining a better understanding of the problems related with indoor radio propagation.

The number of students enrolled in our Electronic Communication course is normally over fourteen. To perform this laboratory module, the students will be grouped into two-three member teams. As a part of performing experiment in the laboratory, each student is required to submit a technical laboratory report, which will part of the evaluation process.

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