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Modeling and simulation of inductive-based wireless power transmission systems

Mohammad Haerinia
mohammad.haerinia@und.edu

Modeling and simulation of inductive-based wireless power transmission systems: Technology, Components and System Design

Mohammad Haerinia
College of Engineering and Mines, University of North Dakota, Grand Forks, USA.

Abstract:

This chapter studies an inductive-based wireless power transfer system for low-power applications at short distances. The transferring power system has been modeled, simulated and analyzed via finite element method. A wireless power transfer system includes important parts such as coil, core and driver. In this chapter, the important parts of an inductive power transfer system have been analyzed. Receiving and transmitting printed spiral coils are designed in an optimized procedure. The experimental results were in a good agreement with the simulation results. Moreover, based on the performed modulation and simulation the use of the pot core as the receiving core is proposed. It is concluded that this type of core can improve magnetic flux density in the receiving side. Different geometries of coils for transmitting side have been modeled and simulated. An electromagnetic analysis has been done; the experimental result was in a good agreement with the simulation result. This work presents an efficient perspective to coil design.

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Olfa Kanoun (Ed.)

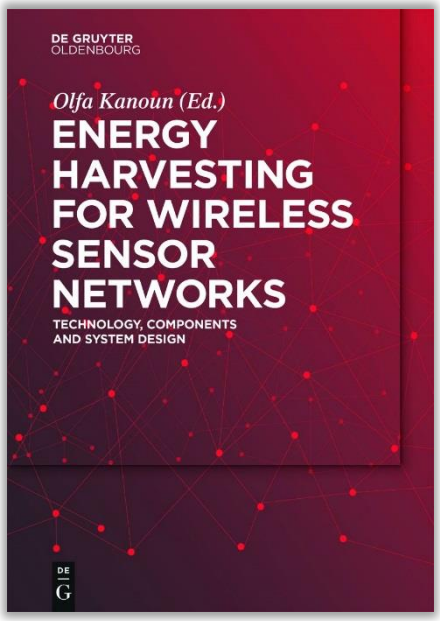
ENERGY HARVESTING FOR WIRELESS SENSOR NETWORKS

Technology, Components and System Design

Wireless sensor systems are becoming increasingly important in several fields of innovation and technology. Decisive properties are the reduced installation costs, the flexible application, and the low-maintenance operation. For the supply of wireless sensor systems, several basic technologies of energy harvesting and energy transfer are nowadays available reaching a good degree of technical maturity, such as solar converters, vibration converters and thermoelectric converters. Nevertheless, the design of wireless sensor networks needs to consider also important aspects concerning energy consumption, such as energy-aware communication technologies and ultra-low-power electronics. Some challenges arise thereby due to the strong dependence on the application environments ambient energy sources, which show typically different behaviors with regard to availability, reliability and dependence on influencing factors and ambient conditions. In order to retain the functionality of the sensor nodes, both energy input as well as intelligent energy management methods need to be addressed under consideration of the situation based on accurate information about the energy balance and the system operating modes. Nodes need to cooperate together to guarantee a better network availability.

The book gives an actual overview of the state of the art of energy aware sensor networks. The book includes comprehensive contributions for the most important ambient energy sources, such as solar energy, vibration, thermoelectric converters, energy management and energy transmission for the power supply of sensor systems.

Prof. Dr. Olfa Kanoun
is professor for measurement and sensor technology at Chemnitz university of technology. She is specialist in the field of sensors and sensor systems design.



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