Hochschule Ostwestfalen-Lippe
University of Applied Sciences

Institut Industrial IT
www.init-owl.de

Fachbereich Elektrotechnik und Technische Informatik
Department of Electrical Engineering and Computer Science

Master Thesis
Ganesh Man Shrestha

Statistical Analysis and Predictive Modeling of Industrial Coexisting Environments

Abstract

Typically, cognitive radio systems either sense the channel just before transmission or perform this task periodically in order to remain aware about the operational environment. The former method is typically known as reactive sensing, while the latter one as proactive sensing. Apart from when to sense, both methods are similar in nature, because both methods decide about the availability of the sensed channel on the basis of information obtained during the sensing process. However, a channel sensed as ‘free‘ can become busy during the transmission of the cognitive system resulting in harmful collision and unnecessary interruption of the data transmission. As a solution, a predictive modeling based approach has been proposed and has shown promising results in simulated environments. However, modeling real-time, dynamic, coexisting environments demand investigation with real-time demonstrators.

This master thesis investigates industrial coexisting environments and illustrates the prediction model selection and its parameter estimation criteria. The quality of prediction results for different radio traffic scenarios are studied in MATLAB. Furthermore, the comparison of predicted results from three different prediction models is presented. Based on these simulation results, a suitable model is selected to implement a testbed using a CC2500 transceiver and MSP430 microcontroller based platform. This testbed is then used to investigate the real-time aspects of predictive modeling in industrial coexisting environments.

1st Supervisor: Prof. Dr.-Ing. Uwe Meier
2nd Supervisor: Prof. Dr.-Ing. Jürgen Jasperneite