AC 2008-1298: GRADUATE LEARNING THROUGH TEACHING: DESIGN OF A DSSS SYSTEM FOR UNDERGRADUATE WIRELESS COMMUNICATIONS LABORATORY

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Abstract

Over the past few years, wireless communications technology has been one of the most rapidly growing disciplines and been widely used both in industry and daily lives. As a result, wireless communications courses are becoming increasingly popular as an important part of engineering education in various universities and educational institutions. However, in many universities, there are still not sufficient or efficient laboratory contents to effectively enhance the students' learning with hands-on experiences. This paper reports progress and results of the development of a Direct Sequence Spread Spectrum (DSSS) system for undergraduate laboratory experiments as a graduate student project. Improvements of teaching quality and effectiveness for both the graduate and undergraduate students in wireless communications area are also reported.

In Western Carolina University's Wireless Communications Lab, DSSS technology has not been covered. Although this technology can be demonstrated through the simulation using MATLAB, SystemView, or other software, however, it will be better to provide students first-hand learning experiences through hardware experiments. In view of this, the development of a DSSS system for undergraduate laboratory was initiated and carried out as a graduate student project by a student whose research interest is wireless communications. This system includes the hardware implementation based on Altera FPGA/CPLD development board and Mini-Circuit RF modules. Software simulation model will also be built based on MATLAB to verify hardware performances. Through the project, the graduate student acquired an in-depth understanding from a systematic perspective and well-trained professional skills useful for further study and research. On the other hand, the outcome of this project-the DSSS system was directly designed to enrich the undergraduate wireless communications laboratory experiments, and it helps undergraduate students obtain better theoretical understanding as well as hand-on experiences of spread spectrum technology and CDMA system. This integration teaching method improves the teaching quality by combining the graduate education with undergraduate education in appropriate way, which is also meaningful for other disciplines.

This paper describes the design, implementation, evaluation, and educational merits of the project.