Project Year
2006

Project Team
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Project Title
Painless Radio Design Laboratory

Audience
Students enrolled in *Radio Design* classes within the Whiting School of Engineering

Pedagogical Issue
Undergraduate engineers are frequently heard commenting on the lack of hands-on experience in their curricular studies. While laboratories and laboratory-based courses are increasing in some disciplines (e.g., computer engineering), opportunities for practical design work in communications and signal processing have been slower to develop, and experiential activity traditionally takes the form of numerical computation or computer-based simulation. While the latter experience is powerful and enriching, the physical, hands-on experience gained by sitting at a workbench and designing a radio is equally useful.

Solution
To provide new opportunities for student to design wireless systems, we would like to provide easy accessibility to a software radio workstation so that actual radio receivers, and (where allowed) transmitters, could be designed, tested, and used. The focus of this proposal is to make the existing software radio workstation in the ECE Department more student-accessible through a web-based graphical user interface that will, in a natural way, explain the workstation and how to use it. The objective is to create a facility that can be used naturally and instinctively by the typical undergraduate engineering student.

Technologies Used
C/C++, Python, Graphic Design, HTML/Web Design

Project Abstract
Undergraduate engineers are frequently heard commenting on the lack of hands-on experience in their curricular studies. While laboratories and laboratory-based courses are increasing in some disciplines, e.g., Computer Engineering, opportunities for practical design work in communications and signal processing have been slower to develop, and experiential activity traditionally takes the form of numerical computation or computer-based simulation. While the latter experience is powerful and

enriching, the physical, hands-on experience gained by sitting at a workbench and designing a radio is equally useful. To provide new opportunities for student to design wireless systems, we propose to improve student accessibility to a software radio workstation so that actual radio receivers, and (where allowed) transmitters, could be designed, tested, and used. In contrast to software simulations and instrumented laboratory signal processing systems, a software radio receiver is a genuine receiver. Fortunately, this project need not start from scratch. The ECE Department's Software Radio Prototyping Laboratory (http://www.ece.jhu.edu/~cooper/SRPL) already contains the essential elements: a computer, a software radio peripheral, and software. This workstation receives local AM and FM radio broadcasts and other signals across the spectrum. (Continued development of this resource is under way under separate management within the ECE Department and is not the objective of this project.) Rather, we propose, with this project, to make the software radio workstation more student-accessible through a web-based graphical user interface that will, in a natural way, explain the workstation and how to use it. The objective is to transform an existing resource into a more user-friendly facility that could be used naturally and instinctively by the typical undergraduate engineering student. This project creates a new educational tool by developing a web-based interface to our Software Radio Prototyping Laboratory workstation, use of which now requires navigating a documentation maze and facility with the Python language. The proposed Technology Fellow, Patrick Mulligan, has built and debugged the workstation, using his excellent software and hardware skills. He will design and implement a graphical interface that provides a complete guide to system use, including a Python tutorial. Our success measure will be the percentage of student volunteers who, with one communications course and a short instruction sheet, can use the workstation to implement a receiver. The workstation will become a permanent part of the ECE Department's Communications Laboratory, maintained with Department resources. This project could also be useful to the Computer Science Department in the future.