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A Software-Define Radio Testbed for Research in Dynamic Spectrum Access

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With the rapidly-increasing amount of wireless devices, technologies and services appearing on the market today, there is an increasingly large demand on the wireless spectrum. The present model for spectrum allocation is such that fixed bands of frequency are assigned for specific functions. This method of allocation prevents unlicensed users from interfering with a licensed user's spectrum and subsequently their communication. The method does a good job of protecting the licensed users in their frequency bands, but it can lead to inefficient usage of the spectrum and the waste of potential bandwidth for other users. Dynamic spectrum access (DSA) shows promise to increase spectral efficiency. DSA aims at dynamically sharing spectrum that is licensed to primary users (PUs) with non-licensed secondary users (SUs). In order to effectively share spectrum the SUs must sense the spectrum to avoid interference to the PUs.

This work describes a software and hardware test bed for research in DSA with a focus in spectrum probing methods. Spectrum probing methodology is an often overlooked component of spectrum sensing research. This work provides theoretical concept, simulation results and experimental results comparing different spectrum probing methods for independent SUs and for a cooperative network of SUs.

This research aims at providing new alternatives to traditional spectrum probing techniques to provide for more flexibility in DSA-enabled radio designs. Experimental test results are presented to support these alternative techniques. The development of the testbed in this research has provided the IPFW Wireless Technology Center with a software defined radio testbed enabling future research opportunities.