FCC Experimental License Application
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Filed 21 June 2012
Unrestricted

Response to Question 4: Government Project Description

Agency: Office of Navel Research
Contract Number: N00014-12-1-0062

Description of Work:
The overall goal of this program is to conduct research addressing the following objectives:
Efficient Use of Spectrum: The goal is to achieve 70% efficiency in a non-cooperative scenario (e.g. cognitive radar and legacy comms) and 95% efficiency in a cooperative scenario (cognitive radar and cognitive comms). We quantify efficiency in terms of occupancy of temporal and spectral resources. For example, if a radar has 5% duty cycle, 20 MHz bandwidth, and hops over 400 MHz, then its spectral temporal efficiency is 0.05 x 20/400 = 0.25%. Our goal is to use the remaining 99.75% for useful communication and exploit spectral/spatial/temporal holes to supply the radar with more bandwidth.
Improved Communications Performance: By allowing military communications systems to operate in the same spectrum as military radars, we provide access to significantly more communications capability.
Improved Radar Performance: By expanding the bandwidth available for radar sensing, we can improve radar resolution and performance by allowing it to operate in nontraditional bands. Also by allowing real time coordination with communication systems we might increase the bandwidth available for radar systems.
Key research challenges we envision are as follows:
Real Time Spectrum Coordination: In order for radar and communications systems to coexist, they must coordinate their access to the spectrum. This can be difficult to achieve since they each use spectrum in very different ways. However, the very directional nature of radar transmissions and of radar receive antennas facilitates this. Additionally, we can take advantage of the fact that most growth in commercial spectrum use involves asymmetric, delay-tolerant, packetized data flows. Research will investigate both distributed and centralized approaches using both indirect and direct control channels between devices.
Security: Any coordination between radars and communications will need to be performed securely to avoid potential leakage of information and impact to operational security. Quality of service techniques can often be abused to cause denials of service. Metadata used for coordination may leak information about potential targets or locations of communications resources.
We propose researching and developing solutions for efficient coexistence of radar and communications systems by developing cognitive radars. To this end, we emphasize spectrum sharing considering two aspects: (1) radar platforms opportunistically accessing available spectrum; and (2) development of new communications approaches that directly coordinate real time spectrum access with radar platforms to even further improve efficiency.