COST-TERRA COST Action IC0905 TERRA

Journal of Green Engineering

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Special Issue on

"Cognitive Radio and the Application to Green Communications: Technical, Economic, and Regulatory Viewpoints"

Call for Papers

Demand for wireless data exchange is perpetually increasing, leading to pressure on deployed wireless capacity. As systems enhance their spectral efficiency to attempt to address this, evermore complex processing techniques are being employed. Such techniques increase power consumption, leading to greater heat output from processors in network elements and increasing powered cooling. Moreover, the requirement for wideband linearity of radio frequency circuitry in state-of-the-art OFDM systems, twinned with high transmission power capability on the network side and the inefficiencies of components when operating at such limits, leads to greater inefficiency hence further heat power output and the need for greater cooling. All of these ingredients significantly affect the power consumption of communications equipment. Indeed, merely considering raw transmission power, the Shannon-Hartley theorem implies necessary transmission power increases exponentially with required capacity.

Such power consumption issues can be mitigated through cognitive radio (CR) techniques. The use of greater bandwidths through CR and in some cases the aggregation of bandwidths, as well as the opportunistic use of spectrum of more appropriate propagation characteristics or with better interference management, can reduce necessary transmission power for devices and systems. Moreover, CR techniques may achieve greater spatial/temporal awareness of connectivity options and their inherent power consumptions, as well as the power consumptions of chosen radio access characteristics. They might be able to use this awareness to dynamically switch to connections that better manage loads and interference, or might be able to minimize the power consumption of radio frequency circuitry through switching radio access technique given a required traffic load. At a simpler level, they may be able to appropriately select nearer connectivity options minimizing path loss/shadowing hence necessary transmission power, in consideration of experienced/predicted traffic loads and channel characteristics. Such capabilities are particularly relevant considering that, at least in terms of the transmission power to from-the-socket power consumption ratio, lower power equipment such as wireless LAN access points achieves far better efficiency than higher-power equipment such as macro-cell base stations. This manifestation is not only because of favorable path loss characteristics, but also because of the better efficiencies of the lower power components in such access points.

CR might also assist in making other areas of life more environmentally friendly. The application of CR to intelligent transportation, for example, facilitating the sharing of information in a timely manner and with appropriate data rates among vehicles and between vehicles and roadside infrastructure through enhancing the capabilities of systems such as IEEE 802.11p, could lead to the better management of traffic signals and better collaborative automated management of traffic speeds, limiting unnecessary vehicular start/stop cycles and greatly reducing the burning of fossil fuels. Moreover, the presence of CR capability in a wide range of future machines will facilitate those machines talking to each other more ubiquitously than today. Such machine-to-machine communications could greatly enhance the energy efficiency of everyday living. One example of this is smart grids and smart homes, facilitating the usage of energy locally, only when needed, and catering for the integration, better prediction of and capitalization from renewable resources. Among other benefits, such solutions would decrease wastage in the home through better management of appliances and heating/cooling options.

In order for the range of solutions described above to become reality, CR technologies must be facilitated. A key challenge here is regulation: without regulatory rules permitting, many CR visions simply cannot exist. However, while regulations should be adapted to allow and facilitate CR, the chosen regulatory way forward must be both technically feasible from a primary user protection perspective and must provide for the commercial success of CR systems. Moreover, the immense social and economic benefit that might transpire through the emergence of CR must be maximized through the definition of appropriate regulations.

Given the above observations, this call for papers solicits original and unpublished submissions on relevant topics, including but not limited to:-

- CR applications to green communications,
- CR applications to green living (e.g., smart homes, vehicular transport),
- CR-enabled sleep modes for network equipment,
- CR-enabled connectivity selection/optimization,
- Spectrum opportunity awareness for CR,
- Database-enabled CR and TV Whitespace,
- Information theory and performance limits of CR,
- CR-enhanced ad-hoc networks,
- PHY and MAC techniques for CR,
- Decision making and learning techniques for CR; policy languages,
- Interference mitigation in shared spectrum environments,
- Cross-layer algorithms for CR,
- Energy consumption of CR technologies (sensing, cognition),
- Energy efficiency metrics and measurements in CRs,
- Cognitive relaying and cooperative techniques for green communications,
- Business models for energy efficient CR networks,
- Appropriate regulatory structures for CR,
- Facilitators for CR (e.g., software defined radio, adaptive radio, reconfigurability),
- CR standardization,
- Hardware design of software defined radio and CR transceivers,
- CR prototypes and test beds.

Submissions can be made from the following link:

http://riverpublishers.com/journal/login.php

Alternatively, submissions can be sent directly by email to the lead guest editor, copying the other guest editors, and including the text “Journal of Green Engineering Submission” in the “subject” field.

Timeline:

- Paper Submission Deadline: **October 7, 2011 (extended)**,
- First Review Deadline: December 16, 2011,
- Revised Paper Submission Deadline: February 3, 2012,
- Second and Final Review Deadline: March 2, 2012,
- Final Manuscript Submission Deadline: April 6, 2012,
- Publication: mid-late 2012.

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