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Special Issue of IEEE Transactions on Vehicular Technology
"Achievements and the Road Ahead: The First Decade of Cognitive Radio"

The paradigm used by regulatory bodies for spectrum management over the last century has been "good fences make good neighbors". Regulators have on the one hand attached compulsory and detailed transmission guidelines to granted licenses, and on the other hand allocated appropriate guard-bands between neighboring frequency bands. Although this approach ensures minimum interference, the growth in the number of wireless applications and technologies has caused frequency allocation tables to become saturated. Moreover, as various measurement campaigns have shown, most of the spectrum is underutilized at any given location. Regulators are therefore considering alternative approaches to spectrum management, such as using market-based mechanisms, introducing technology-neutral licenses, and allowing secondary spectrum usage.

Cognitive Radio (CR) is a viable means to increase spectrum utilization through leveraging secondary spectrum access. Upon its conception in 1999, CR was intended to involve RF environment sensing, model-based reasoning, and learning and acting according to this knowledge in order to improve communications aspects. However, two major shifts in the focal point of CR are occurring. The first is a narrower focus on intelligent spectrum utilization, for example through opportunistic/secondary spectrum access. The other major shift is from autonomous CR operation, which is more suitable for ad hoc networking scenarios, to cooperative approaches and structured networking architectures, such as manifested in the IEEE 802.22 standard. This paradigm is generally known as Cognitive Radio Networking (CRN) or Cognitive Wireless Networking (CWN).

There is tremendous opportunity to improve spectrum efficiency and QoS through shared utilization. Several IEEE standards groups are working on issues related to spectrum sharing; for instance, IEEE 802.22 is aiming to create Wireless Regional Area Networks (WRANs) based on CR through the secondary usage of TV bands. In the US, WRANs will opportunistically use the VHF and UHF TV bands between 52 and 862 MHz. IEEE SCC41 efforts are also developing standards for technologies, architectures, and facilitators to realize dynamic spectrum access networks. Furthermore, IEEE 802.16h and IEEE 802.11y are working on interference management and efficient resource allocation in shared (e.g., unlicensed) bands.

Coupled with the advantages and flexibility of CR systems and technologies, there is an ever-growing interest around the world in exploiting CR-enabled communications in vehicular and transportation environments. Through the integration of CR and CRN into vehicles and associated infrastructure, Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communications, as well as many other emerging "Killer Applications", can be expected. CR and CRN, based upon enhanced intelligent interactions with the transportation system, interactions among vehicles, and even interactions among radios within vehicles, will help improve radio resource and energy efficiency, road traffic management, network management, vehicular diagnostics, road traffic awareness in applications such as route planning, mobile commerce, and much more.

A decade after CR first entered the lexicon of wireless communications, this special issue aims to bring together a comprehensive view of the major achievements and developments in this field. Through critical analysis of the state-of-the-art, further aims are to highlight the significant research challenges that remain in CR and ensuing CRN efforts, to present pioneering solutions to resolve such issues, and to point the way forward regarding the significant potential for CR and CRN to be employed within vehicular domains. In line with such objectives, original, unpublished contributions are solicited in relevant topics, including but not limited to:

- CR enhanced Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communications,
- CR enhanced vehicular ad hoc networks,
- CR enhanced radio resource management and QoS support in vehicular environments,
- PHY and MAC techniques for CR,
- Cognitive radio networking,
- Information theoretic analyses of CR,
- Interference mitigation in shared spectrum environments,
- Security issues for CR,
- Software Defined Radio (SDR) and reconfigurability,
- Standardization efforts such as IEEE 802.22, IEEE P1900 (SCC41), IEEE 802.16h, etc.,
- Higher layers and interdisciplinary research on CR (AI, computer vision, neural networks, etc.),
- Intelligent radio and cognition cycle considerations,
- Coding for CR channels,
- Biological-inspired networking for CR,
- Study of the applications and social impacts of CR, such as on public safety,
- Cooperative networking with shared resources,
- Cross-layer designs and architectures for CR,
- Beam-forming and MIMO for interference avoidance in the CR context,
- Self-organizing networks and autonomic communications,
- Policy and policy languages for shared spectrum management,
- Spectrum sensing techniques,
- Ultra-wideband for spectrum sharing in CR,
- Game theoretical analysis for CR.

Submission instructions can be found at the site: http://transactions.vtsociety.org/

Timeline:

- Paper Submission Deadline: May 15, 2009,
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- Revised Paper Deadline: October 1, 2009,
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Guest Editors:

Prof. Joseph Mitola III (Corresponding Guest Editor)
Stevens Institute of Technology
Hoboken, NJ 07030-5911, USA
E-mail: joe.mitola@stevens.edu

Dr. Alireza Attar
King's College London
Strand, London WC2R 2LS, UK
E-mail: alireza.attar@ieee.org

Prof. Honggang Zhang
Zhejiang University
Zheda Road 38, Hangzhou 310027, China
E-mail: honggangzhang@zju.edu.cn

Dr. Oliver Holland
King's College London
Strand, London WC2R 2LS, UK
E-mail: oliver.holland@kcl.ac.uk

Dr. Hiroshi Harada
National Institute of Information and Communications Technology
3-4 Hikarino-Oka, Yokosuka 239-0847, Japan
E-mail: harada@nict.go.jp

Prof. Hamid Aghvami
King's College London
Strand, London WC2R 2LS, UK
E-mail: hamid.aghvami@kcl.ac.uk