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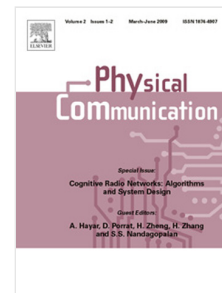
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A Spectrum Handoff Scheme for Optimal Network Selection in Cognitive Radio Vehicular Networks: A Game Theoretic Auction Theory Approach

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ABSTRACT

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The recent strides in vehicular networks have emerged as a convergence of multi radio access networks having different user preferences, multiple application requirements and multiple device types. In future Cognitive Radio (CR) vehicular networks deployment, multiple radio access networks may coexist in the overlapping areas having different characteristics in terms of multiple attributes. Hence, it becomes a challenge for CR vehicular node to select the optimal network for the spectrum handoff decision. A game theoretic auction theory approach is interdisciplinary effective approach to select the optimal network for spectrum handoff. The competition between different CR vehicular node and access networks can be formulated as multi-bidder bidding to provide its services to CR vehicular node. The game theory is the branch of applied mathematics which make intelligent decision to select the optimal alternative from predetermined alternatives. Hence, this paper investigates a spectrum handoff scheme for optimal network selection using game theoretic auction theory approach in CR vehicular networks. The paper has also proposed a new cost function based multiple attribute decision making method which outperforms other existing methods. Numerical results reveal that the proposed scheme is effective for spectrum handoff for optimal network selection among multiple available networks.

1. Introduction

One of the major challenges for today's wireless communication is the exponential growth in wireless networking (Wang et al., 2014; Zheng et al., 2015). According to Cisco, the mobile data traffics are expected to have eightfold increase from 2015-20 (Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2015–2020, 2016). There is a rapid progression in number of vehicles on the road with their communication applications. The exponential growth in vehicular communications may lead to the overcrowding of the allocated spectrum bands. It has raised the demand for the extra spectrum bands to improve the spectral efficiency for improving vehicular communications. It is difficult to find separate vacant spectrum to accommodate the growing demands. The only feasible way is to exploit the potential of existing spectrum by improving the spectrum efficiency of wireless system. Thanks to the new regulations (FCC, 2003) to open up licensed underutilized radio spectrum to use it opportunistically, and for which Cognitive Radio (CR) technology has been introduced. CR technology introduced by Mitola III in 1999 (Mitola and Maguire, 1999; Mitola, 2001; Mitola, 2009), is a key enabling technology to use underutilized spectrum by dynamic spectrum access. CR networks are receiving high attention from the research community to overcome the radio spectrum scarcity problem, as well as to improve the

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