香港浸會大學理學院
HKBU Faculty of Science

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DEPARTMENT OF COMPUTER SCIENCE

PhD Degree Oral Presentation

PhD Candidate:	Ms Lu YU
Supervisor:	Prof Yiu Wing LEUNG
External Examiner:	Prof Lawrence K YEUNG Dr Eric W M WONG
Time:	18 Aug 2015 (Tuesday) 10:30 am – 12:30 pm (35 mins presentation and 15 mins Q & A)
Venue:	RRS 732, Sir Run Run Shaw Bldg., HSH Campus

"Rendezvous for Cognitive Radio Networks"

Abstract

With the traditional static spectrum management, a significant portion of the licensed spectrum is underutilized in most of time while the unlicensed spectrum is over-crowded due to the growing demand from various wireless devices. With cognitive radios, the unlicensed users (SUs) can opportunistically identify and access the vacant portions of the spectrum of the licensed users (PUs). In cognitive radio networks (CRNs), multiple idle channels may be available to SUs. If two or more SUs want to communicate with each other, they must select a channel which is available to all of them. The process of two or more SUs to meet and establish a link on a commonly-available channel is known as rendezvous.

1) Multiple Radios for Fast Rendezvous in CRNs: The existing works on rendezvous implicitly assume that each cognitive user is equipped with one radio. As the cost of wireless transceivers is dropping, this feature can be exploited to significantly improve the rendezvous performance at low cost. We first study how the existing rendezvous algorithms can be generalized to use multiple radios for faster rendezvous. We then propose a new rendezvous algorithm, called role-based parallel sequence (RPS). We derive the upper bounds on the maximum time-to-rendezvous (MTTR) and the expected TTR (E(TTR)).

2) Efficient Channel-Hopping Rendezvous Algorithm Based on Available Channel Set: All the existing rendezvous algorithms that provide guaranteed rendezvous generate channel-hopping (CH) sequences based on the whole channel set. We design a new rendezvous algorithm, called Interleaved Sequences based on Available Channel set (ISAC), that attempts rendezvous on the available channels only for faster rendezvous. We prove that ISAC provides guaranteed rendezvous and derive the upper bounds on the MTTR.

3) Adjustable Rendezvous in Multi-Radio CRNs: We propose an Adjustable Multi-Radio Rendezvous (AMRR) algorithm which exploits multiple radios for fast rendezvous based on available channels only. AMRR is adjustable in giving its best performance on either MTTR or E(TTR) by adjusting value of the number of stay radios. Simulation results show that AMRR performs better than the state-of-the-art.

4) Cooperative Rendezvous in Multi-User CRNs: The existing rendezvous algorithms assume that only one pair of users send handshaking messages for rendezvous at a time. In practice, more than one pair of users may go through the rendezvous process at about the same time and their handshaking messages may collide with each other. We propose to turn this disadvantage into an advantage. We propose a Cooperative Rendezvous Protocol (CRP) where multi-pair users are cooperative to relay the channel information to speed the rendezvous efficiently. If one user gets the channel information of its intended rendezvous user, it can change the channel set and only hop on the commonly-available channels between itself and its intended rendezvous user. CRP can be applied in conjunction with any existing rendezvous algorithm. We prove that CRP can decrease the E(TTR).

***** ALL INTERESTED ARE WELCOME *****