

SHUYU SHI

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Research Interests *Learning Human Contexts Leveraging Wireless Networks*

I am interested in using the wireless networks to implicitly sense human contexts. I, along with my coauthors, have worked on the design of wireless device-free human-contexts detection systems—which would leverage various types of RF radios to classify attention, gestures or activities of humans. We have also been exploring approaches of machine learning that utilize measurements of RF readings to improve the accuracy of sensing.

Implicit Visual Communication via Camera-display Link

Human visual system cannot perceive the dynamics and motion beyond 60Hz, on the other hand, high frame refresh rate displays are becoming popular. We would like to design a new barcodes system, which can capture frames and decode data without any distraction to human visual system, when such barcode-embedded video is played at a high refresh rate display (120 fps and 240 fps). Also, high frequency contents like edges are easily detectable than low frequency component in an image, therefore, I design a scheme to make the barcode-embedded images less intrusive to the video observer.

Optimizing Average-Maximum TTR Trade-off for Cognitive Radio Rendezvous

In cognitive radio (CR) networks, “TTR”, a.k.a. time-to-rendezvous, is one of the most important metrics for evaluating the performance of a channel hopping (CH) rendezvous protocol, and it characterizes the rendezvous delay when two CRs perform channel hopping. There exists a trade-off of optimizing the average or maximum TTR in the CH rendezvous protocol design. I, along with my collaborators, strike a balance in the average-maximum TTR trade-off for CR rendezvous by leveraging the advantages of both random and sequence-based CH protocols.

Education

the Graduate University of Advanced Studies, Japan

Ph.D in Informatics

October 2011 - Present

University of Science and Technology of China (USTC)

B.S in Computer Science

July 2011

Professional and work experience

National Institute of Informatics, Japan

Research Assistant, Advisor: Yusheng Ji and Stephan Sigg

October 2011 - Present

- Developed passive activity recognition systems leveraging FM and WiFi radios

Yale University, New Haven, CT

Visiting Student, Advisor: Wenjun Hu

July 2014 - December 2014

- Developed a high-rate implicit visual codes prototype to transmit information via display-camera link
- Helped to design rendezvous protocol for cognitive radio networks

Further Skills

Programming: Java, Objective-c, C++, Python, Matlab, CPLEX, \LaTeX

Tools: Orange, Gnuradio (USRP), uhd, ns3, iOS, Android

Language: Chinese (Native language), English (Fluent), Japanese (Beginner)

Awards

Japan Society for the Promotion of Science (JSPS) Fellowship	2015
University President Award	2014
Short-stay study abroad program Award	2014
Excellent Student Award, USTC	2008, 2009, 2010

Publications

1. Shuyu Shi, Lin Chen, Kaigui Bian, Yusheng Ji, “A framework for balancing Average-Maximum TTR in heterogeneous cognitive radio networks”, *IEEE Transactions on Parallel and Distributed Systems (TPDS)*. *under submission*
2. Shuyu Shi, Wenjun Hu, Lin Chen, Marco Gruteser, “Reading between Lines: High-rate, Non-intrusive Visual Codes within Regular Videos via ImplicitCode”, *The 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp 2015)*.
3. Lin Chen, Shuyu Shi, Kaigui Bian, Lin Chen, Cong Liu, Jung-Min Jerry Park, and Xiaoming Li. 2014. “A group-theoretic framework for rendezvous in heterogeneous cognitive radio networks”, *IEEE/ACM Transactions on Networking (ToN)*. *major revision*
4. Lin Chen, Ruolin Fan, Shuyu Shi, Kaigui Bian, Lin Chen, Mario Gerla, Tao Wang, and Xiaoming Li, “On Heterogeneous Neighbor Discovery in Wireless Sensor Networks”, *IEEE/ACM Transactions on Networking (ToN)*. *under submission*
5. Lin Chen, Shuyu Shi, Kaigui Bian, and Yusheng Ji, “Optimizing Average-Maximum TTR Trade-off for Cognitive Radio Rendezvous”, accepted by *IEEE International Conference on Communications (IEEE ICC 2015)*, London, UK, June 2015
6. Shuyu Shi, Stephan Sigg, Wei Zhao, Yusheng Ji, “Monitoring Attention Using Ambient FM Radio Signals”, *IEEE Pervasive Computing*, vol.13, no. 1, pp. 30-36, Jan.-Mar. 2014
7. Stephan Sigg, Shuyu Shi, and Yusheng Ji, “RF-based device-free recognition of simultaneously conducted activities”, accepted by the 4th CoSDEO workshop in conjunction with the 2013 ACM International Joint Conference on Pervasive and Ubiquitous Computing (CoSDEO@UbiComp 2013), Zurich, Switzerland, 2013
8. Shuyu Shi, Stephan Sigg and Yusheng Ji, “Joint Localisation and Activity Recognition from Ambient FM Broadcast Signals”, accepted by the 4th CoSDEO workshop in conjunction with 2013 ACM International Joint Conference on Pervasive and Ubiquitous Computing (CoSDEO@UbiComp 2013), Zurich, Switzerland, 2013
9. Shuyu Shi, Stephan Sigg, and Yusheng Ji, “Activitune: A multi-stage system for activity recognition of passive entities from ambient fm-radio signals”, *Wireless Algorithms, Systems, and Applications*, volume 7992 of *Lecture Notes in Computer Science*, pages 221–232. Springer Berlin Heidelberg, 2013.
10. Stephan Sigg, Markus Scholz, Shuyu Shi, Yusheng Ji, Michael Beigl, “RF-Sensing of Activities From Non-Cooperative Subjects in Device-Free Recognition Systems Using Ambient and Local Signals”, *IEEE Transactions on Mobile Computing(TMC)*, vol. 99, no. 1, 2013
11. Shuyu Shi, Stephan Sigg, and Yusheng Ji, “Passive detection of situations from ambient FM-radio signals”, In *Proceedings of the 2012 ACM Conference on Ubiquitous Computing (UbiComp '12)*. Pittsburgh, PA, USA, 1049-1053, 2012
12. Shuyu Shi; Stephan Sigg, Yusheng Ji, “Activity recognition from radio frequency data: Multi-stage recognition and features”, *2012 IEEE Vehicular Technology Conference (VTC Fall)*, pp.1-6, 3-6 Sept. 2012