Di Guo

Affiliations: Department of Computer Science, Xiamen University of Technology, China.

Assignment: Associate Professor

Degree: Ph.D.

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RESEARCH INTERESTS

- ❖ Missing data recovery and compressive transmission in sensor networks
- ❖ Sparse representation and compressed sensing
- ❖ Wireless networks and communication
- ❖ Signal and image processing

WORK EXPERIENCE

Xiamen University of Technology	05/2012-current
Associate Professor	07/2015-current
Assistant Professor	05/2012-07/2015

EDUCATION

University of Washington	10/2009-10/2011
Visiting Scientist in Electrical Engineering	
Advisor: Prof. Ming-Ting Sun, Dr. Zicheng Liu (Microsoft)	
Xiamen University	09/2008-04/2012
Ph.D. in Communication Engineering	
Advisor: Prof. Yan Yao	
Xiamen University	09/2006-09/2008
Graduate Student in Communication Engineering	
Advisor: Prof. Mingbo Xiao	
Xiamen University	09/2001-07/2005
B.S. in Communication Engineering	

RESEARCH EXPERIENCE

Project 1: Online missing data recovery with overcomplete dictionary   10/2010-08/2011

For the missing samples in 3-D sensor data, an online and overcomplete dictionary is composed to sparsely represent the current coming frames. Assuming the statics property of neighboring frames, the dictionary can be corrected and provide better precise sparse representation. The missing samples are recovered by regularizing the L1 norm of the coefficients with aspect to the dictionary.

Project 2: Sparsity-based Spatial Interpolation in Wireless Sensor Networks   10/2009-10/2010

The missing samples in 2-D sensors networks are recovered assuming the data is sparse in DCT domain. Theoretically, perfect recovery is based on the null space property of the dictionary. This property points out the way to choose an appropriate sparsifying dictionary to further reduce the recovery error. Simulation results demonstrate that the proposed approach can reasonably recover the missing data and outperforms the weighted average interpolation methods when the data change relatively fast or blocks of samples are lost. Besides, there exists a range of missing rates where the proposed approach is robust to missing patterns.

Project 3: Optimized Local Superposition in Wireless Sensor Networks   10/2009-10/2011

Compressed sensing (CS) shows great potential to recover sparse data from undersampled measurements and reduce energy for sensor networks. First, a basic global superposition model is proposed to obtain the measurements of sensor data, where a sampling matrix is modeled as the channel impulse response (CIR) matrix while the sparsifying matrix is expressed as the distributed wavelet transform. However, both the sampling and sparsifying matrixes depend on the location of sensors, so this model is highly coherent. This violates the assumption of CS and easily produces high data recovery error. In order to reduce the coherence, we propose to control the transmission power of some nodes with the help of t-average-mutual-coherence, and recovery quality is greatly improved. Finally, to make the approach more realistic and energy-efficient, the CIR superposition is restricted in local clusters. Two key parameters, the radius of power control region and the radius of local clusters, are optimized based on the system coherence and network energy consumption.

Project 4: Compressed Sensing for network and cognitive radio   06/2008-10/2009

I lead four student members for the project. I investigate compressed sensing (CS) in distributed large-scale networks and sparsifying networked data.

Project 5: Cross-layer Optimization Design in Hybrid Wireless Mesh Networks   10/2006-06/2008

I investigated the performance of voice and video transmission in wireless mesh networks, focused on comparison with different MAC and routing protocols.

Project 6: Implementation of Wireless Video Transmission system on ARM 9   09/2004-07/2005

TEACHING EXPERIENCE

Primary Instructor   02/2008-07/2008

Network Protocol Analysis at Xiamen University of Technology

Teaching Assistant   02/2007-07/2007

Professional English for Electrical Engineering at Xiamen University

Supervisor Assistant for Undergraduate Thesis Project   02/2008-06/2008

Comparison and Improvement on Routing Protocols for Video Transmission in Ad Hoc Networks

Comparative Analysis on VoIP Capacity under Different MAC Protocols in Wireless Mesh Networks

PUBLICATIONS

[1] **Di Guo**, Zicheng Liu, Xiaobo Qu, Lianfen Huang, Yan Yao, Ming-Ting Sun. Sparsity-based Online Missing Data Recovery Using Overcomplete Dictionary, *IEEE Sensors Journal*, DOI: 10.1109/JSEN.2011.2178826, 2011. (**SCI/EI, JCR3, IF 1.47**)

[2] **Di Guo**, Xiaobo Qu, Lianfen Huang, Yan Yao. Optimized Local Superposition in Wireless Sensor Networks with T-average-mutual-coherence, *Progress in Electromagnetics Research*, 122, pp. 389-411, 2012. (**SCI/EI, JCR2, IF 3.76**)

[3] **Di Guo**, Xiaobo Qu, Lianfen Huang, Yan Yao. Sparsity-based Spatial Interpolation in Wireless Sensor

Networks, *Sensors*, vol. 11, no. 3, pp. 2385-2407, 2011. (**SCI, JCR2, IF 1.77**)

[4] **Di Guo**, Xiaobo Qu, Lianfen Huang, Yan Yao, Zicheng Liu, Ming-Ting Sun. Sparsity‐based Online Missing Sensor Data Recovery, *2012 IEEE Int. Symp. Circuits and Systems-ISCAS'12*, Seoul, Korea, May 20-23, 2012, pp.918‐921. (**Oral presentation**, win **student grant KRW550,000**)

[5] **Di Guo,** Xiaobo Qu, Mingbo Xiao, Yan Yao. Comparative Analysis on Transform and Reconstruction of Compressed Sensing in Sensor Networks, in *Int. Conf. Commun. and Mobile Computing*, Jan. 6-8 2009, Kunming, China, pp.441-445. (**EI**)

[6] Xiaobo Qu, **Di Guo**, Bende Ning, Yingkun Hou, Yulan Lin, Shuhui Cai, Zhong Chen. Undersampled MRI reconstruction with patch-based directional wavelets, *Magnetic Resonance Imaging*, DOI: 10.1016/j.mri.2012.02.019, 2012. (**SCI, JCR4, IF 2.21**)

[7] Xiaobo Qu, **Di Guo**, Xue Cao, Shuhui Cai and Zhong Chen. Reconstruction of Self-sparse 2D NMR Spectra from Undersampled Data in Indirect Dimension, *Sensors*, vol. 11, no. 9, pp. 8888-8909, 2011. (**SCI, JCR2, IF 1.77**)

[8] Changwei Hu, Xiaobo Qu, **Di Guo**, Lijun Bao, Zhong Chen. Wavelet-based Edge Correlation Incorporated Iterative Reconstruction for Undersampled MRI, *Magnetic Resonance Imaging*, vol.29, no.7, pp. 907-915, 2011. (**SCI, JCR4, IF 2.21**)

[9] Xiaobo Qu, Xue Cao, **Di Guo**, Changwei Hu and Zhong Chen. Combined Sparsifying Transforms for Compressed Sensing MRI, *Electronics Letters*, vol.46, no.2, pp.121-123, 2010. (**SCI/EI, JCR3, IF 1.07**)

[10] Xiaobo Qu, Weiru Zhang, **Di Guo**, Congbo Cai, Shuhui Cai, Zhong Chen. Iterative Thresholding Compressed Sensing MRI based on Contourlet Transform, *Inverse Problems in Science and Engineering*, vol.18, no.6, pp.737-758, 2010. (**SCI/EI, JCR4, IF 0.69**)

HONORS /SCHOLARSHIP

1. Fellowship of Postgraduates' Oversea Study Program for Building High-Level Universities, China Scholarship Council (CSC).   10/2009-10/2011
2. Jiageng award nomination (top 0.5%), Xiamen University   04/2012
3. ISCAS 2012 student grant (KRW550,000)   04/2012
4. Excellent Graduate (top 10%), Xiamen University   06/2011
5. Distinguished Student Paper in School of Information Science and Technology, Xiamen University 04/2011
6. Huawei Scholarship, Xiamen University.   04/2011
7. Industrial & Commercial Bank of China Scholarship, Xiamen University   04/2009
8. First Prize of Entrance Scholarship for Ph.D. Candidates.   09/2008-09/2009
9. Full Tuition Waiver for Graduate Students   09/2006-09/2008
10. Third Prize for the 4th National Postgraduates Mathematical Contests in Modeling, China   12/2007
11. Second Prize for the 4th COMBA Cup "Wireless Change Life" Application Design Grand Prix   06/2009
12. Tri-excellent Student, Xiamen University   12/2008
13. Third Prize for the 3rd COMBA Cup "Wireless Change Life" Application Design Grand Prix   03/2008
14. Excellent League Member, Xiamen University   05/2008
15. Academic Activist, School of Information Science and Technology, Xiamen University   05/2008
16. Second Prize of Scholarship, Xiamen University   11/2003
17. Tri-excellent Student, Xiamen University   12/2002
18. Second Prize of Scholarship, Xiamen University   11/2002

SKILL

Programming: MATLAB, C++

Language: Certificate of PETS Level 5(written: 60/100, listening: 25/30, oral: 4/5)   12/2007

ACTIVITIES

- Reviewer: Transactions on Mobile Computing
- Membership: IEEE Student Member, IEEE Women in Engineering, IEEE Communications Society
- Oral presentation at 2008 IEEE International Symposium on IT in Medicine & Education   12/2008

COLLABORATORS

- Ming-Ting Sun, Professor, Fellow of IEEE, University of Washington, USA
- Zicheng Liu, Senior Researcher, Senior member of IEEE, Microsoft Research (Redmond), USA
- Yan Yao, Professor, Senior member of IEEE, Xiamen University, Tsinghua University, China
- Lianfen Huang, Associate Professor, Xiamen University, China
- Xiaobo Qu, Assistant Professor, Member of IEEE, Xiamen University, China