Shenghong He

Ph.D. Candidate (Thesis defense finished on Dec. 9, 2017)
School of Automation Science and Engineering,
South China University of Technology, Guangzhou, China

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Phone: +86-134-1615-2325
Gender & Birth: Male, July 1989

Job Objective   Postdoctoral position related with BCI, biological signal analysis, clinical application of BCI, neuroscience, etc.

Education

Ph.D., South China University of Technology (SCUT) , Guangzhou, China
9/2013 - 12/2017 (expected)
- Majored in pattern recognition, focused on BCI.
- Thesis topic: Asynchronous Human Machine Interface Based on EEG and EOG signals
- Advisor: Prof. Yuanqing Li (*IEEE Fellow and Dean*)

M.Sc., South China University of Technology, Guangzhou, China
9/2011 - 7/2013
- Majored in pattern recognition, focused on BCI.
- Advisor: Prof. Yuanqing Li

B.Sc., South China University of Technology, Guangzhou, China
9/2007 - 7/2011
- Majored in automation
- SCUT is a top 10 university in engineering in China

Publications

Journal Articles:

[J1] S. He and Y. Li, "A single-channel EOG-based speller," *IEEE Trans. Neural Syst. Rehabil. Eng.*, vol. 25, no. 11, pp. 1978–1987, Nov. 2017.

[J2] S. He, R. Zhang, Q. Wang, Y. Chen, T. Yang, Z. Feng, Y. Zhang, M. Shao, and Y. Li, "A P300-based threshold-free brain switch and its application in wheelchair control," *IEEE Trans. Neural Syst. Rehabil. Eng.*, vol. 25, no. 6, pp. 715–725, Jun. 2017.

[J3] Y. Li, S. He (co-first author), Q. Huang, Z. Gu, and Z. Yu, "An EOG-based switch and its application for "start/stop" control of a wheelchair," *Neurocomputing*, accepted, Sep. 2017.

[J4] Q. Huang, S. He, Z. Gu, N. Peng, K. Li, and Y. Li, "An EOG-based human-machine interface for wheelchair control," *IEEE Trans. Biomed. Eng.*, accepted, Jul. 2017.

[J5] R Zhang, Q. Wang, K. Li, S. He, S. Qin, Z. Feng, Y. Chen, P. Song, T. Yang, Y.Zhang, Z. Yu, Y. Hu, M. Shao, and Y. Li, "A BCI-based environmental control system for patients with severe spinal cord injuries," *IEEE Trans. Biomed. Eng.*, vol. 64, no. 8, pp. 1959–1971, Aug. 2017.

[J6] S. He, H. Li, Y. Li, and L. Ye, "A property protection method based on local feature matching," *Computer Applications and Software (Chinese)*, vol. 3, pp. 233–235, Mar. 2015.

[J7] <u>S. He</u>, Y. Li, L. Zhao, and L. Ye, "Simple methods for property protection in video surveillance," *Journal of Computational Information Systems*, vol. 10, no. 23, pp. 1–10, Dec. 2014.

Conference Papers:

[C1] <u>S. He</u>, T. Yu, Z. Gu, and Y. Li, "A hybrid BCI web browser based on EEG and EOG signals," in *Proc. 39th IEEE Annual International Conference on Engineering in Medicine and Biology Society (EMBC)*, pp. 1006–1009, 2017.

[C2] <u>S. He</u>, Q. Huang, and Y. Li, "Toward improved P300 speller performance in outdoor environment using polarizer," in *Proc. 12th IEEE World Congress on Intelligent Control and Automation (WCICA)*, pp. 3172–3175, 2016.

Patents:

[P1] Y. Li and <u>S. He</u>, "An EOG-based switch," CN201710091478.3.

[P2] Y. Li and <u>S. He</u>, "An EOG-based asynchronous speller," CN20161118744.9.

[P3] Y. Li and <u>S. He</u>, "A P300-based threshold free brain switch," CN201510929285.1.

[P4] Y. Li and <u>S. He</u>, "A property protection method based on background matching," ZL201410415313.3.

[P5] Y. Li and <u>S. He</u>, "A property protection method based on local feature matching," ZL201410415336.4.

Honors and Awards	• First Prize, 2017 World Robotics Competition - BCI Control Robot Competition, *by The Chinese Institute of Electronics (CIE)* 2017
	• Innovation Funding for Outstanding Doctoral Dissertation, *by SCUT* 2016
	• First Prize, China BCI Competition - Robot Control Session, *by NSFC* 2015
	• National Scholarship for Doctoral Students (top 5%), *by Ministry of Education, China* 2014
	• Award of Excellence for Fresh Doctoral Students, *by SCUT* 2013

Research Experience	**Hybrid asynchronous BCI based on EEG and EOG signals** with Prof. Yuanqing Li, 1/2016 - present

In this research, we first proposed a novel blink-based button selection method, in which a trigger mechanism similar as the oddball paradigm used in P300-based BCIs is introduced to guide the users' blinks and to assist in detecting blinks. Based on this button selection method, we developed a switch design and a speller. Then, we combined MI and the proposed EOG-based button selection method and developed a hybrid BCI web browser, in which the user can control the horizontal movement of the mouse by performing MI tasks, and control the vertical movement of the mouse, select/reject target, or input text in an edit box by blinking eyes in synchrony with the flashes of the corresponding buttons on the GUI. This research was supported by the National Key Basic Research Program of China (973 Program) under Grant 2015CB351703. The related publications include [J1], [J3], [J4], [C1], [P1] and [P2].

P300-based asynchronous BCI system and its application in wheelchair

with Prof. Yuanqing Li, 1/2015 - 1/2016

In this research, we first developed an intelligent wheelchair system that consisted of a BCI system based on P300 and an autonomous navigation system, in which the user can select a destination using the BCI system and then the autonomous navigation system will automatically drive the wheelchair to the destination. To deal with the start/stop issue of the system, we designed an asynchronous P300-based threshold-free brain switch, in which the pseudo key strategy and two SVM classifiers were used. Specifically, the scores obtained by SVM1 in a round of button flashes were used to conduct a new feature vector, i.e., SVM score feature vector, for the second classification, and the decision of control or idle state was directly made based on the outputs of these two classifiers. This research was supported by the National Natural Science Foundation of China under grant 91120305, and the related publications are [J2], [J5], [C2] and [P3].

Video image processing and its application in Urban Rail Transit

with Prof. Yuanqing Li, 1/2012 - 1/2014

In this research, we built an online video surveillance system at a local subway station. The system was used to detect several non-safety behaviors of the passengers, e.g., retrograde on the escalator, wander around, abandon suspicious objects, move key equipment, etc. This research was supported by the Industry-University-Research program of Guangzhou under grant 2011Y5-00009, and the related publications are [J6], [J7], [P4] and [P5].

Professional Activities	Oral/poster presentations in the following conferences/seminars/forums:

- 39th IEEE Annual International Conference on Engineering in Medicine and Biology Society (EMBC), Jeju Island, Korea, Jul. 2017.
- 12th IEEE World Congress on Intelligent Control and Automation (WCICA), Guilin, China, Jun. 2016.

Invited reviewer of the following journals:

- Neural Networks
- IEEE Transactions on Neural Systems and Rehabilitation Engineering

Organizer of the following conferences/seminars:

- 2015 IEEE International Conference on Intelligence Science and Big Data Engineering (IScIDE), Guangzhou, China, Jun. 2015.

Professional membership:

- IEEE Student Member

Skills

Computer: Matlab, C, C++, Windows/Linux
Language: Mandarin Chinese, fluent English
Maths: Calculus, Linear Algebra, Probability and Statistics
Informatics: Pattern Recognition, Signal and Linear System, Image Processing, Computer Vision, Machine Learning