

UNIVERSITY OF TECHNOLOGY SYDNEY
Faculty of Engineering and Information Technology

Enhance the Perception in Viewing Business Data

by

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A THESIS SUBMITTED
IN FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE

Doctor of Philosophy
Under the supervision of
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Sydney, Australia

2022

Certificate of Original Authorship

I, Yina Li, declare that this thesis, is submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the School of Computer Science, Faculty of Engineering and Information Technology at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

This research is supported by the Australian Government Research Training Program.

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ABSTRACT

A variety of computer graphics and visualization techniques for viewing business data on the screen are developed. Viewers' efficient and accurate perception of explicit and implicit business information relies on the interface design adaptive to the human eye-brain system. Human's attention, recognition, and semantic meaning interpretation are the keys to the perception of business data. This thesis discusses perception enhancement in three directions:

- 1) Enhance the perception (i.e., recognition) of visual networks through visual clutter reduction (or edge bundling).

- 2) Enhance the perception (i.e., attention) of a focal graphic object among similar others through the graphic saliency highlighting technique.

- 3) Enhance human capability in interpreting visualized temporal information through perception bias identification.

The thesis conducts experiments to examine how shape, color, location, orientation, and motion as the basic visual elements influence users' perception of business data displayed on the visual interface. We analyze the mechanisms in which visual elements are organized, perceived, and interpreted and indicate the opportunities to optimize users' experiences adaptive to the key stages of information processing when viewing business data.

Acknowledgements

I would like to extend my heartfelt appreciation to my supervisor, Professor Mao Lin Huang. Without his patient instruction, insightful guidance, and unwavering encouragement, this endeavor would not have been possible. He guides me on the path to exploring human interaction with interface and visualization, encourages me to step forward into a new domain, and teaches me how to manage work-life balance. I am particularly grateful for Professor Huang's suggestions, which have consistently alleviated my anxiety when faced with obstacles and inspired me to persevere. His unwavering belief in my abilities has been a constant source of motivation, propelling me forward in my academic pursuits.

I would like to express my appreciation to my co-supervisors, Christy Jie Liang and Yitong Wang, for their invaluable guidance and support throughout my research journey. Christy has been an exceptional role model, demonstrating how female scientists can make significant contributions to the community. Her dedication, expertise, and passion for research have inspired me to strive for excellence in my own work. Yitong, on the other hand, has provided me with invaluable insights into the fascinating realm of business. His mentorship has broadened my horizons and equipped me with business knowledge. I am truly fortunate to have had the opportunity to work with them.

I have been doing research in visual communication and visualization for over ten years. During the academic journey, I would like to thank Professor Kang Zhang at the University of Texas at Dallas, Professor Haipeng (Allan) Chen at the University of Kentucky, Professor Jinhui Yu at Zhengjiang University, Professor Dongjin Li at Nankai University and Professor Daoguang Liu at Southeast University. What I learned from them establishes my confidence to make theoretical contributions and expand human horizons to look at the truth.

I would like to thank my parents for their unconditional support and love and my

friends who accompanied me actually and virtually.

Yina Li

Sydney, Australia, 2022.

List of Publications

Journal Papers

- J-1. Zheng Huang, **Yi-Na Li**, Jun Kong. (2022) “Investigating the Pointing Techniques in the Tabletop-Centric Cross-Device Interaction,” *Multimedia Tools and Applications*, 82(7): 10077-10098
<https://doi.org/10.1007/s11042-022-12975-0>
- J-2. Zhen-Bao Fan, **Yi-Na Li**, Kang Zhang, Jinhui Yu, Mao Lin Huang. (2022) “Measuring and Evaluating the Visual Complexity of Chinese Ink Paintings,” *The computer Journal*, 65(8): 1964–1976.
<https://doi.org/10.1093/comjnl/bxab035>
- J-3. Kirlin Li, **Yi-Na Li**, Hong Yin, Yanpeng Hu, Peng Ye, Changbo Wang. (2020) “Visual analysis of retailing store location selection,” *Journal of Visualization*, 23: 1071-1086.
<https://doi.org/10.1007/s12650-020-00681-8>
- J-4. **Yi-Na Li**, Kang Zhang, Dong-Ni Hu, Mao Lin Huang. (2019) “The Influence of Edge Bundling on Visual Information Search,” *Information Sciences*, 495: 234-246.
<https://doi.org/10.1016/j.ins.2019.05.007>

Conference Papers

- C-1. **Yi-Na Li**, Zhen-Bao Fan, Mao Lin Huang, Kang Zhang. “White space and Chromatic complexity: the predictors of the perceived complexity of Chinese Ink Paintings and their downstream consequences,” (Paper ID S06203) *Brain Informatics (The 1st International Workshop on Computational Neuroaesthetics)*, 2019, December, 1315, Haikou, Hainan, China

Papers Ready to Submit

- J-1. **Yi-Na Li**, Mao Lin Huang. “Saliency Competition of Product Profile Images on E-commerce interface”

- J-2. **Yi-Na Li**, Mao Lin Huang. “The speed of Visualized Time Elapsing: The Role of Horizontality in Temporal Perception”

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