Zhenhua Xu

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Education

Hong Kong University of Science and Technology **Sep. 2018 – Present**
4th year Ph.D. candidate of CSE, supervised by Prof.Ming Liu and Prof.Huamin Qu *Hong Kong, China*

University of California, Los Angeles **Jul. 2017 – Sep. 2017**
CSST (Cross-disciplinary Scholars in Science and Technology) program (GPA 4.0/4.0) *LA, USA*

Harbin Institute of Science and Technology **Sep. 2014 – Jun. 2018**
Bachelor in Electronics and Information Engineering (Score 91.19/100, ***ranking 1/89****)* *Harbin, China*

Zhengzhou Foreign Language School **Sep. 2011 – Jun. 2014**
Zhengzhou, China

Research Topics

Transformer for road-network graph detection with complicated topology | *Transformer, Road-network graph*

- We propose *RNGDet* to detect road-network graph inspired by DETR structure. *RNGDet* can handle complicated road network topology, such as curve roads, intersection points of multiple roads, etc.
- *RNGDet* could be adapted to other line-shaped object detection tasks, which demonstrates the generalization ability of our proposed model.
- Paper submitted to IEEE Transactions on Instrumentation and Measurement.

Self-attention for graph generation | *City-scale HD Map Automation*

- We propose a new method named *csBoundary* to automatically generate the HD map of road boundaries of the whole New York City based on high resolution aerial images.
- Self-attention mechanism is utilized to predict the adjacency matrix of extracted vertices in an one-shot way.
- Paper Accepted by RA-L&ICRA.

Iterative graph generation by decision making | *Road-boundary/ Road-curb Detection, Imitation learning*

- We solve the road-boundary/ road-curb detection problem by proposing *iCurb*, which is an imitation-learning based agent network. *iCurb* iteratively generates the graph of target objects. High topology correctness is assured.
- We release a public-available benchmark dataset named *Topo-boundary* on road-boundary detection in aerial images.
- Papers accepted by RA-L&(IROS/ICRA).

Topology-aware semantic segmentation loss | *Semantic Segmentation, Line-shaped object Segmentation*

- We design a new loss function for semantic segmentation. It can enhance the topology correctness of the semantic segmentation result.
- Paper accepted by IROS.

Visualization analysis of discrimination in machine learning | *Data Visualization, Human-Computer-Interaction*

- We design a visual analysis system to help users interactively understand the discrimination of machine learning models.
- The method for better human-computer interaction is carefully studied.
- Paper accepted by TVCG.

Publications

[1] **Z. Xu**, Y. Liu, L. Gan, Y. Sun, L. Wang, and M. Liu, "RNGDet: Road Network Graph Detection by Transformer," Under review.

[2] **Z. Xu**, Y. Liu, L. Gan, X. Hu, Y. Sun, L. Wang, and M. Liu, "csBoundary: City-scale Road-boundary Detection in Aerial Images for High-definition Maps," IEEE Robotics and Automation Letters (RAL), 2022.

[3] Y. Liu, **Z. Xu**, and M. Liu, "Star-Convolution for Image-Based 3D Object Detection," in 2022 IEEE/RSJ International Conference on Robotics and Automation (ICRA), 2022.

[4] **Z. Xu**, Y. Sun, L. Wang, and M. Liu, "CP-loss: Connectivity-preserving Loss for Road Curb Detection in Autonomous Driving with Aerial Images," in 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2021.

[5] **Z. Xu**, Y. Sun, and M. Liu, "Topo-Boundary: A Benchmark Dataset on Topological Road-Boundary Detection Using Aerial Images for Autonomous Driving," IEEE Robotics and Automation Letters (RAL), vol. 6, no. 4, pp. 7248–7255, 2021.

[6] **Z. Xu**, Y. Sun, and M. Liu, "iCurb: Imitation Learning-Based Detection of Road Curbs Using Aerial Images for Autonomous Driving," IEEE Robotics and Automation Letters (RAL), vol. 6, no. 2, pp. 1097–1104, 2021.

[7] T. Liu*, Q. Liao*, L. Gan, F. Ma, J. Cheng, X. Xie, Z. Wang, Y. Chen, Y. Zhu, S. Zhang, Z. Chen, Y. Liu, M. Xie, Y. Yu, Z. Guo, G. Li, P. Yuan, D. Han, Y. Chen, H. Ye, J. Jiao, P. Yun, **Z. Xu**, H. Wang, H. Huang, S. Wang, P. Cai, Y. Sun, Y. Liu, L. Wang, and M. Liu, "The Role of the Hercules Autonomous Vehicle During the COVID-19 Pandemic: An Autonomous Logistic Vehicle for Contactless Goods Transportation," IEEE Robotics and Automation Magazine (RAM), 2021.

[8] Q. Wang, **Z. Xu**, Z. Chen, Y. Wang, S. Liu and H. Qu, "Visual Analysis of Discrimination in Machine Learning," in IEEE Transactions on Visualization and Computer Graphics, vol. 27, no. 2, pp. 1470-1480, Feb. 2021, doi: 10.1109/TVCG.2020.3030471.

[9] Y. Zhang, S. Yang, H. Li, **Z. Xu**. "Shadow tracking of moving target based on CNN for video SAR system." IGARSS 2018-2018 IEEE International Geoscience and Remote Sensing Symposium. IEEE, 2018.

[10] **Z. Xu**, Y. Zhang, H. Li, H. Mu, Y. Zhuang. "A new shadow tracking method to locate the moving target in SAR imagery based on KCF." International Conference in Communications, Signal Processing, and Systems. Springer, Singapore, 2017.

Awards and Honors

- **2018-2022** HKPF (Hong Kong PhD Fellowship, 26,600 HKD/month)
- **2018** Outstanding Graduate of Harbin Institute of Technology
- **2018** Guanghua Scholarship
- **2017** CSST (Cross-disciplinary Scholars in Science and Technology)
- **2017** National Scholarship
- **2016** Meritorious Winner in MCM/ICM
- **2014-2018** Renmin Scholarship
- **2014-2018** University Merit Student
- **2013** Provincial 1st prize in National High School Mathematics League (NO.49 in Henan province)

Technical Skills

Computer Science: Python, LaTex, Ubuntu, C/C++, ROS, MATLAB
Language: Chinese, English (TOEFL 105)

Academic services

- Reviewer: RA-L,IROS,ICRA,BMVC,AAV
- Teaching assistant: COMP3711 (Design and Analysis of Algorithms), COMP3311 (Database Management Systems)