Cong Liu

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Education

Tsinghua University, China Sep. 2022 - June. 2025

- M.Eng in Electronic and Information Engineering (Intelligent Manufacturing), Supervisor: Xinghui Li
- GPA: 4.0/4.0 (**Top 1%**)

Northeastern University, China Sep. 2018 - June. 2022

- B.Eng in Measurement and Control Technology and Instrumentation
- GPA: 4.03/5.00 (**Top 5%**)
- University First-class Scholarship (2021) (**Top 3%**) & University Second-class Scholarship (2019 & 2020)
- Thesis: Research and design on calibration method of 3D laser scanning system (**Outstanding Graduation Thesis Award**)
- Outstanding Graduate of Northeastern University, 2022, Northeastern University

Research Experience

Monocular depth estimation of volatile kiln burden surface Feb. 2023 - Present

- A customized encoder-decoder network integrated with an attention model is proposed for monocular depth estimation of volatile kiln burden surface for the first time, which achieves a precision of 93.4% and outperforms the SOTA networks.
- The attention model with global and local attention mechanisms is developed to intelligently fuse low-level fine-grained and high-level semantic features for partitioning depth intervals precisely, thus improving prediction accuracy.
- A scale-down prototype of an industrial on-site volatile kiln is built to simulate the actual operation of the kiln.

Research on image scratch removal method based on deep learning Mar. 2022 - Jun. 2022

- In this work, a cGAN model, named Pix2Pix, is applied to remove scratches from images. The repaired images output by generator G, which uses damaged images as input, are then fed into discriminator D along with the real unimpaired images. G and D are trained together to eliminate discrepancy and discriminate between the repaired images and the real unimpaired images.
- GAN loss and L1 loss are jointly applied in training the network for retaining both the high and low-frequency components of the images. The algorithm shows high accuracy of removing scratches, with the evaluation metric: PSNR of 41.1dB, MSE of 0.000084, and LPIPS of 0.003976.

Design of bank card number recognition algorithm based on EAST-CRNN Sep. 2020 - Nov. 2020

- An efficient text detection model is employed to extract features from bank card images, generating position boxes with different score maps. Non-Maximum Suppression (NMS) algorithm is then applied to process score maps, retaining only the position box with the highest score.
- A BLSTM-based model, named CRNN, is applied for character recognition of the positioned bank card number images. Adjacent image patches are jointly used as the input for CRNN to predict single characters, achieving a final recognition accuracy of up to 90%.

Publications & Patents

1. **C. Liu**, C. Zhang, X. Liang, ...& X. Li. Attention Mono-depth: attention-enhanced transformer for monocular depth estimation of volatile kiln burden surface. (IEEE Transactions on Circuits and Systems for Video Technology) (Paper is under review.)

2. **C. Liu**, C. Zhang, X. Liang, X. Li, etc. A monocular depth estimation method for materials in the kiln head area of rotary kilns. *China Invention Patent*. CN202410114473.8.

3. W. Luo, Z. Han, X. Liang, **C. Liu**, etc. An experimental setup for digital twin verification of material motion in a rotary kiln under multiple operating conditions. *China Invention Patent*. (Patent pending).

Skills

Programming: Python/Pytorch, C/C++, Matlab, etc.

Tools: VS Code, SolidWorks, Multisim, Altium Designer, Comsol, etc.