Recreation of Stereo Pairs From 3D Anaglyph Images

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Digital Version

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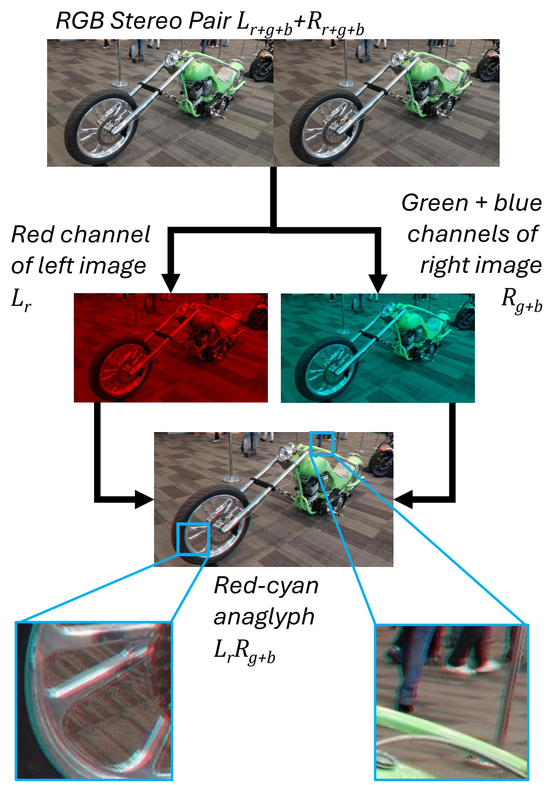
Introduction

- 3D anaglyph images are used for stereo visualization, e. g. movies, video games, macro-visualization of chemical structures, educational purposes
- During creation of anaglyph images, 50% of color information is being lost (green + blue channels of the left image and red channel of the right image)
- Mathematical recreation is not possible, thus missing color channels must be estimated
- Current reconstruction methods need additional information, next to input anaglyph images, e. g. original stereo-pairs, illumination- / depth information [1]
- Solution: recreation via U-Net for image segmentation [4]
- U-Nets produce higher quality outputs than current used alternatives, e. g. Generative Adversarial Networks (GANs), Variational Auto-encoders (VAEs), due to transmission of spatial information between encoder and decoder [1, 2, 5]

Research Questions

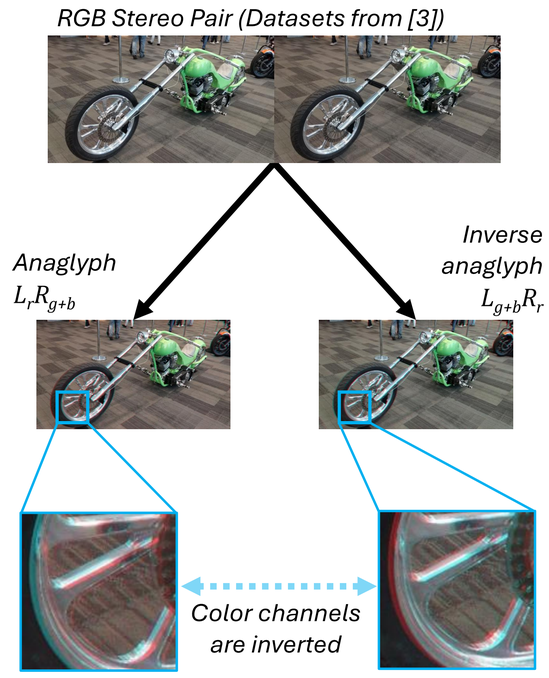
- How precise are estimation methods to recreate original stereo pairs without additional input information?
- How do U-Net estimation methods perform in comparison to currently used alternatives (GANs/VAEs)?

Anaglyph Creation

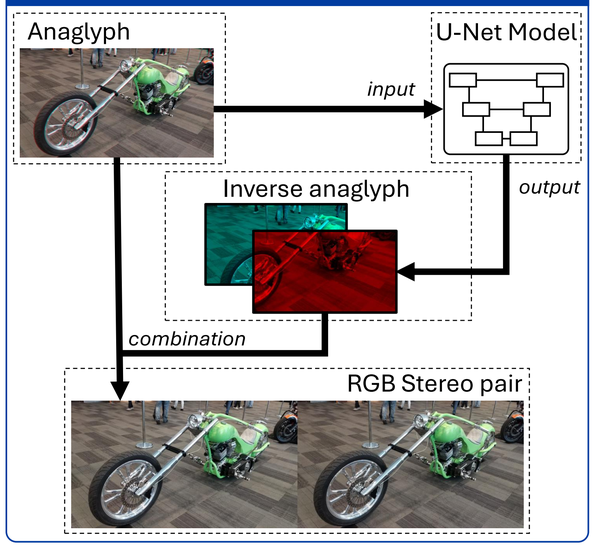


Training Data Generation

- Creation of 3D anaglyph images and inverse anaglyphs from stereo pairs

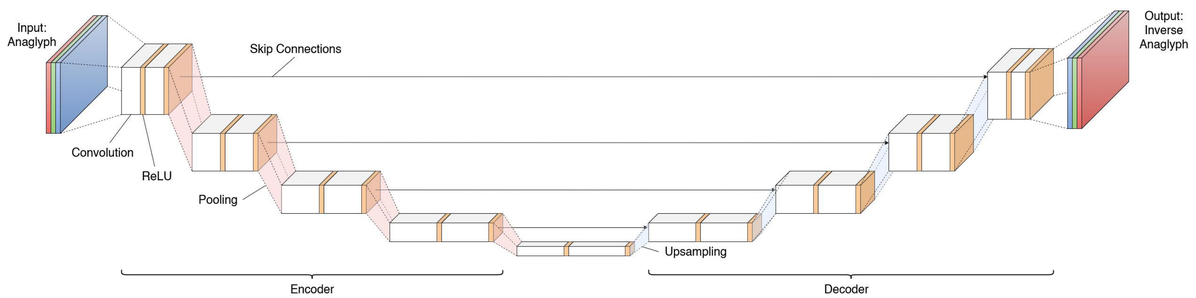


Model Usage



U-Net Architecture

- Encoder produces high-level semantic features [5]
- Decoder upsamples hidden features [5]
- Skip connections transmit contextual information to decoder [5]



U-Net Architecture to create an inverse anaglyph from an input anaglyph image

Future Steps

- Conduct experiments with U-Net architecture models
- Comparison to current methods
- Transfer to anaglyph images with different color channel variations, e. g. anachrome, triscopic, ColorCode-3D

References

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[2] H. Hoyez, C. Schockaert, J. Rambach, B. Mirbach, and D. Stricker, “Unsupervised Image-to-Image Translation: A Review,” Sensors (Basel), vol. 22, no. 21, Jan. 2022, doi: 10.3390/s22218540.

[3] Y. Hua et al., “Holopix50k: A Large-Scale In-the-wild Stereo Image Dataset,” Mar. 2020. [Online]. Available: http://arxiv.org/pdf/2003.11172

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[5] H. Wang, P. Cao, X. Liu, J. Yang, and O. Zaiane, “Narrowing the semantic gaps in U-Net with learnable skip connections: The case of medical image segmentation,” Dec. 23, 2023, arXiv: arXiv:2312.15182. doi: 10.48550/arXiv.2312.15182.