

如何提升DSO的表现

韩腾飞

<http://www.vision.is.tohoku.ac.jp/us/home/>

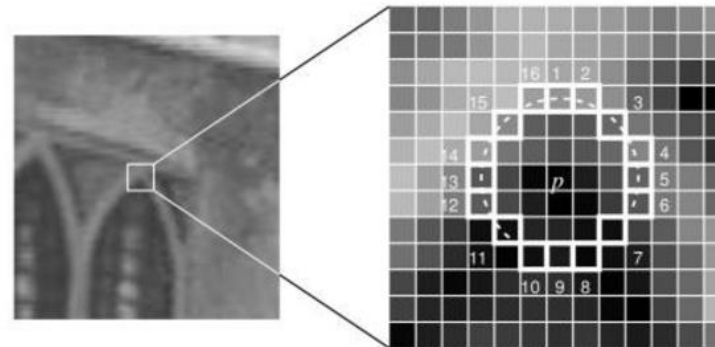
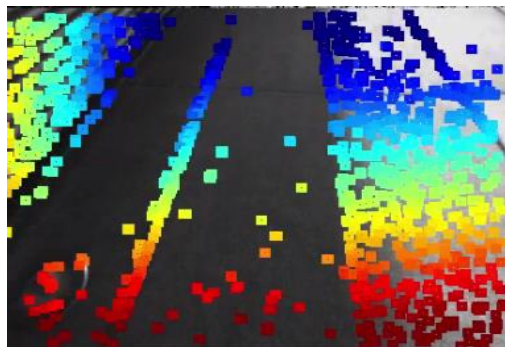
可能的方向

- 光度标定
- 全局快门相机
- 调节曝光时间
- 增强图像质量(low light)
- 单目深度估计
- 适应光照变化
- ...

极端情况



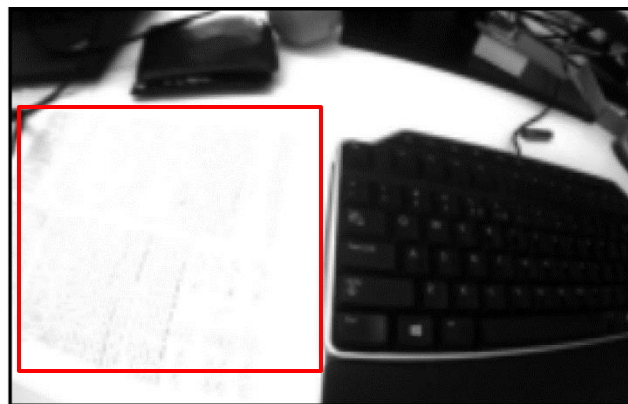
图像质量基准



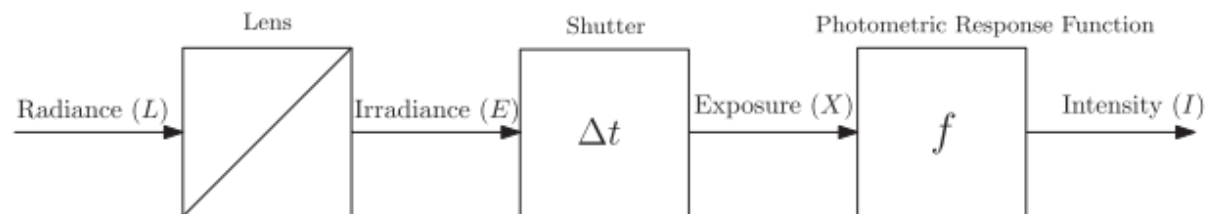
- The **percentile of the gradient** $G(u_i)$ is a robust metric

$$M_{sum} = \sum_{u_i \in I} G(u_i)$$

$$M_{perc}(p) = \text{percentile}(\{G(u_i)\}_{u_i \in I}, p)$$



The percentile metric 展现了在HDR场景下最好的效果



➤ Photometric response function

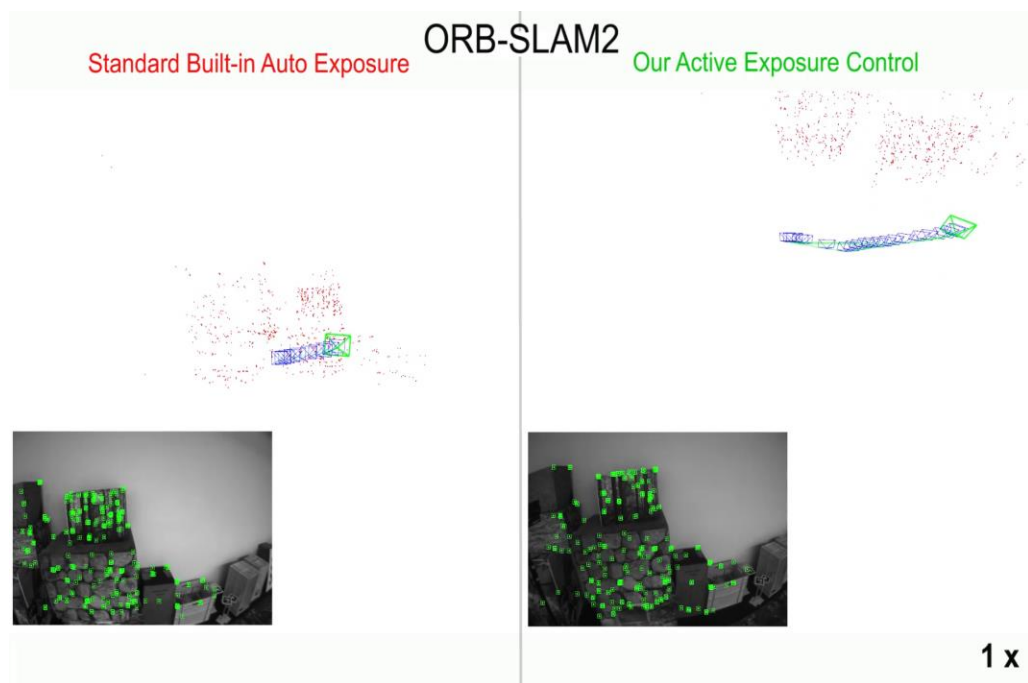
$$I = f(E\Delta t)$$



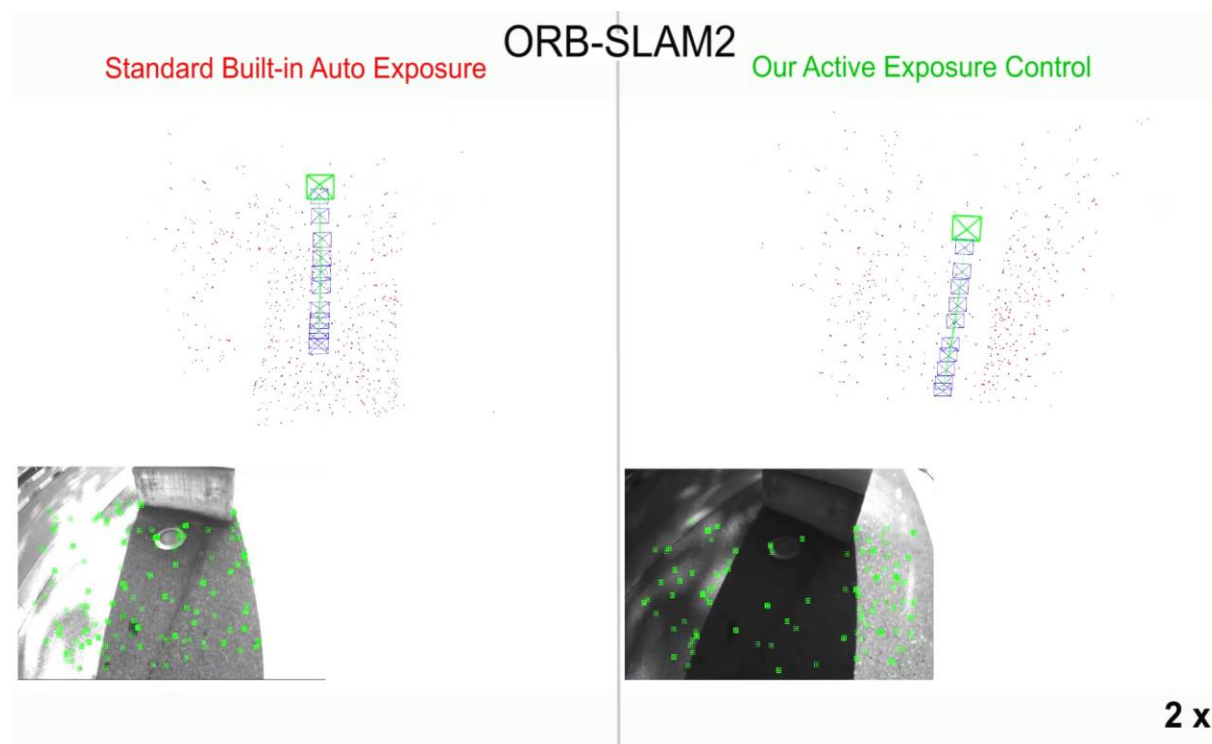
曝光调节:

$$\Delta t_{next} = \Delta t + \gamma \frac{\partial M_{softperc}}{\partial \Delta t}$$

提升ORB-SLAM



1 x



2 x

提升DSO

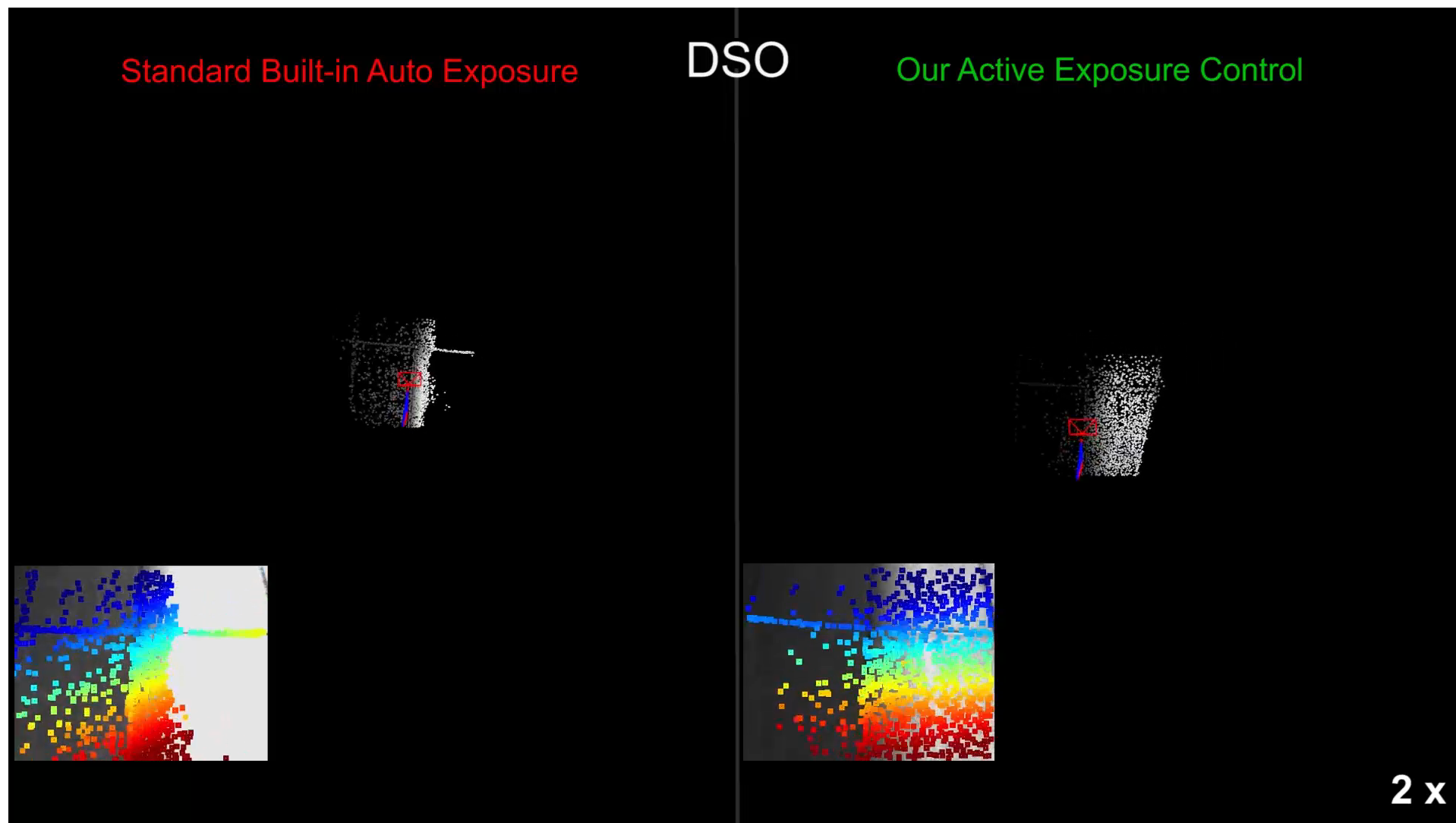


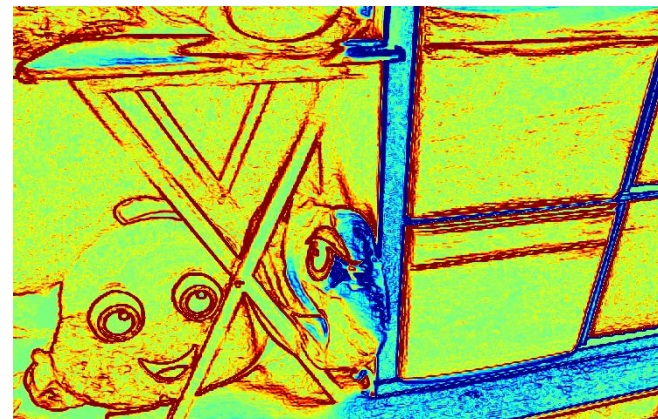
Image enhancement



输入图像



输出图像

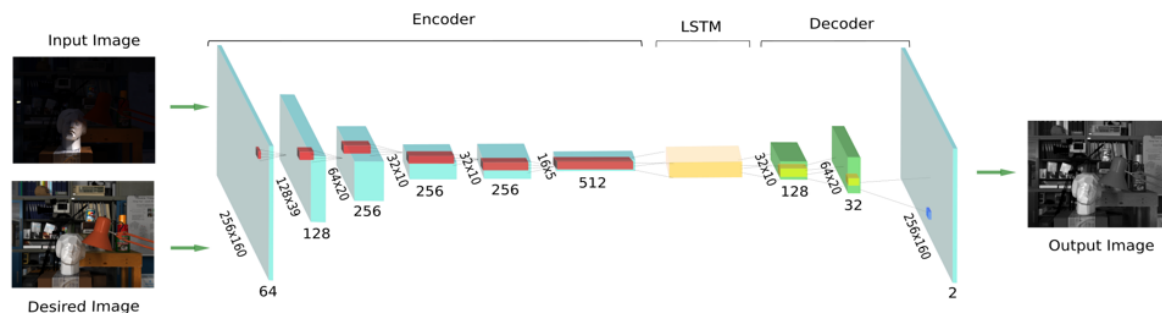


梯度差异

给定一系列图像, 目标是得到具有光照不变性或对动态环境表现出鲁棒的增强图像序列。
同时, 会包括更多的梯度信息方便进行更好的追踪

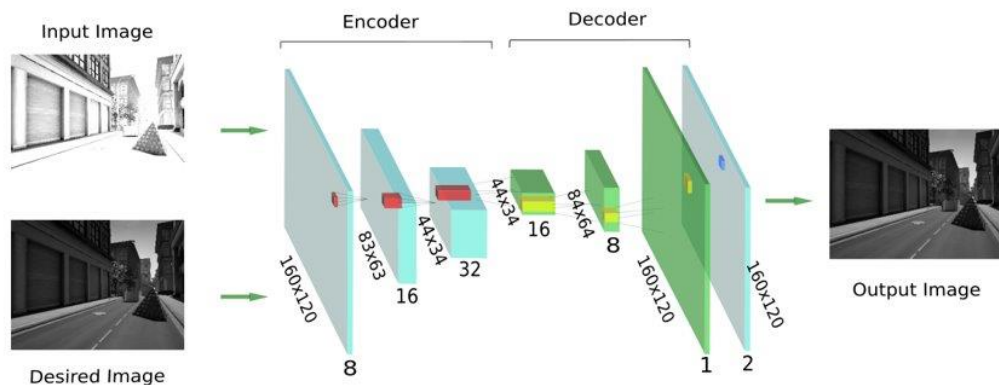
Proposed method

DNN model



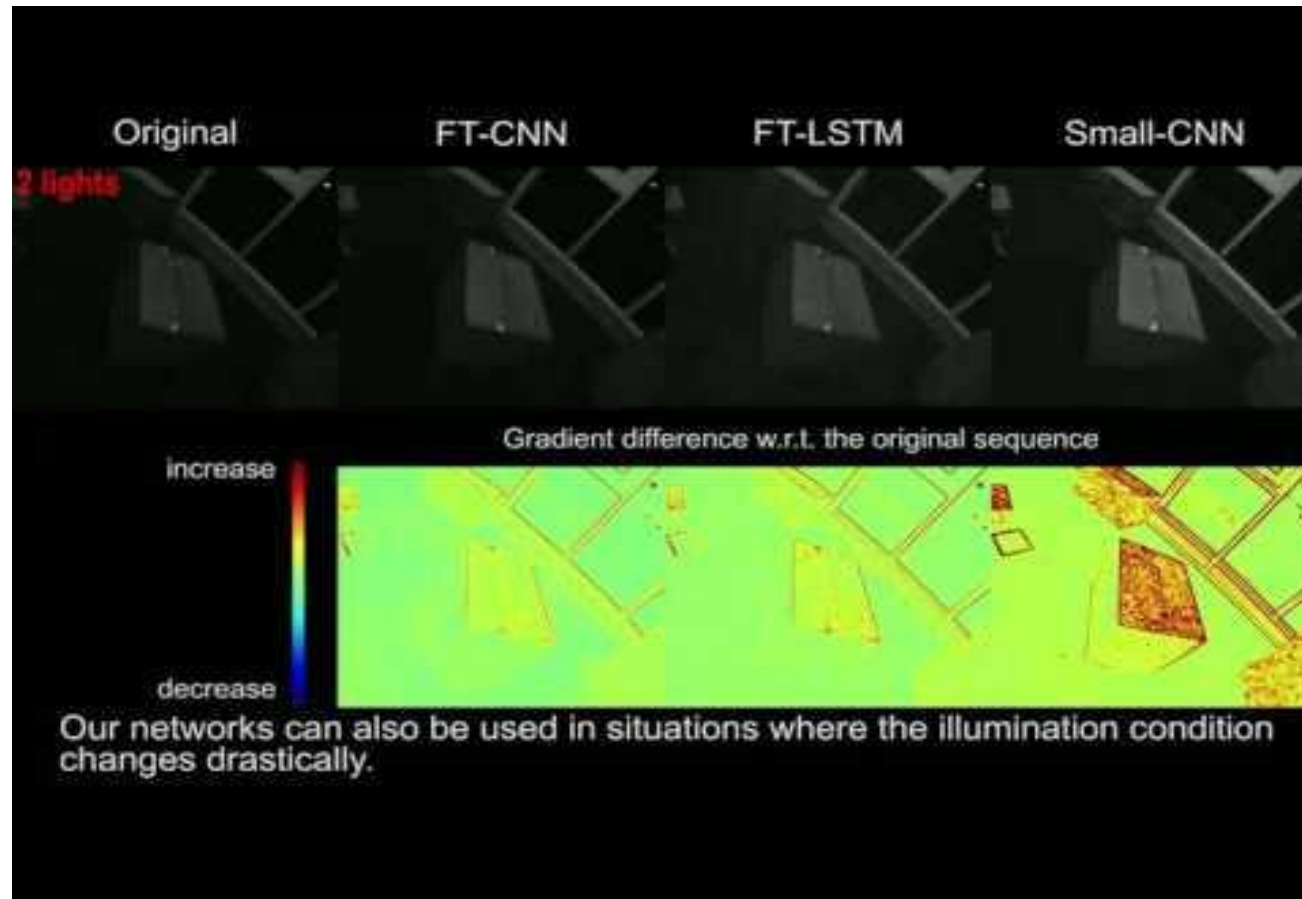
特点:
误差最小
耗时长
计算负载要求高

Small-CNN



特点;
误差几乎与DNN一致
耗时短
计算负载要求相对较低

Demo



Zhang Z, Gonzalez-Jimenez J, et al. Learning-based image enhancement for visual odometry in challenging HDR environments[C]//2018 IEEE International Conference on Robotics and Automation (ICRA).

Oxford robotcar Dataset



特点:

同一场景, 不同天气(晴天, 雨天, 多云, 下雪...)

多种传感器类型(双目, 鱼眼, 激光)

有GPS真值

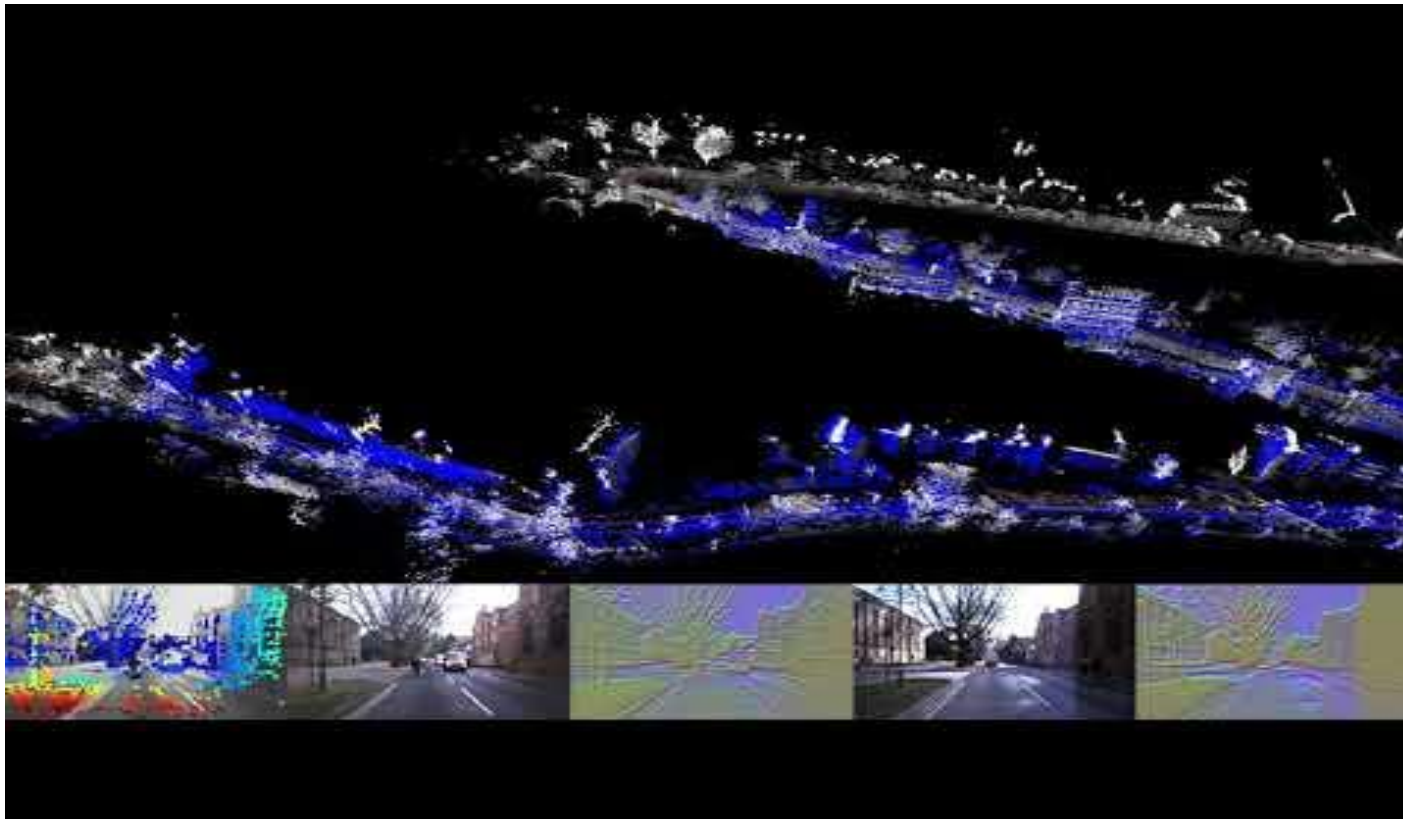
大范围, 场景真实(行人, 车辆)

地址: <https://robotcar-dataset.robots.ox.ac.uk/>

SDK: <https://github.com/ori-mrg/robotcar-dataset-sdk>

重定位

dataset & supplementary material: <https://vision.in.tum.de/research/vslam/gn-net>



von Stumberg L, Wenzel P, Khan Q, et al. GN-Net: The Gauss-Newton Loss for Deep Direct SLAM[J]. arXiv preprint arXiv:1904.11932, 2019.

Monocular depth prediction

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Monocular Depth Estimation

39 papers with code · [Computer Vision](#)

Subtask of [Depth Estimation](#)

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Example: <https://github.com/muskie82/CNN-DSO>

State-of-the-art leaderboards

[Add a result](#)

Trend	Dataset	Best Method	Paper title	Paper	Code	Compare
	KITTI Eigen split	BTS	From Big to Small: Multi-Scale Local Planar Guidance for Monocular Depth Estimation			See all
	NYU-Depth V2	BTS	From Big to Small: Multi-Scale Local Planar Guidance for Monocular Depth Estimation			See all

Greatest papers with code

[Greatest](#)

[Latest](#)

[Without code](#)

Depth Prediction Without the Sensors: Leveraging Structure for Unsupervised Learning from Monocular Videos

15 Nov 2018 · tensorflow/models · TensorFlow

Models and examples built with TensorFlow

#15 best model for Monocular Depth Estimation on KITTI Eigen split

DEPTH AND CAMERA MOTION

MONOCULAR DEPTH ESTIMATION

MOTION ESTIMATION

ROBOT NAVIGATION

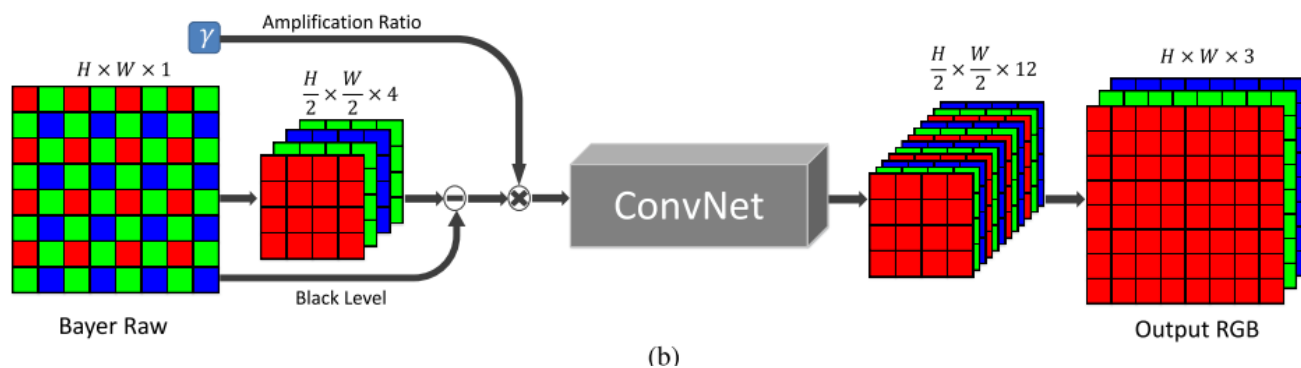
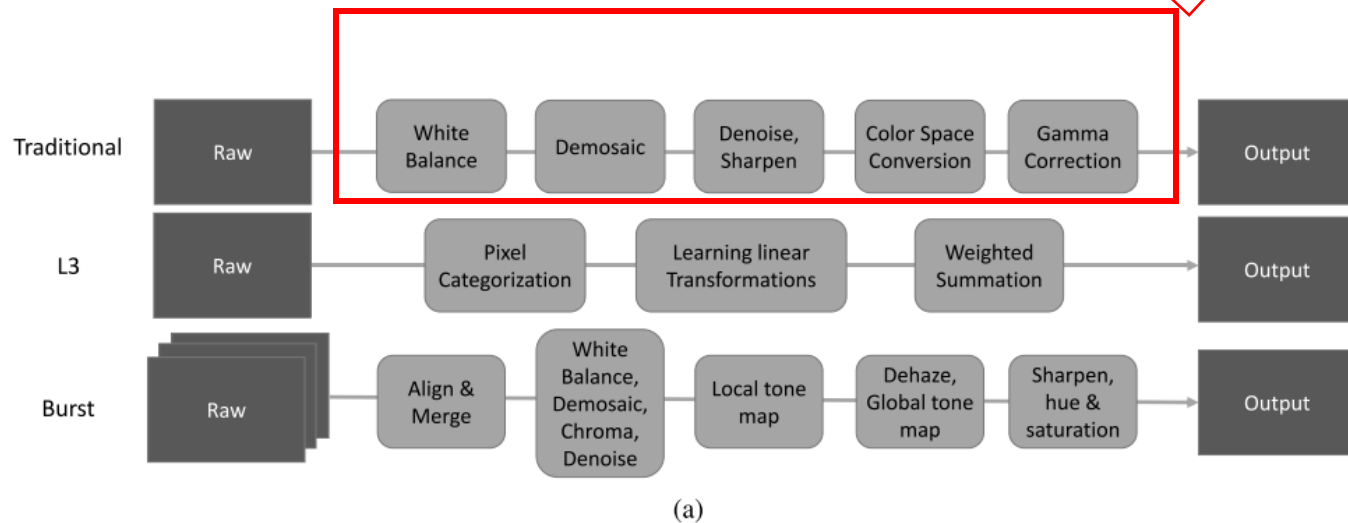
★ 58,275

Paper

Code

弱光环境下图像增强

略去，用网络代替



demo



Chen, Chen, et al. "Learning to see in the dark." *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*. 2018.

参考文献

- Zhang, Zichao, Christian Forster, and Davide Scaramuzza. "Active exposure control for robust visual odometry in HDR environments." *2017 IEEE International Conference on Robotics and Automation (ICRA)*. IEEE, 2017.
- Zhang Z, Gonzalez-Jimenez J, et al. Learning-based image enhancement for visual odometry in challenging HDR environments[C]//2018 IEEE International Conference on Robotics and Automation (ICRA).
- von Stumberg L, Wenzel P, Khan Q, et al. GN-Net: The Gauss-Newton Loss for Deep Direct SLAM[J]. *arXiv preprint arXiv:1904.11932*, 2019.
- Chen, Chen, et al. "Learning to see in the dark." *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*. 2018
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