# Depth from Defocus Approach for Video Depth Estimation

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## Motivation

- Video depth information is important for robotics, autonomous driving, 3D reconstruction, and beyond

- Depth from defocus approaches are used for single image depth estimation and outperform many state-of-art methods. However, defocus blur hasn't been applied to video depth estimation yet.

## Related Work

- Images with defocus blur in deep learning approaches outperforms all-in-focus images. Coded aperture and end-to-end optimization of optics are used for depth estimation[1].

- Video depth estimation usually considers information between frames, like Monodepth2[2], SC-Depth[3].

## References

[1] Ikoma et al., Depth from defocus with learned optics for imaging and occlusion-aware depth estimation, ICCP, 2021.
[2] Godard et al., Digging into self-supervised monocular depth prediction, 2019.
[3] Bian et al., Unsupervised scale-consistent depth learning from video, IJCV, 2021.

## New Technique
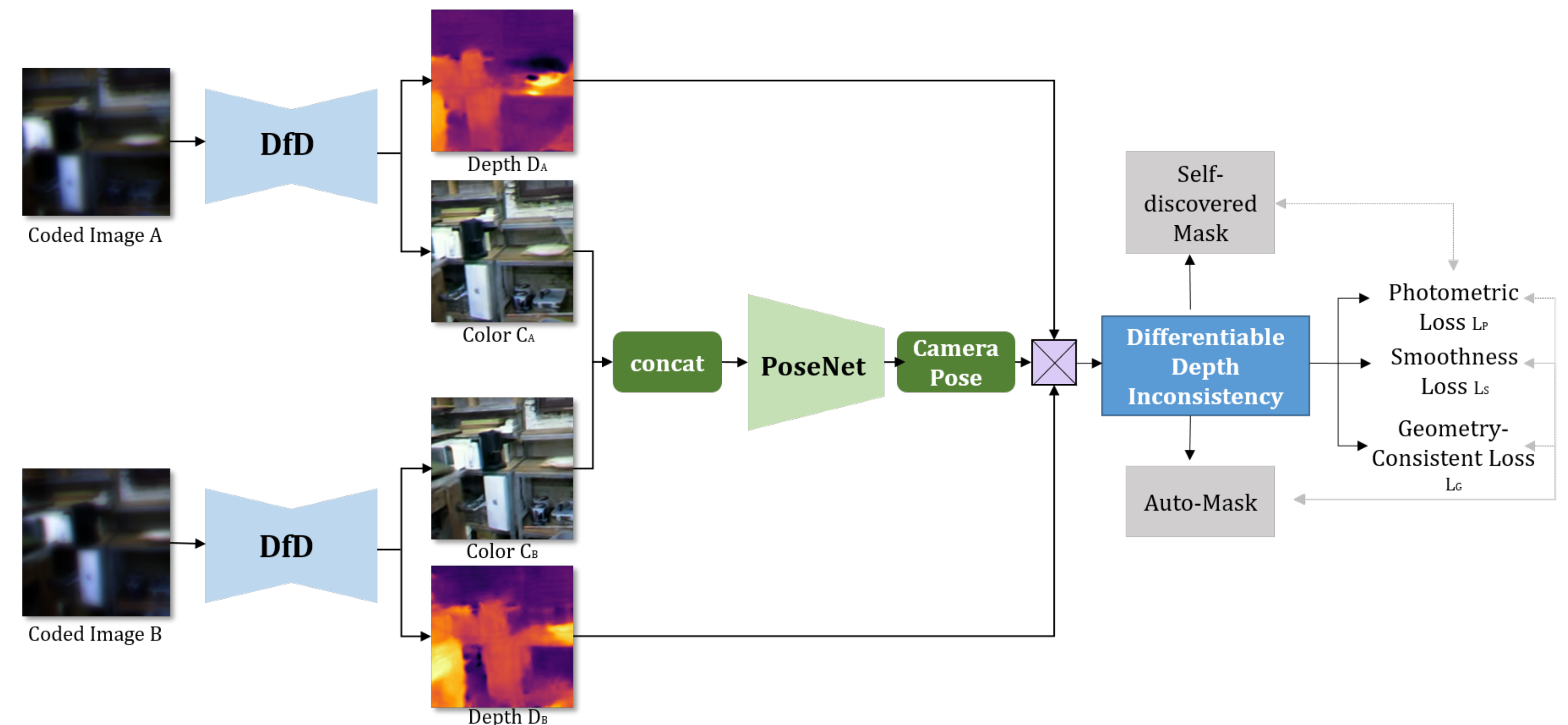


## Experimental Results



SC-Depth | DfD | DfD-SC-Depth(Ours) | GT
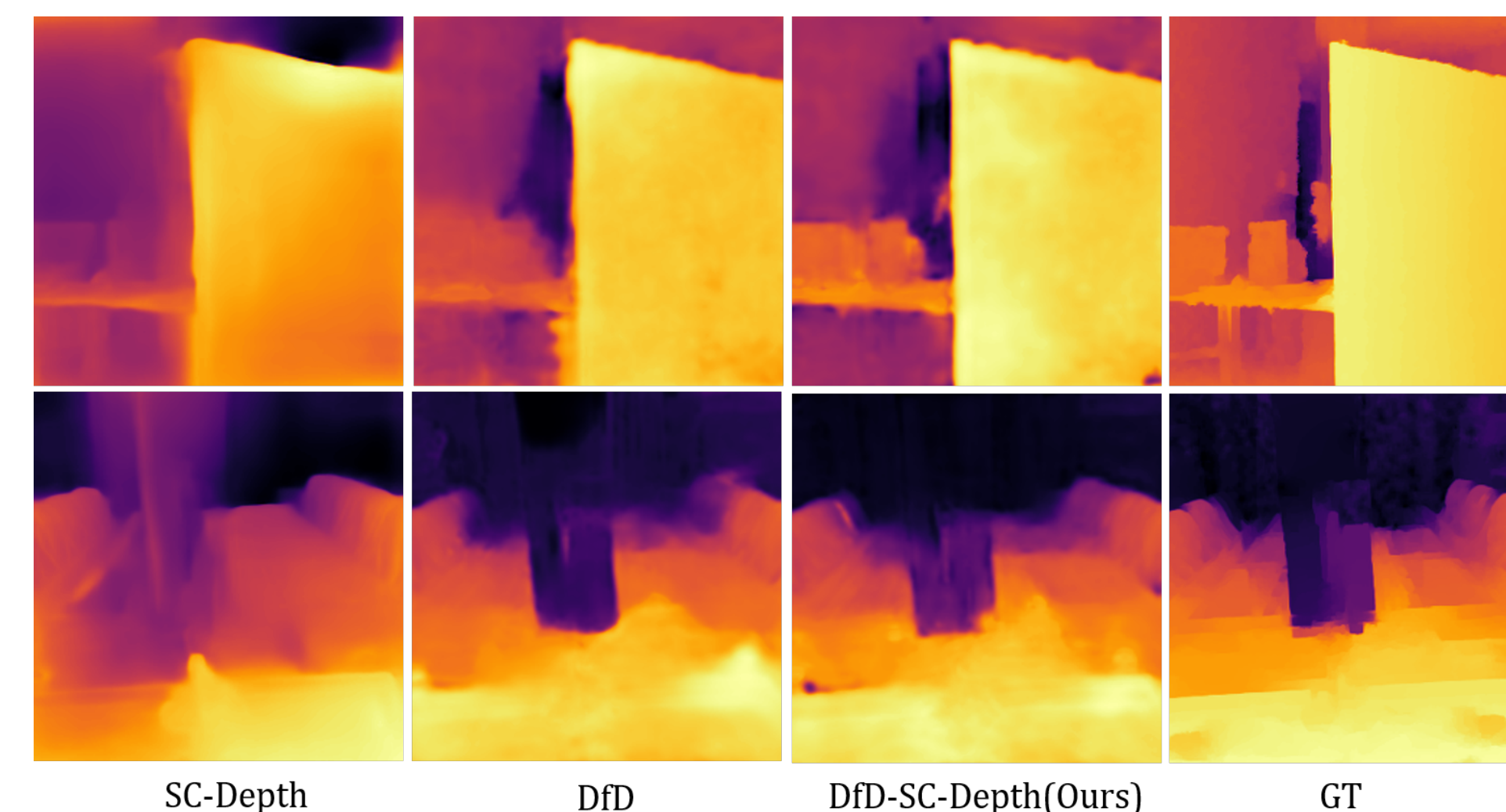
| | SC-Depth | DfD | DfD-SC-Depth(Ours) |
|---|---|---|---|
| RMSE↓ | 0.399 | 0.426 | **0.372** |
| Abs_rel↓ | 0.214 | 0.215 | **0.198** |
| Log10↓ | **0.089** | 0.102 | 0.095 |
| a1↑ | 0.682 | 0.649 | **0.688** |
| a2↑ | 0.881 | 0.830 | **0.846** |
| a3↑ | **0.954** | 0.916 | 0.923 |