

FC-DCNN: A densely connected neural network for stereo estimation

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Motivation

- stereo estimation is a major topic in computer vision and has become increasingly popular
- traditional methods like SGM or MGM still good but slow and often outperformed by machine learning methods
- many good performing networks utilize fully-connected layers and/or 3D-Convolutions leading to deep complex networks
- we therefore build a hybrid method with a lightweight disparity estimation network and our own post-processing





Overview



stereo pair

disparity output

sparse disparity

final disparity





Method



•
$$loss = ReLU(s_{+} - s_{-} - 0.2)$$





Method contd.

Method	Param
FC-DCNN (ours)	0.37M
MC-CNN-ACRT	0.5M
GC-Net	2.9M
PSMNet	3.5M





Method contd.







Qualitative Results



Middlebury Test 2-PE: 6.52

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Qualitative Results



ETH Test 2-PE: 0.18

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Qualitative Results



KITTI2012 Test 2-PE: 3.76

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Qualitative Results



KITTI2015 Test 3-PE: 3.41

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Quantitative Results

Middlebury									
Method	4-PE	3-PE	2-PE	1-PE	0.5-PE				
Ours	11.2	-	17.9	36.8	65.3				
SGM (H)	12.2	-	18.4	31.1	54.4				
iResNet	11.1	-	20.3	35.1	58.7				
ETH3D									
Ours	3.38	-	5.77	10.41	24.12				
MeshStereo	2.61	-	5.78	11.52	22.27				
LSM	4.58	-	7.38	14.01	29.98				





Quantitative Results

KITTI2012										
Ours	3.68	4.72	7.79	-	-					
ATGV	3.99	5.02	7.08	-	-					
SGM	4.38	5.76	8.66	-	-					
KITTI2015										
Ours	-	5.21	-	-	-					
SNCC	-	5.36	-	-	-					
PASMnet	-	5.41	-	-	-					





Summary

- build a novel lightweight disparity network that is able to compete with state-of-the-art methods
- more accurate as traditional non-learning methods such as SGM while needing less GPU-Ressources than fully end-to-end methods
- easy to plug-and-play own methods for post-processing and refinement
- source-code can be found:



https://github.com/thedodo/FC-DCNN

