JUNE 18-22, 2023 CVPR VANCOUVER, CANADA

Rigidity-Aware Detection for 6D object Pose Estimation


Yang Hai[1]


Rui Song[1]

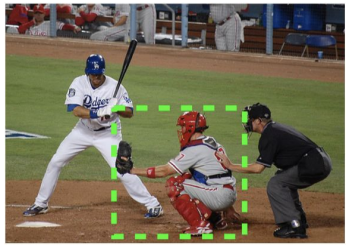

Jiaojiao Li[1]

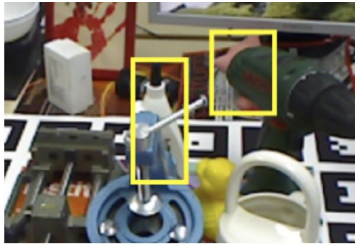

Mathieu Salzman[2]


Yinlin Hu[3]

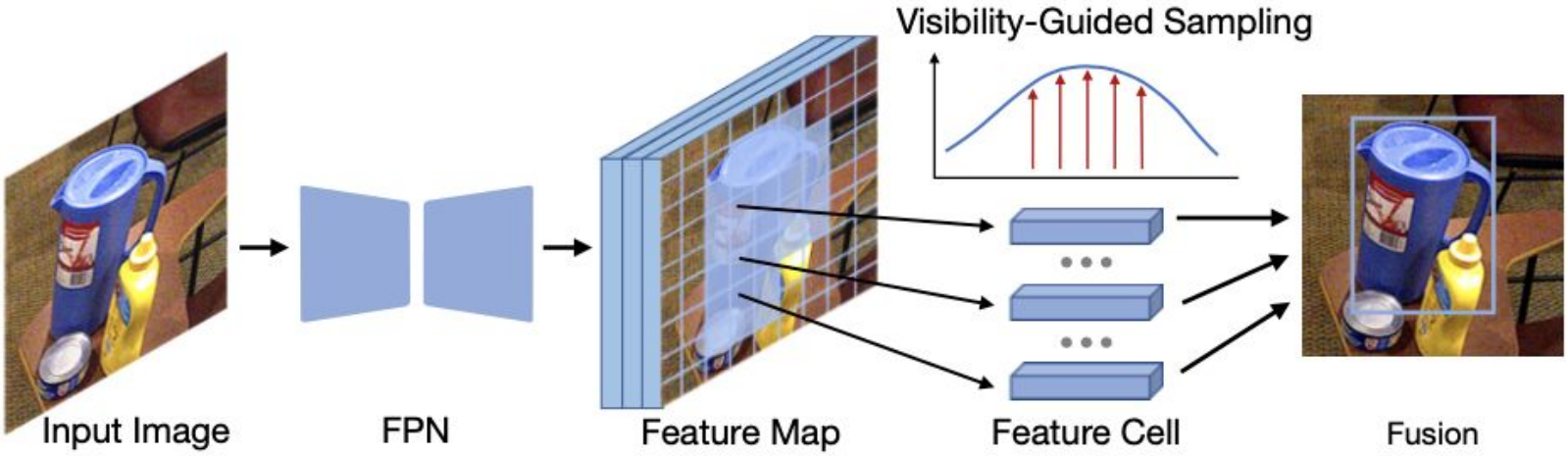
[1]Xidian University, [2]EPFL, [3]Magic Leap

The problem

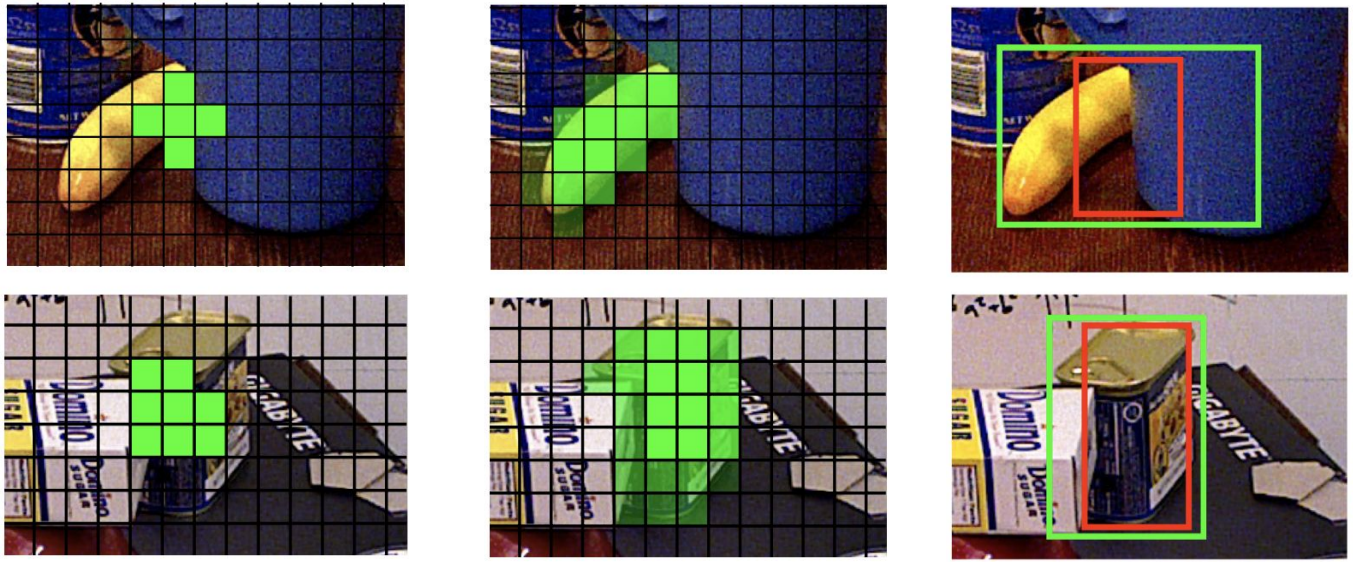



The overall architecture



The sampling strategy is the key

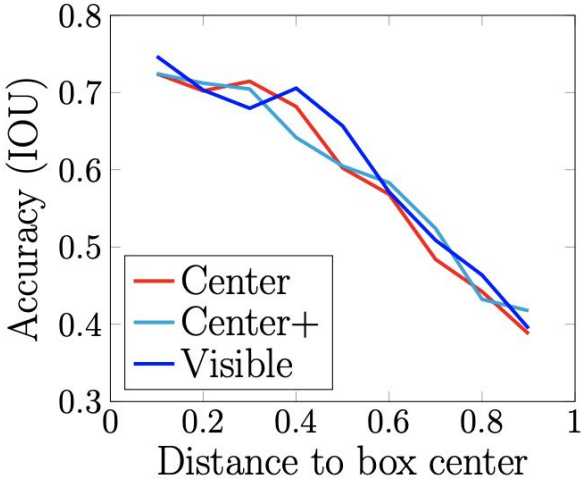


(a) Baseline strategy (b) Our strategy (c) Detection results

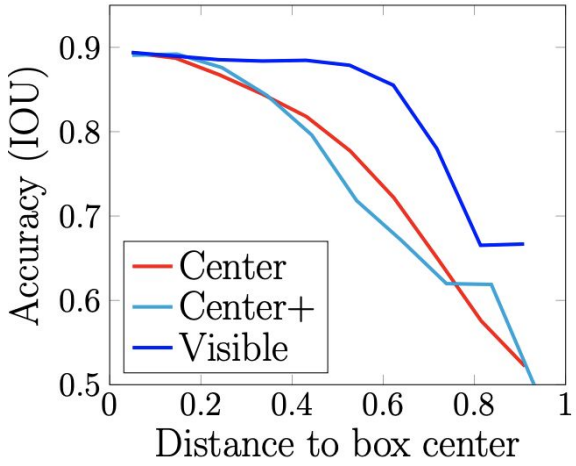
: Our strategy

: Basline strategy

Analysis of rigidity in object detection



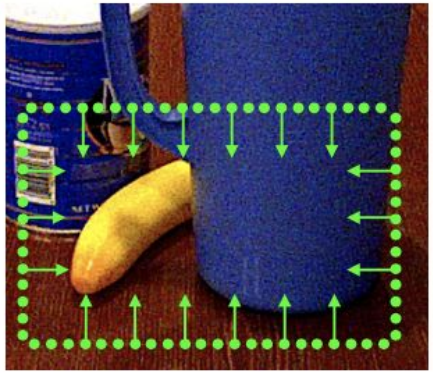
(a) General (COCO)



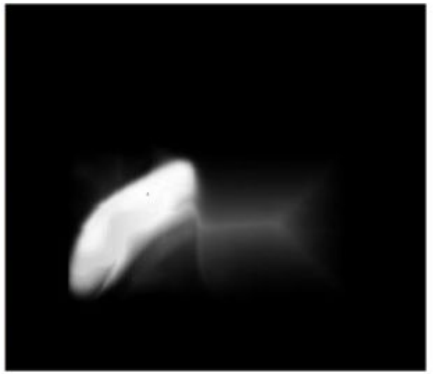
(b) Rigid (YCB-V)

Visibility-guided sampling

(a) Initial seeds



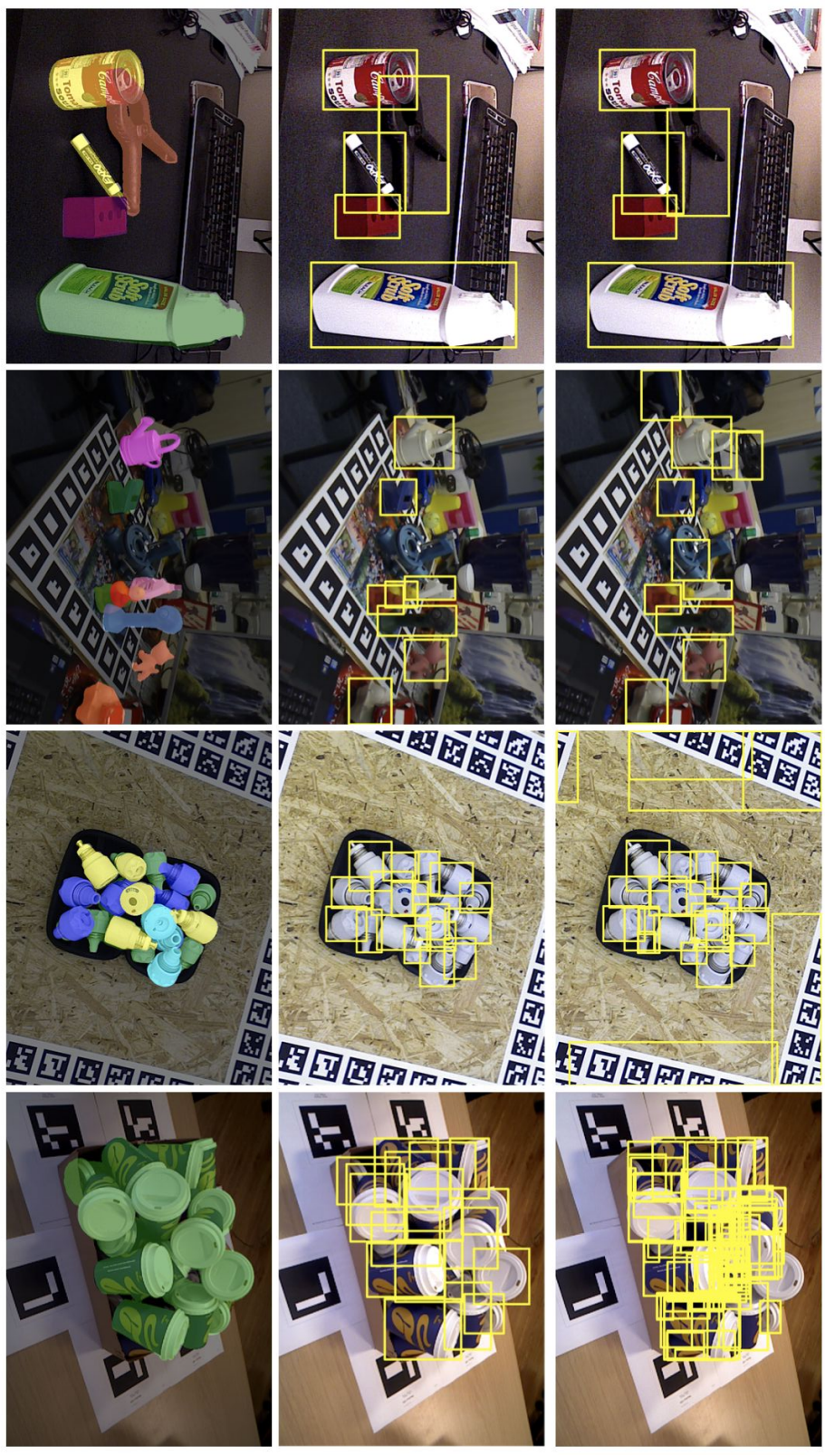
(b) Seeds growing



(c) Distance map

Fusion during inference

(a) The standard strategy (b) The proposed strategy


Pose
Ours
FCOSv2

Thanks

Code

Paper

Method	Real	Data	LM	HB*	YCB	Avg.
PFA+Ours		RGB	**0.7**	**0.840**	**0.648**	**0.658**
PFA [15]		RGB	0.6	-	0.614	-
SurfEmb [9]		RGB	0.6	0.791	0.647	0.650
CosyPose [23]		RGB	0.6	0.656	0.574	0.570
CDPNv2 [26]		RGB	0.6	0.722	0.390	0.472
PFA+Ours	✓	RGB	**0.7**	**0.840**	0.806	**0.704**
PFA [15]	✓	RGB	0.6	-	0.748	-
SurfEmb [9]	✓	RGB	0.6	0.791	0.711	0.677
CosyPose [23]	✓	RGB	0.6	0.656	**0.821**	0.637
CDPNv2 [26]	✓	RGB	0.6	0.722	0.532	0.529
PFA+Ours		RGBD	**0.7**	**0.869**	**0.826**	**0.762**
PFA [15]		RGBD	0.7	-	0.804	-
SurfEmb [9]		RGBD	0.7	0.866	0.799	0.758
CDPNv2+ICP [26]		RGBD	0.6	0.712	0.532	0.534
PFA+Ours	✓	RGBD	**0.7**	**0.869**	0.888	**0.787**
PFA [15]	✓	RGBD	0.751	-	0.823	-

Method	Real	Data	Avg.
PFA+Ours		RGB	**0.658**
PFA [15]		RGB	-
SurfEmb [9]		RGB	0.650
CosyPose [23]		RGB	0.570
CDPNv2 [26]		RGB	0.472
PFA+Ours	✓	RGB	**0.704**
PFA [15]	✓	RGB	-
SurfEmb [9]	✓	RGB	0.677
CosyPose [23]	✓	RGB	0.637
CDPNv2 [26]	✓	RGB	0.529
PFA+Ours		RGBD	**0.762**
PFA [15]		RGBD	-
SurfEmb [9]		RGBD	0.758
CDPNv2+ICP [26]		RGBD	0.534
PFA+Ours	✓	RGBD	**0.787**
PFA [15]	✓	RGBD	-
SurfEmb [9]	✓	RGBD	0.773
CIR [30]	✓	RGBD	0.741
CosyPose+ICP [23]	✓	RGBD	0.698
CDPNv2+ICP [26]	✓	RGBD	0.568