EdgeFlow: Achieving Practical Interactive Segmentation with Edge-Guided Flow

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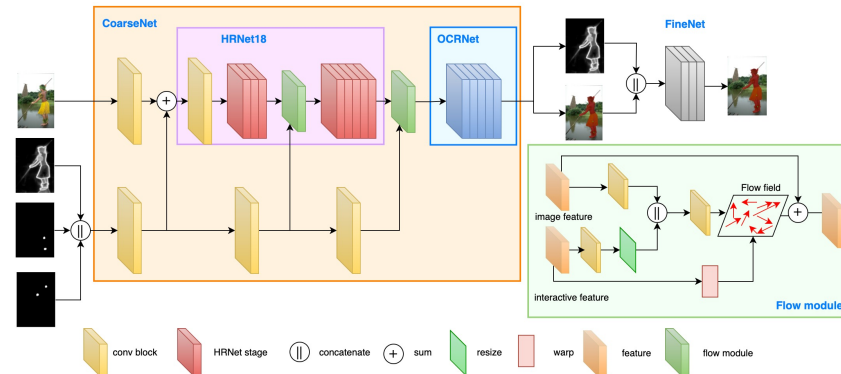[1]Baidu, Inc.   [2]NYU   [3]CQJTU

Interactive Image Segmentation

Examples of interactive clicks
- Green dots denote positibe clicks
- Red dots denote negative clicks

EdgeFlow Architecture

Coarse-to-fine network
- CoarseNet utilizes HRNet-18+OCR
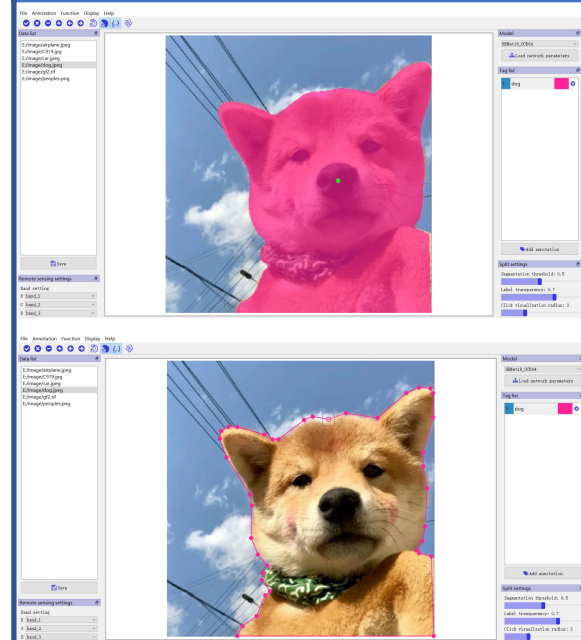- FineNet utilizes three atrous convolution blocks

Edge-guided Flow
- Prevents feature dilution over the network
- Respond to the clicks efficiently

Object edges as prior information
- Improves the stability of segmentation results

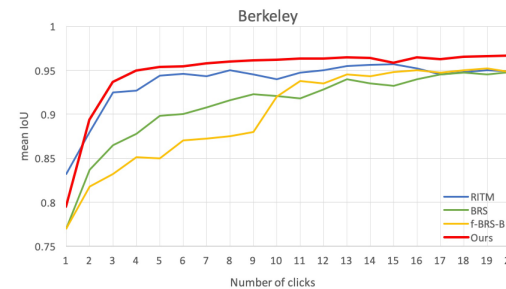## Interactive Segmentation Tools

Annotation pipeline
- Data preparation
- Interactive annotation
- Polygon frame editing

Advantages
- Precise segmentation result
- Adjust the polygon vertexes
- Filter the largest connected region
- Multiple saved formats

Experiments

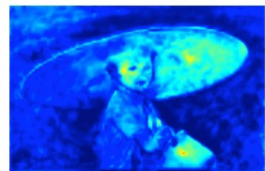| Method	GrabCut		Berkeley	DAVIS		Pascal VOC
	NoC@85	NoC@90	NoC@90	NoC@85	NoC@90	NoC@85
GC [10]	7.98	10.00	14.22	15.13	17.41	-
GM [18]	13.32	14.57	15.96	18.59	19.50	-
RW [17]	11.36	13.77	14.02	16.71	18.31	-
ESC [19]	7.24	9.20	12.11	15.41	17.70	-
GSC [19]	7.10	9.12	12.57	15.35	17.52	-
DOS [49]	-	6.04	8.65	-	-	6.88
LD [26]	3.20	4.79	-	5.05	9.57	-
RIS-Net [27]	-	5.00	6.03	-	-	5.12
ITIS [35]	-	5.60	-	-	-	3.80
CAG [36]	-	3.58	5.60	-	-	3.62
BRS [21]	2.60	3.60	5.08	5.58	8.24	-
FCA [29]	-	2.08	3.92	-	7.57	2.69
IA+SA [24]	-	3.07	4.94	5.16	-	3.18
f-BRS-B [46]	2.50	2.98	4.34	5.39	7.81	-
RITM-H18 [47]	**1.54**	**1.70**	2.48	4.79	6.00	2.59
Our method	1.60	1.72	**2.40**	**4.54**	**5.77**	**2.50**

Effect of Early-Late Fusion
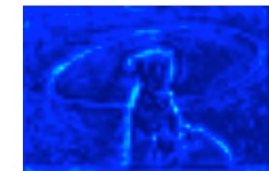
image and clicks   model w/o early-late fusion   model + early-late fusion

Conclusion

Interactive segmentation becomes an efficient way to extract the object of interest. In this work, we propose a novel interactive architecture named EdgeFlow that fully utilizes the user interaction information without any post-processing or iterative optimization scheme. With the coarse-to-fine network design, our proposed method achieves state-of-the-art performance on common benchmarks. Furthermore, we develop an efficient interactive segmentation tool that helps the user to improve the segmentation result progressively with flexible options.