## SeedNet: Automatic Seed Generation with Deep Reinforcement Learning for Robust Interactive Segmentation - Supplementary Material -

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In this supplementary material, we provide additional experimental result for SeedNet. In the first section, we describe an ablation experiment that changes the segmentation module of SeedNet. In addition to GC [7] and GSC [4] in our main paper, the experiment is conducted on RWR [5]. In the second section, we show additional qualitative results for SeedNet experiments.

## 1. Ablation Experiments : RWR segmentation

We conduct ablation experiments on SeedNet in Section 5.3 of our main paper. The ablation experiments are conducted on the change of reward function and the change of

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segmentation method. In this section, we have further tested the SeedNet RWR version for the segmentation method change experiments. RWR, which is a method of adding a restart probability to RW, is applied to interactive segmentation and shows excellent results. The experimental results for the MSRA10K dataset by replacing SeedNet segmentation module with RWR are shown in Table 1. We use IoU as an evaluation metric. The RWR version also shows a significant improvement in performance when using seeds generated through SeedNet. As with experiments using other segmentation methods such as RW, we use five randomly generated seed sets from Set-1 to Set-5. Some examples of



Figure 1. SeedNet RWR version results. The left part (first to third columns) contains the input image, GT mask, and initial seed with corresponding RWR [5] result. The right part is the SeedNet result, showing the first three steps (fourth to sixth columns) and the final result (seventh column).

 Table 1. Ablation Experiments : RWR Segmentation

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Method	Set 1	Set 2	Set 3	Set 4	Set 5	Mean	
RWR [5]	35.35	36.8	35.96	35.17	35.28	35.71	
SeedNet (RWRver.)	52.56	55.15	52.61	52.38	52.49	53.04	

the SeedNet results in the RWR version are shown in Figure 1. Foreground seeds are represented by green dots, and background seeds by red dots. Only the foreground area is highlighted.

## 2. Qualitative Results

Figure 2 shows a few more SeedNet qualitative results for the MSRA10K dataset. The figure shows that the object touching the edge or the object similar in color to the background color is well processed. We also show the qualitative experimental results for the unseen datasets. The quantitative results for the five types of unseen datasets are present in Section 5.4 of the main paper. In this section, we show a qualitative result. The experimental results for GSC-SEQ [4], Weizmann single object [1], Weizmann horse [3], iCoseg [2], and IG02 [6] datasets are shown in order from the top to the bottom of Figure 3. Comparing the third and seventh columns, we can see that SeedNet significantly improves the initial RW results for all datasets.

## References

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Figure 2. MSRA10K results. The left part (first to third columns) contains the input image, GT mask, and initial seed with corresponding RWR [5] result. The right part is the SeedNet result, showing the first three steps (fourth to sixth columns) and the final result (seventh column).



(e) IG02 dataset

Figure 3. Unseen dataset results. The left part (first to third columns) contains the input image, GT mask, and initial seed with corresponding RWR [5] result. The right part is the SeedNet result, showing the first three steps (fourth to sixth columns) and the final result (seventh column).