UnAMT: Unsupervised Adaptive Matting Tool for Large-Scale Object Collections

Jaehwan Kim*, JongYoul Park, and Kyoung Park
Electronics and Telecommunications Research Institute, Republic of Korea

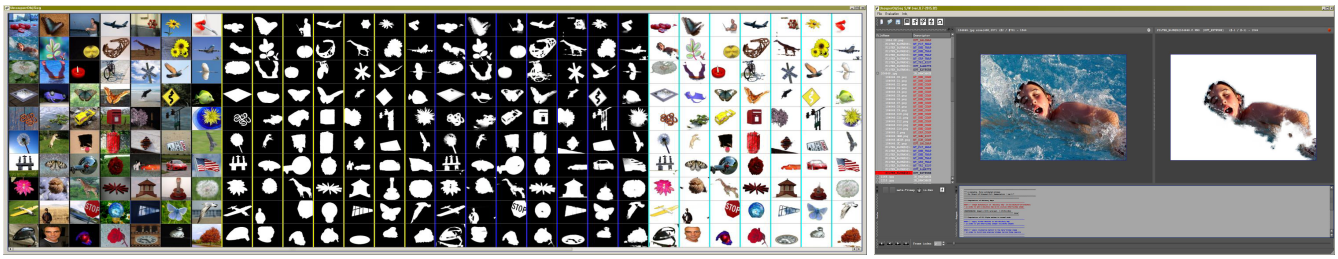

Figure 1: Result of applying our method to sample images in MSRA database: (yellow side)ground truth data; (blue & cyan side)final alpha mattes & extracted object images obtained through our system, 'Unsupervised Adaptive Matting Tool(UnAMT)'. UnAMT screenshot.

1 Introduction

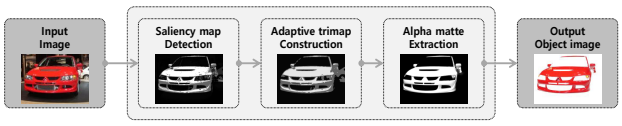

Figure 2: Overview of our system

Unsupervised matting, whose goal is to extract interesting foreground components from arbitrary and natural background regions without any additional information of the contents of the corresponding scenes, plays an important role in many computer vision and graphics applications. Especially, the precisely extracted object images from the matting process can be useful for automatic generation of large-scale annotated training sets with more accuracy, as well as for improving the performance of a variety of applications including content-based image retrieval. However, unsupervised matting problem is intrinsically ill-posed so that it is hard to generate a perfect segmented object matte from a given image without any prior knowledge. This additional information is usually fed by means of a trimap which is a rough pre-segmented image consisting of three subregions of foreground, background and unknown. When such matting process is applied to object collections in a large-scale image set, the requirement for manually specifying every trimap for each of independent input images can be a serious drawback definitely. Recently, automatic detection of salient object regions in images has been widely researched in computer vision tasks including image segmentation, object recognition and so on. Although there are many different types of proposal measures in methodology under the common perceptual assumption of a salient region standing out its surrounding neighbors and capturing the attention of a human observer, most final saliency maps having lots of noises are not sufficient to take advantage of the consequent computational processes of highly accurate low-level representation of images.

2 Our approach

Motivated by existing works [Rhemann et al. 2009][Borji et al. 2012], in this note we introduce a novel object extraction tool, whereby it is possible to precisely segment salient objects in a large-scale image set in an unsupervised manner. Our goal is to automatically and accurately extract object-of-interest in images without any additional information. The system is referred to as "Unsupervised Adaptive Matting Tool(UnAMT)", where the procedure is performed by way of incorporating a saliency estimation into a matting process. We also introduce an adaptive trimap as a refined segmented image of saliency map in order to provide more exact salient object extraction. The adaptive trimap is constructed in the subsequent way: gaussian convolution of saliency map, tri-partitioning of the filtered map, and foreground pixels extraction according to a relevance measure. The main property of the relevance measure is that the closer the color of distance between trimap's foreground and salient subregions in the same unknown, the greater the contribution to the region of the object-of-interest. In Fig.2, our system flow is briefly illustrated. Once a saliency map where the intensity of each pixel represents the probability of that pixel belonging to the salient object, has been extracted from the given image through existing saliency measure, we next perform our proposed adaptive trimap-based matting method with the extracted saliency map. In order to obtain a visual comparison of results, we use a ground truth data set in MSRA database(see Fig.1). Our system is developed in C++ with Qt SDK in order to provide the user with flexible UI and compatibility for the different operating systems.

References

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RHEMANN, C., ROTHER, C., WANG, J., GELAUTZ, M., KOHLI, P., AND ROTT, P. 2009. A perceptually motivated online benchmark for image matting. In *Proc. Int'l Conf. Computer Vision and Pattern Recognition*, 1826–1833.

*e-mail: jh.kim@etri.re.kr, Tel:+82 42 860 1070. This work was supported by the ICT R&D program of MSIP/IITP [14-824-09-001]

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