Saliency Driven Image Manipulation – Supplementary

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1. We provide extended qualitative evaluation in the project page http://cgm.technion.ac.il/Computer-Graphics-Multimedia/Software/saliencyManipulation/. Where we evaluate four applications: object enhancement, saliency shift, distractor attenuation and background decluttering. The majority of images are on in the first application. Each image is presented along with the saliency map extracted using Margolin et al. [22] and WFB, CC and REALISM scores.

2. A schema of our method is presented in Figure 1.

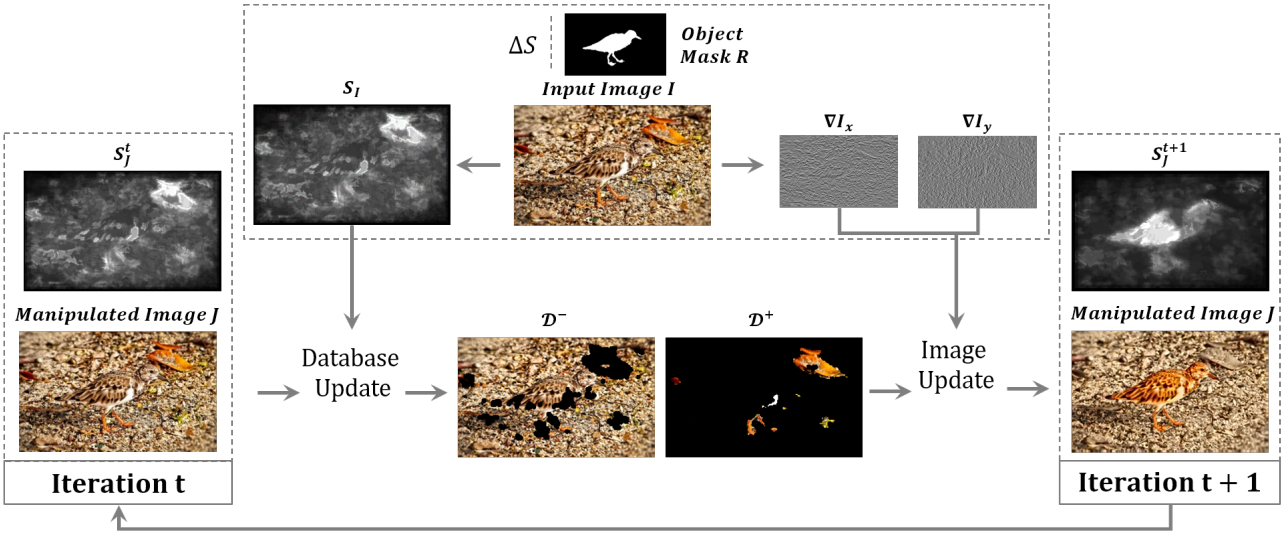
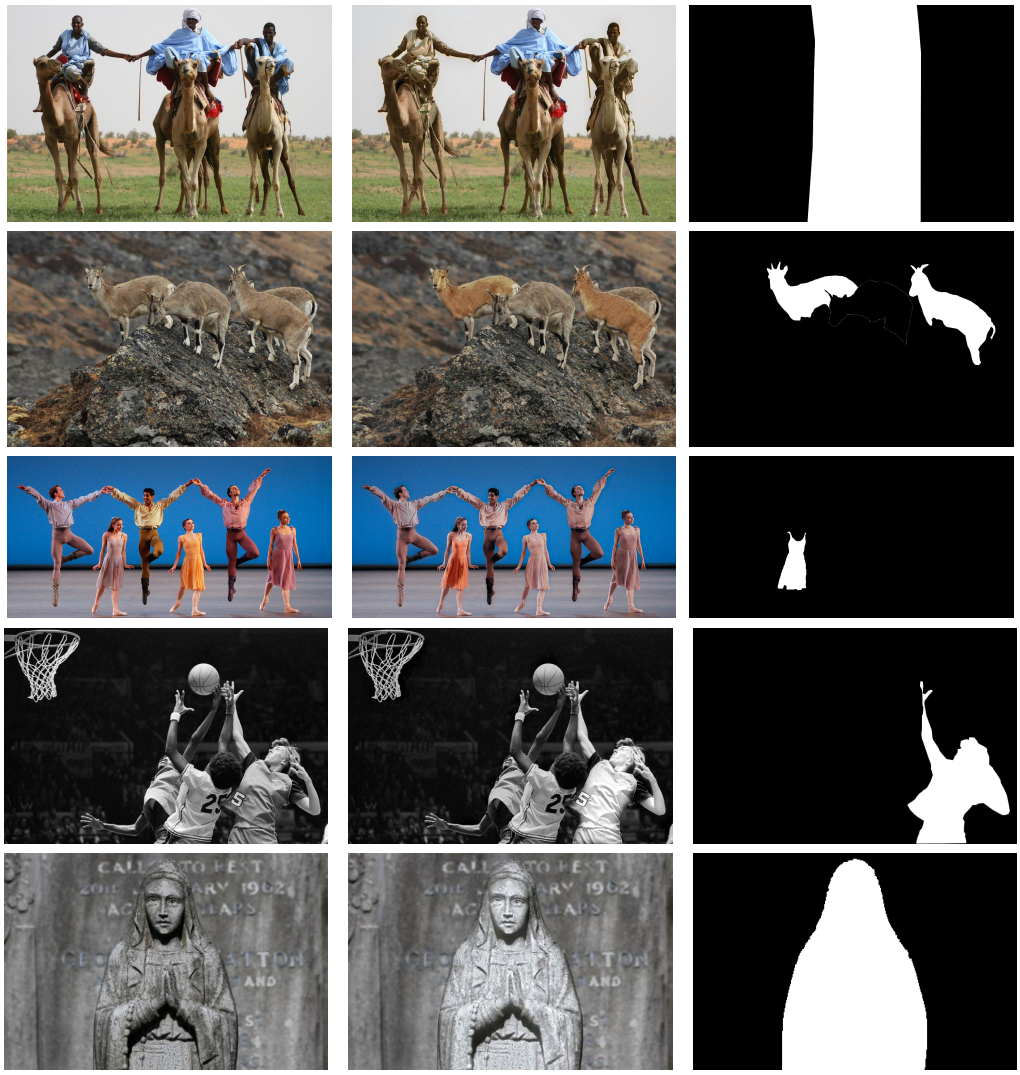


Figure 1: **Algorithm overview.** One iteration of our algorithm: the manipulated image J^t (on the left) is updated to be J^{t+1} (on the right) using two stages of our algorithm: In the *Database Update* step, $\mathcal{D}^+$ and $\mathcal{D}^-$ are updated using thresholds on S_I, the saliency map of the input image. The thresholds are updated by calculating the saliency contrast in the current saliency map S_J^t. After the databases are set, we synthesize the image using a Search-Vote-Poisson scheme in the *Image Update* step. The inputs are the image, the object mask and the desired saliency contrast ΔS.

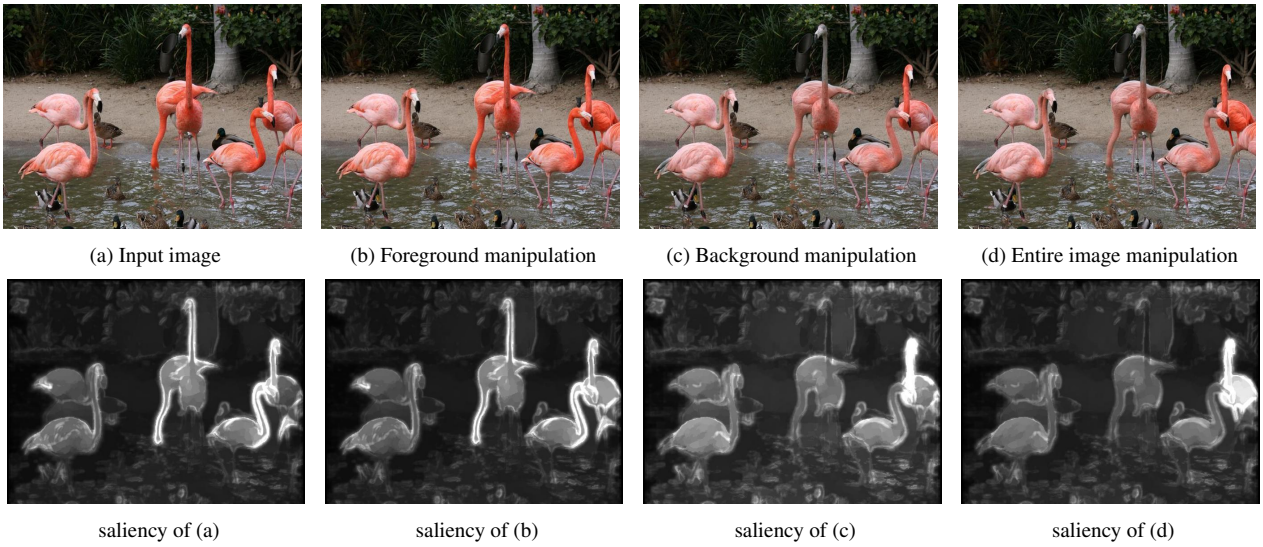
3. Our method handles multiple image regions and can either increase or decrease the saliency of each region. This generality is very useful, for example, to remove multiple background distractors, to highlight several important objects, or to change the focus from one object to another – see Figure 2.



(a) input image (b) manipulated image (c) mask

Figure 2: **Generality of our framework.** Our approach can achieve various effects. Object enhancement by reducing the background saliency (first row); Enhancing several important objects (second row); Highlighting one object instead of another by shifting saliency (third row). Additionally, our method relies on internal saliency properties of the input image, therefore it effectively manipulates also gray-scale images (fourth and fifth rows).

4. Some previous methods manipulate only the colors of the target region they fail to achieve this attention shift effect. Further demonstration of the importance of decreasing the background saliency is given in Figure 3. Since several flamingos are salient in the input image enhancing a single one succeeds only when reducing the saliency of its fellows.



(a) Input image (b) Foreground manipulation (c) Background manipulation (d) Entire image manipulation

saliency of (a) saliency of (b) saliency of (c) saliency of (d)

Figure 3: **Importance of reducing the background saliency.** (a) We define the top-right flamingo to be the selected foreground in the input image. (b) When only the foreground is manipulated, the other flamingos remain salient. (c) When only the background is manipulated, the selected flamingo remains non-salient. (d) By enhancing the chosen flamingo and demoting the background the achieve the desired object enhancement effect. Our method gains from both foreground and background manipulation.

5. Our manipulation latches onto the internal statistics of the image and emphasizes the objects via a combination of different saliency cues, such as color, saturation and illumination. Examples of these effects are presented in Figure 4.

Figure 4: **Emphasize by different effects.** In most images multiple enhancement effects occur simultaneously. Here, for illustration purposes, we present examples were one dominant effect is reflected. In each pair the input image is on the left and the manipulated image is on the right. Blue: emphasize by color; Green: emphasize by illumination; Red: emphasize by saturation. Our algorithm is able to adapt the manipulation automatically to each photo, without the need of user guidance. $\Delta S = 0.6$ for all examples.