

EE604: Assignment 2

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Due time: 11:59PM

Weight: 21%
Submission: MookIT

Introduction

You need to figure out which algorithms are suitable for solving these problems, and then apply their combinations to find optimal solutions. You may need to refer appropriate research publications, some references are given here for your help. If you can not solve the problems optimally, try to use your own clever ideas to get approximate solutions for each them.

1 *The lava:* antaragni [7%]

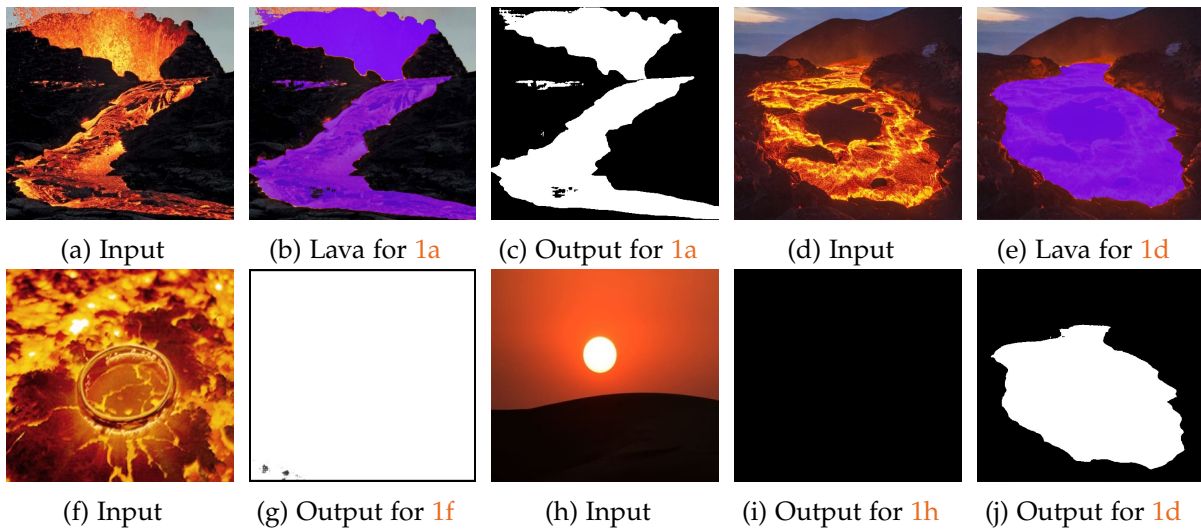


Figure 1: Four samples showing inputs, intermediate results and corresponding final outputs.

Sincere students usually defamed as emotionless or rocks by their over-exuberant friends, probably because they can't see studious student's *antaragni* yet. Who says the rocks can't float? Let the rock-n-roll play, and you will see rocks rocking with spectacles in the air.

The lava is hot molten rock erupted from a volcano and the magma is hot fluid material below or within Earth's crust. Enormous amount of lava when get erupted, it flows like a river.

Gradually top portion of the lava first gets cooled due to air contact, creating floating rocks in the river. These rocks need to be accounted for estimating the overall lava flow.

After volcanic eruption, estimation of accurate lava flow is essential for emergency response planning, public safety, property protection, land use planning and environmental impact assessment. You can imagine, there is no method other than capturing variety of images (via drones) and processing them for this assessment task.

Given such input images Fig.1a and 1d, how lava region will look like after overlaying on same image are shown in Fig. 1b and 1e respectively. Final lava detected region is shown as white color mask with non-lava region as black. Your task is to generate only the final output mask image (like Fig.1c, 1g, 1i and 1j) for the given input image. Various examples are shown in Fig. 1. Your algorithm will be tested on 25 new test images using Dice coefficient overlap [1].

2 *Pro-night with or without camera flash?: proligh* [7%]

You might have seen photographers carrying variety of strobe lights (flash) during professional, cultural or festival events occurring at night (pro-night). They produce a brief burst of light at a color temperature of about 5500 Kelvin to help illuminate a scene.

Pro-nights are filled with glittery ornaments, flashy cloths, truck load of makeups and toasting glasses, where everything including people are showpieces. Flash causes specular reflections, unwanted glows, prolong dark shadows and other glittery artifacts. Moreover it also changes scene ambiance away from night mood. Without a flash, the images will be dark with noisy speckle effect and celebrities will look suntanned. Looks illuminating? Indeed for us, but for photographers it's a dilemma about, flashy-night with or without a flash?

When we faced the similar dilemma during denoising with or without preserving edges, the bilateral filter came to our rescue. You will extend the similar idea to design a cross bilateral filter for fusing flash and no-flash images to produce final proligh image. You may refer to research publications like [2], [3] and [4].

Write the python program, which takes input both flash and no-flash images of the same scene, fuses them appropriately and produces final good quality (prolight) image. Some representative sample input and outputs are given in Fig. 2. Your program will be tested for different sample input pairs. Main criterion of evaluation is processing speed provided your program produces sufficient good quality proligh image with removing flashy artifacts. Higher the speed, greater the score. If it can't produce better quality than no-falsh and flash, then score will be 0.

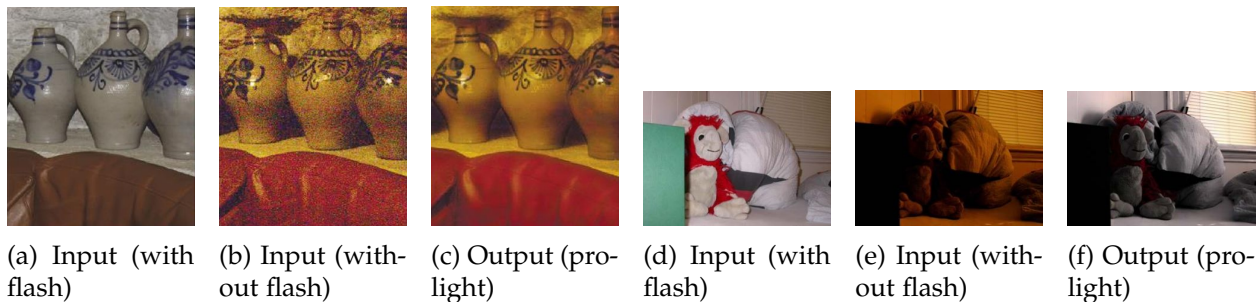


Figure 2: Sample inputs containing both with flash and without flash images. Your function should fuse these input pairs to produce good proligh image within short computational time.

3 *The victory over delusion: dussehra* [7%]

India is a land of festivals where all religions find refuge and coexist harmoniously. It's a modest, dusty land with a rich and colorful history, encompassing not only kings but also sages.

Dussehra is celebrated to commemorate the victory of Lord Rama over the ten-headed demon king Ravana. Rama, the virtuous king always faced the demons from front whether its king Bali or Ravana. Similarly, one should directly confront and triumph over ten negative qualities: greed, jealousy, lust, impatience, self-delusion, selfishness, anger, procrastination, envy and negativity. It's not that easy, as these qualities are often deceptive.

Similarly during the war, the Ravana manifested many delusions, yet Rama skillfully overcame them all. You will resolve one such delusion of finding whether Ravana is facing you in 'real' or is facing his back with heads manipulated and causing a 'fake' confrontation.

Design a python program to find reality or delusion from given a single input image, and it should output either 'real' or 'fake' word. Fig. 3 shows some of inputs and outputs.

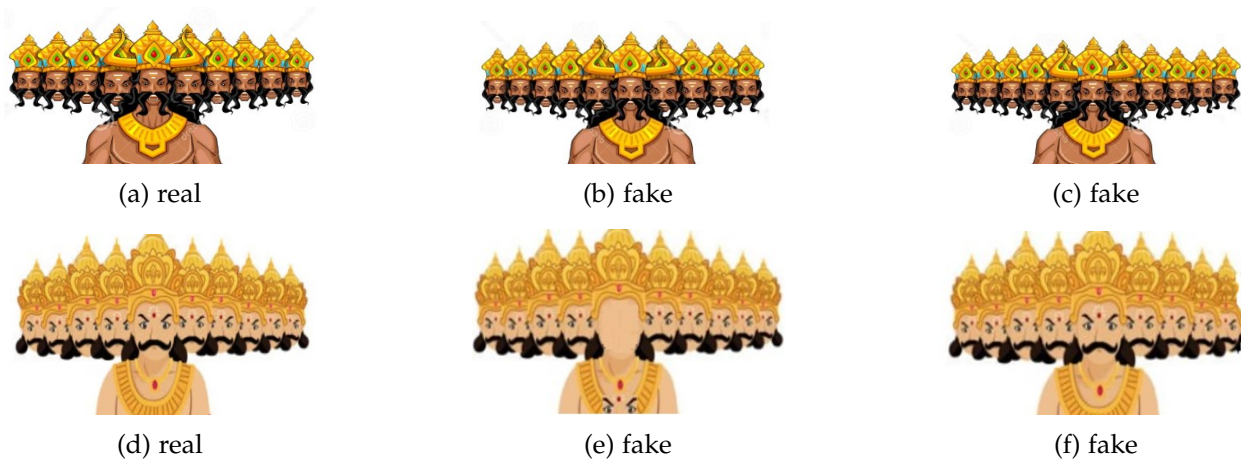


Figure 3: Sample inputs and their corresponding outputs 'real' or 'fake' is given in the captions. You can think of other corner cases. Extra test images will be similar and horizontally aligned.

References

- [1] T. J. Ramírez-Rozo, J. C. García-Álvarez and C. G. Castellanos-Domínguez, "Infrared thermal image segmentation using expectation-maximization-based clustering", IEEE 17th symposium of image, signal processing and artificial vision, 2012.
- [2] G Petschnigg, R Szeliski, M Agrawala, M Cohen, H Hoppe, K Toyama, "Digital photography with flash and no-flash image pairs", ACM transactions on graphics, 2004.
- [3] E Eisemann, F Durand, "Flash photography enhancement via intrinsic relighting", ACM transactions on graphics, 2004.
- [4] Francesco Banterle, Massimiliano Corsini, Paolo Cignoni, Roberto Scopigno, "A Low-Memory, Straight-forward and Fast Bilateral Filter Through Subsampling in Spatial Domain", Computer graphics forum wiley, 2012.