2018

Team Two - 2018

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MCEN 5151

Image Context

For the second team image, we plan to imply the drop splash apparatus. This apparatus enables us make carefully timed droplets, synchronized with flash, to make images like this one. The apparatus was built by Kyle Hollis and Kyle Walters in 2016, as an Independent Study project. I'm mainly in charge of setting up the system and fixing the signal problem. Brandon and Noah are responsible for timing setup and camera issue. Winston did the support work.

Flow Apparatus

First, we assembled the whole apparatus following the 'PROJECT DROPSPLASH: FULL DOCUMENTATION AND QUICK-START GUIDE', which is written by Kyle Hollis & Walters. One valve was attached on the frame controlled by the project box. A shallow sink was under the valve while a acrylic board was inserted in it. The Nikon D700 with two flash pointed to the liquid surface. The Figure.1 shows the whole apparatus.

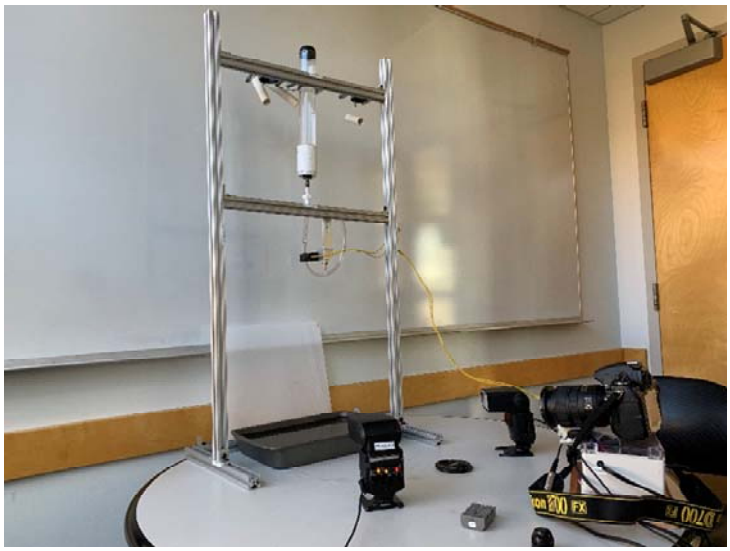

Figure 1 Apparatus

We use an android phone to control the droplet size and timing. The setup for the controller is illustrated in Figure.2. The droplet size was limited in a low level to make the Worthington jet[1] more notable. The camera trigger was 0 from the guide book but based on our experiment it took nothing about the drop splash. So we make the camera trigger 400 million seconds behind the flash trigger, which frozen the drop splash moment with acceptable amount of light come into the CMOS.

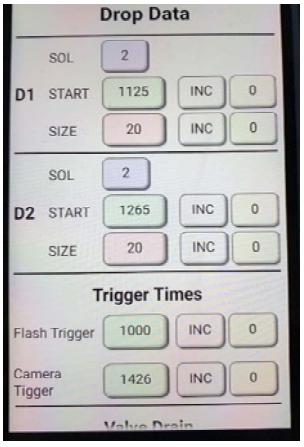

Figure 2 Setup for Timing

Worthington jet is the significant physical phenomenon in the image. The high velocity liquid ejected into a liquid surface which produce and collapse an air cavity[2]

[1] Hsu, Tienyi T., et al. "Instabilities and elastic recoil of the two-fluid circular hydraulic jump." *Experiments in fluids* 55.1 (2014): 1645.

[2] Gekle, Stephan, and J. M. Gordillo. "Generation and breakup of Worthington jets after cavity collapse. Part 1. Jet formation." *Journal of fluid mechanics* 663 (2010): 293-330.

Visualization technique

For the lighting control, we chose a bright room in the ITLL which was not an appropriate choice as we know later. The flash could only work in a dark condition to freeze the drop splash moment or the noise and motion blur from the raw file would ruin the content.

Photographic technique

A Nikon D700 was implied in this experiment. Owing to the inappropriate lighting setting, the ISO came to an extreme high level at 25600. The aperture value was f/6.3 and the exposure timing was 1/1600 s. The focal lens of the camera is at 65 mm.

Owing to giant noise in the image, I used several tool in photoshop to neutralize its impact. The camera raw 5.0 was firstly applied. In the detail panel, I set color detail and smoothness as the figure 3 shows. And some sharpening work also applied to enhance the clarity of the image.

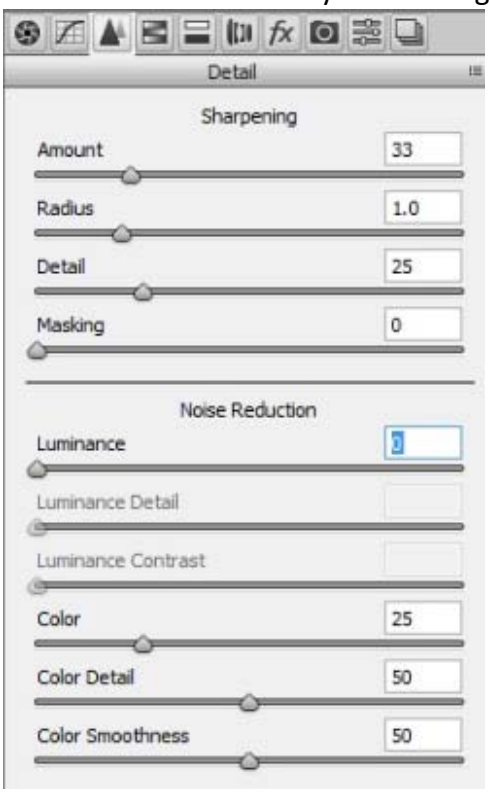

Figure 4 Camera raw setting

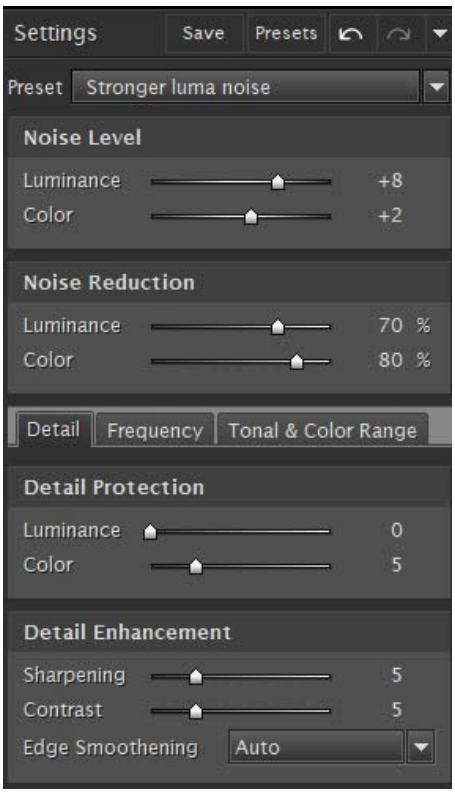

Figure 3 Noiseware

Then a plugin called imaginomic-Noiseware was employed for further noise reduction. I chose stronger noise setting. The Luminance and color were decreaced in the noise level section while the oppiste setting was picked in the noise reduction section. Some Detail protection and ecnhancement adjustment were also composed.

Figure 5 Original Image

Figure 6 Final edited Image

Image reveals

The Worthington jet was revealed in a clearly as well as aesthetic way. The concentric rings illustrated hydraulic jump well. However, due to the wrong understand of flash setup, the noise and motion blur effected the image quality to a great extent. Besides, if camera could have been placed in a lower position, it would reach a better frame.