

Team 3 Image Report

For my final team image we played around with the high speed camera trying to capture a variety of different flow. Unfortunately the camera was very moody and kept freezing preventing us from capturing as much footage as we had hoped. The image I chose to submit was an image I took at home with my simple point and shoot camera. Although I captured some other good images, I was intrigued by the turbulent backflow caused by a flushing toilet. With a few quick lighting adjustments I was able to capture the image that I chose to submit.

The flow apparatus used for this image was simply my toilet. By snapping several pictures throughout the flushing process, I was able to capture this image just as the bowl began to refill. I initially wanted to capture the swirling water but in the end I was most satisfied with this image because of the textured feel it has. The flow was high and appeared very turbulent as the rushing water began to flow out of the neck and into the body of the toilet bowl. A flow with a high Reynolds number is considered to be turbulent. The Reynolds number is calculated to be:

$$Re = \frac{QL}{vA}$$

In this equation, Q is the flow rate, L is the distance traveled by the fluid, v is the kinematic viscosity and A is the cross sectional area of the flow. It is very difficult to judge the velocity of this flow as it was more of rushing water backing out of a pipe rather than a flow through a pipe. This image also captures the idea of surface tension or cohesion between the water molecules because despite the turbulent flow, the water is not splashing up but sticks together keeping a continuous surface. As the water is backing up the numerous forces create the rough topography effect that this image captures. I was surprised by how well the image captured this by reflecting the light throughout the surface.

The flow visualization techniques used in capturing this image were very simple and straight forward. I used the white ceramic background of my toilet to act as a mirror that reflected the flash of my camera back through the turbulent water. Although I played with various backlights and flash options, the simple point and shoot options provided the best reflection effect to the water. The bright flash really highlighted the flow giving the image a better depth perspective. I think a colored filtered flash or even a brighter flash from a different angle could have really improved the contrast of this image. Getting closer to the surface of the water and capturing from a less perpendicular image would have provided a nice perspective.

Lastly, I captured this image with a simple point and shoot camera using the autofocus and macro settings. I used a Casio EX-S770 camera with a shutter speed of 1/30 second. The autofocus settings adjusted the focal length of 6.2mm. The f-stop was f/4.3. The flash was fired but without the redeye reduction feature. The final image was 2280 pixels wide and 2304 pixels tall. A few small contrast adjustments were made in Photoshop to bring out the reflective accents.

Overall, I was very pleased with the way this image turned out as it does a great job capturing the turbulent flow of a toilet. I like how it is a beautiful image of an everyday device that is rarely associated with beauty. I think more often than not most of us take toilets for granted and do not stop to admire the flows that they create. I was amazed to see that my simple camera was able to capture the great surface effects of the water at such a close distance. The flash also highlights the refractory properties of water as the moving flow distorts the light in several different ways. To further this image I would like to play with capturing a variety of dyes in the water to possibly act as tracers throughout the flow.