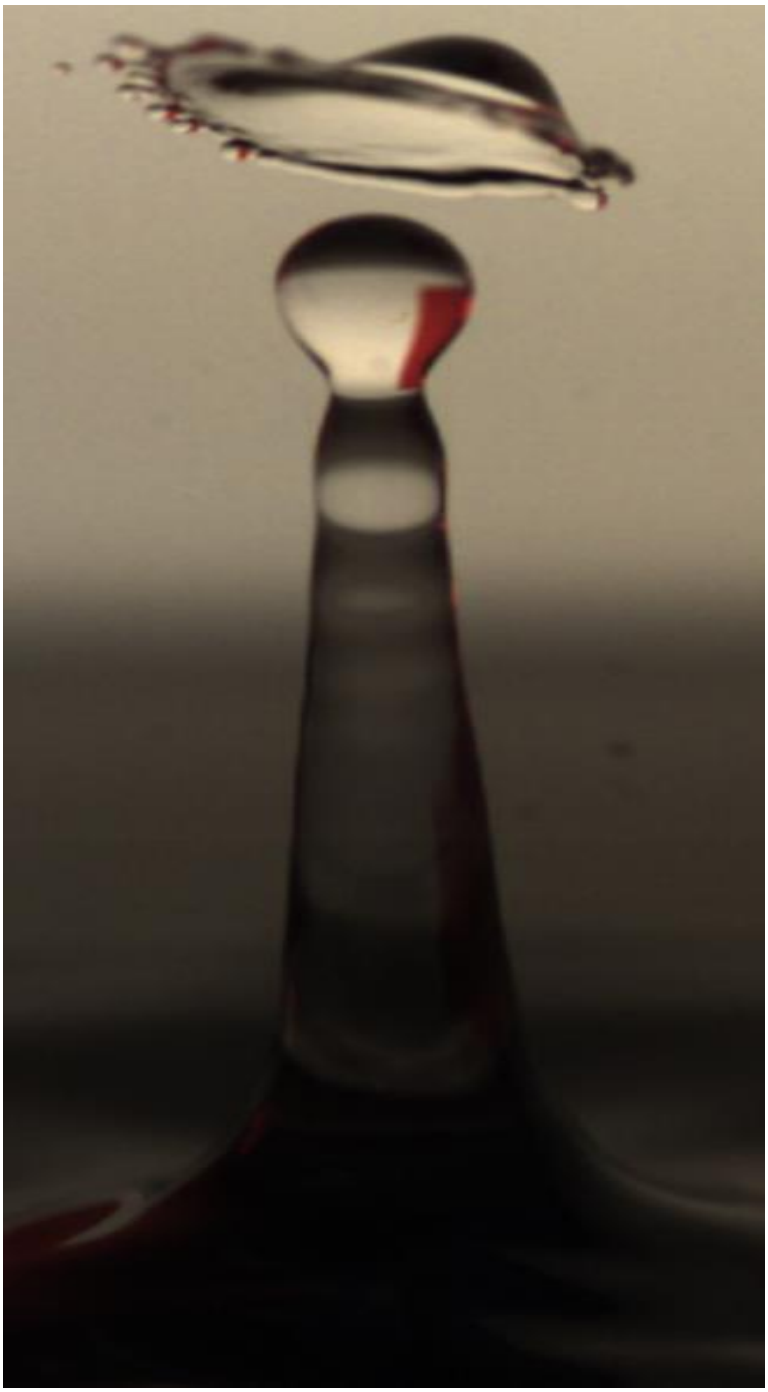
Theo Petrides
Jean Hertzberg
Flow Visualization

Team Second Image: Worthington Jet



Team 8: Danny Baker, Brett Sibel, Marcus Gurule, Theo Petrides

Introduction

For our second team images, we wanted to get photographs of water droplets splashing into a water basin. To do this, we used Project SplashDrop, provided by Kyle Walters and Kyle Hollis. They two created the setup for an independent study class by Professor Hertzberg. The creators of Project Splash Drop only have us the materials and documentation, and it was our prerogative was to set it up with minimal assistance.

The goal of using this setup was to capture a Worthington Jet. This jet is formed when a water droplet hits a solid or liquid surface. To capture this image a Phantom camera was provided by Professor Tadd Truscott from Utah State University. This camera allowed from slow motion videography to capture the drop at the right timing.

Procedure

The documentation for the setup of the project starts with a Quick Start Guide. This guide outlines a kit inventory that includes a project box, seven frames, three solenoid valves, and two flash diffusers. Not included in the kit, but needed for the experiment is a camera, tripod, camera remote release cable, and a water basin.

To begin we assemble frames 1 and 3 by attaching them to the T-shaped pieces of frames 2 and 4. Next we attached frames 5 and 6. These are interchangeable and act as mounts for the valves which can be arranged with any height variation and angle adjustment. Finally, frames 5, 6, and 7 will be the crossbars of the two legs with five being the bottom and 7 being the top. We had to rotate frame 7 a bit to makes sure the reservoir clamp was away from the frame to slide it into the clamp. The final assembly should look like figure 1 below.

Figure 1: Fully-assembled frame

Afterward we filled a water basin, nearly to the top, with tap water and placed it under the frame. Fog lamps were then placed behind the assembly, with one being on the left and one on the right. We placed a red see-through sheet on the left light to give the basin more color. We can set up the tripod in front of the assembly ready to photograph.

Finally, it was time to connect the Android application to the system. The app itself was called dropControllerBT and used on Kyle Walters cell phone. We set the drop rate to be. Once we pressed go on the app, it was time to take the slow motion video The app that was used can be seen in the figure below to control the droplet.

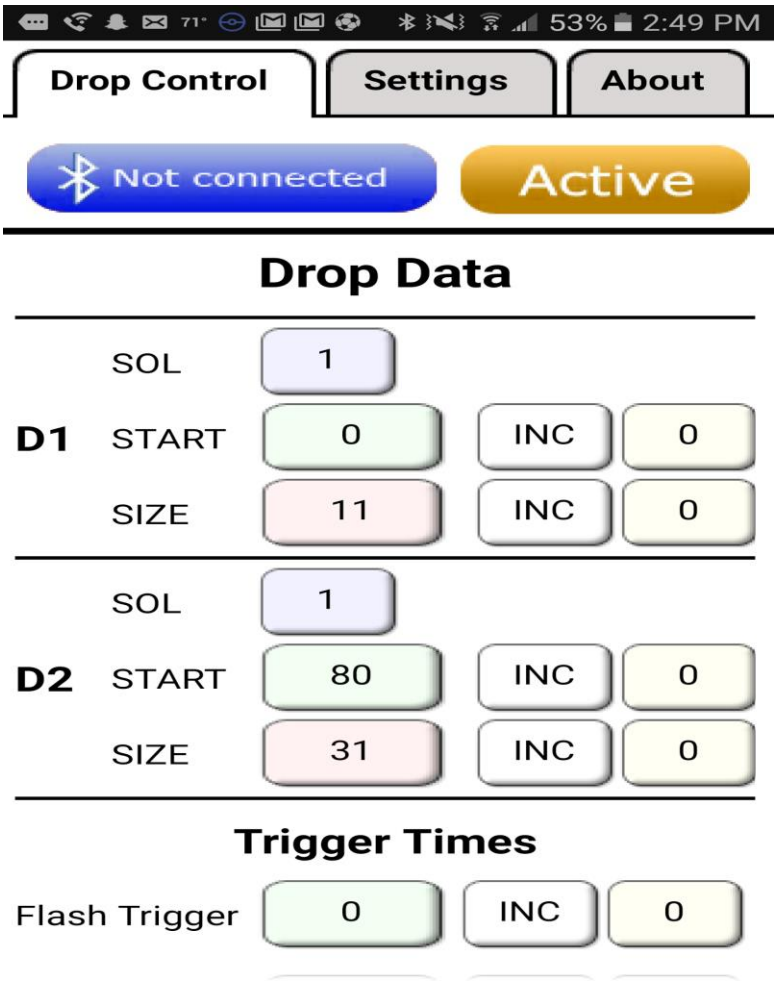


Figure 2: App used to control the droplet

Camera Technique:

The camera was placed a reasonable distance away roughly 1ft away from the drop apparatus to get the shot you see below in the unedited image below. The camera was operated by Professor Tadd Truscott. The camera used is cam be seen to capture the droplets in slow-motion in the figure on the next page. The recorded unedited image is also seen from a resulting slow-motion capture shot.

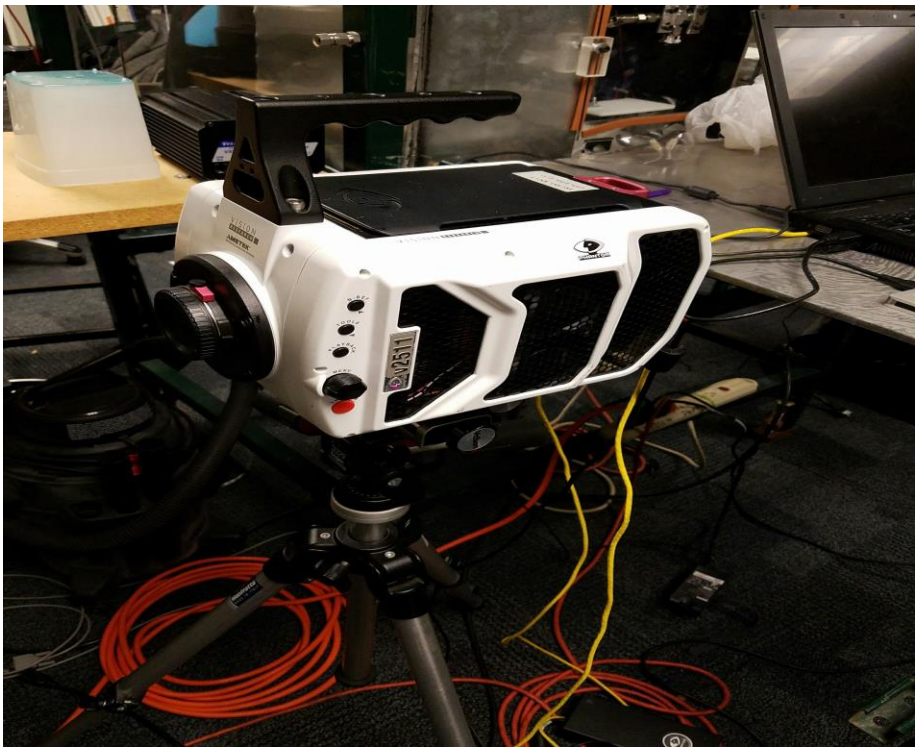


Figure 3: Tadd Truscott's high speed phantom camera

Figure 4: Unedited image from motion capture of high speed shot

Post Processing:

The post processing done to the image was through Gimp and furthermore it was cropped to show only the collision of the droplet just above the jet. There was a small red reflection from the apparatus which I thought was worth keeping because it adds a nice accent to the black and white droplet and appropriate jetting from below. The image you see below is from a colliding water droplet that happened after the original jet that is coming from the original droplet.

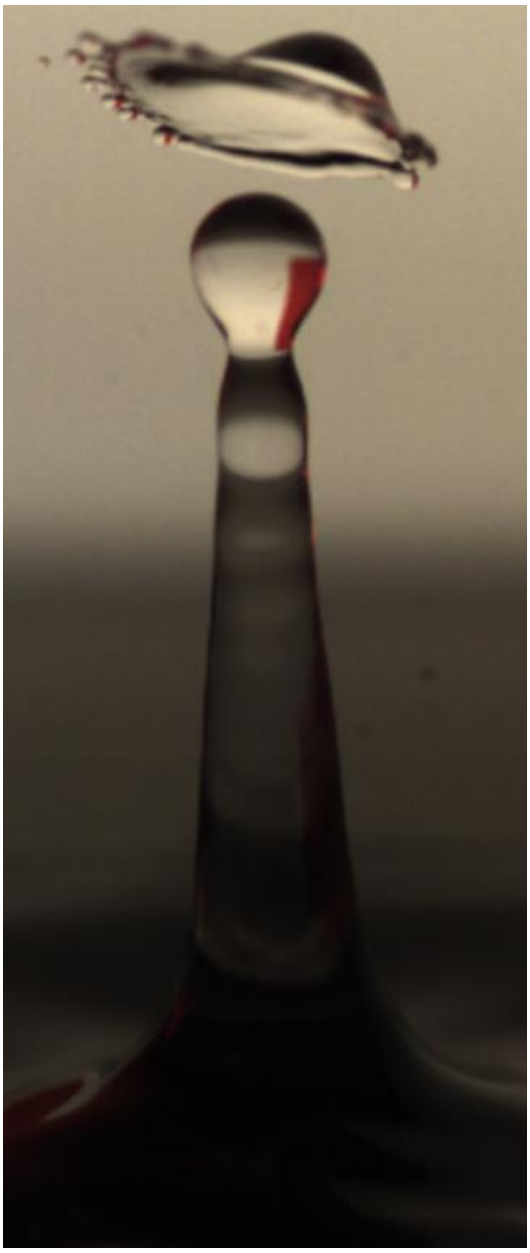


Figure 5: Edited image done in Gimp

References

Brett Sibel (Introduction/Procedure)

Professor Tadd Truscott from Utah State University

Project SplashDrop, provided by Kyle Walters and Kyle Hollis

Jean Hertzberg, provided necessary contact for flow visualization techniques and necessary lab equipment