

Team Third Report

Bubbles



David Leng

12.09.2016

Flow Visualization

INTRODUCTION

Bubbles are a common occurrence in everyday life. Bubbles can happen naturally or we can create them ourselves. The fluid phenomena of a bubble will be analyzed and discussed in this report. Team 2 of the Fall 2016 semester course Flow Visualization comprised of Sierra Castillo, Katie Gresh, and myself aim to photograph and analyze this phenomena. Using a store bought bubble mixture, lights, and a black backdrop the team was able to create and photograph the image above.

A bubble is a thin sphere of liquid enclosing air or another gas. Soap bubbles occur when air is able to get between a liquid. The bubble is held together by surface tension. The spherical shape of the bubble is explained by Laplace's Law. A sphere is the shape with the smallest surface area to volume ratio meaning it is the particles are in the tightest possible grouping.

$$\text{Laplace's Law: } P_i - P_o = \frac{2\gamma}{R}$$

P= Pressure

γ = Surface Tension

R= Radius

The fluid phenomena of a bubble would not occur without the Marangoni Effect. The Marangoni Effect deals with surface tension gradients, and the pull on different liquids. The bubble mixture acts as a surfactant and stabilizes the bubbles.

The visualization technique used to capture this image was to have a lot of lighting and a strong black backdrop. The image was created using a Nikon D3200 DSLR Camera. With the lighting in the ITLL on campus and additional lights under the bubbles the ISO was set at 1600. The F-stop was at f/5.6, exposure time 1/125sec, and at a focal length of 32mm. The lighting could have been better as well as the focus.

The final image has been cropped and edited. Post processing was used to highlight the texture and boundaries of the bubbles. Some portions of the background are a bit distracting and could have been smoothed out. The colors were brought up, contrast increased, and increasing exposure. These edits made the bubbles clearly the focus of the image.

CONCLUSION

The image allows one to clearly visualize the beauty and flow of bubbles. As seen in the image the bubbles take up the whole field of view. The bubbles also are varying sizes, but they all retain the same spherical shape. Ultimately the intent of the image was to photograph and analyze the bubbles. The artistic intent of the image was well captured, but I wish I could have analyzed the bubbles more with additional equipment it was a difficult task to get the camera settings right for this image. If I were to recreate this image I would get more lights and use a faster shutter speed.

REFERENCES

[1] University of California Santa Cruz

<http://scipp.ucsc.edu/~haber/ph5B/bubble.pdf>

