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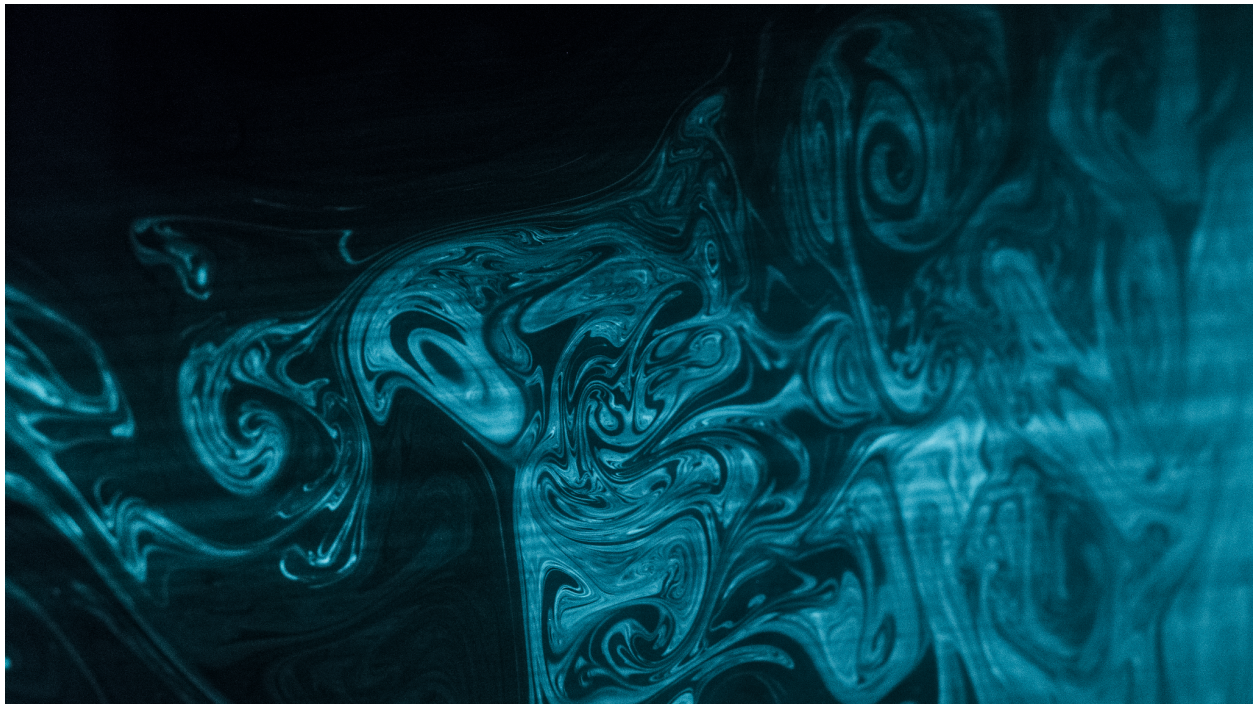
MCEN 5151 - Flow Vis

Prof. Jean Hertzberg

Team Second

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Team Second Report

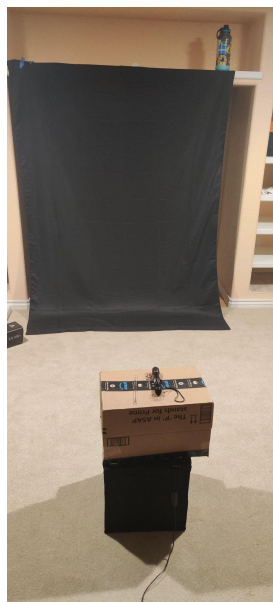


This is our Team Second assignment, we are free to use different techniques to visualize flows. Our group worked with lasers, a glass cylinder and fog machine. We planned to use a laser and glass cylinder to create a vertical beam of laser and use a fog machine to show the flow in the basement. We were not particularly trying to create a type of flow, rather air and fog are moving freely and we capture their paths. The laser machine we borrowed from the professor unfortunately did not work. Michael had to get a new laser after Bradley drove us around Boulder without luck finding a power laser.

The flow here is mostly turbulence flow, as most unregulated fluids are supposed to be. On the left side, there is some of the air in circles about to become turbulence flow, just like the air flow when you wave the arm up and down. Here, there is nothing restricting the flow, simply fog out of the fog machine and how they mix with air and move around the basement that does not have any other source of airflow. Although fog's density is higher than air, but they are very close, I'd estimate the Reynolds number is close to atmosphere 14.6×10^{-6} , with a little dense fog, this number might be a little lower, since fog viscosity will be a little higher than air. Most of the air is turbulent.

The visualization technique used is fog, at the same time, this is exactly what we are capturing and to the contrast of invisible air. Fog was generated by using a fog machine with fog juice made from mixing water and glycol. We turn on the fog machine right in front of the laser plane, it will mix with existing air, at the same time, the fog machine generates a little air flow to disrupt most stationary air.

Photographic technique is to capture the most clear and visible flow. We had a dark background setup to show the contrast better, below is a rough picture of the setup.



The laser with a glass cylinder shootout creates a vertical laser plane, the fog machine on the bottom left of the background will emit fog right into the laser plane, we take pictures from two sides. This setup without any other lights but laser requires the f stop to be as low as possible to capture more light, and a quick shutter speed to avoid motion blur which happened to some of the photos.

- Size of the field of view: 45.3 Degrees
- Lens focal length: 61mm
- Type of camera: Sony a7R Mk.ii. Full Frame digital camera.
- Original pixels: 7952x4472
- Final image pixels: 5599x3150
- Exposure specs: f/4, 1/150 sec, ISO 6400



The picture was cropped down a little to show the majority of the flow rather than $\frac{1}{3}$ of the empty background on the right, I also modified the color from green laser to light blue to

further highlight the contrast between air and fog. I also modified the exposure, contrast and brightness to make the flow easier to see as well.

I really like how the picture turned out, and the editing brings out a little different feel with cold color schemes. Image reveals the flow, from the process of taking the pictures, we can see how fast it moves and where the air moves towards, it's pretty neat to see in person. The question I have is: does the light strike across the entire screen of the picture? I think it might have been the cylinder, but I am not sure, some pictures have them, some pictures do not, maybe shutter speed as well?