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MCEN 4151

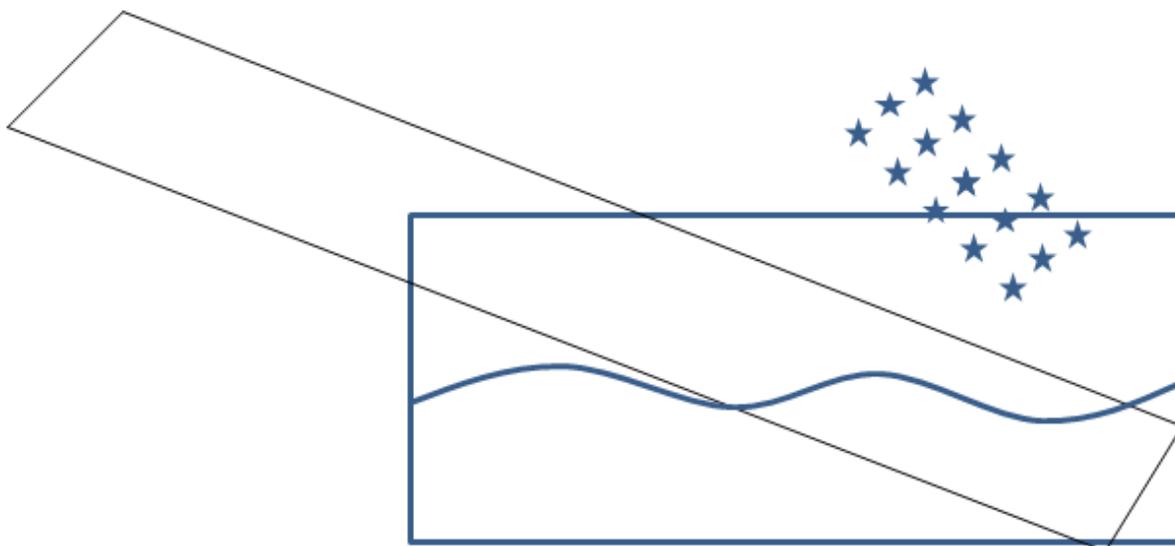
Team Assignment 2

Professor Hertzberg

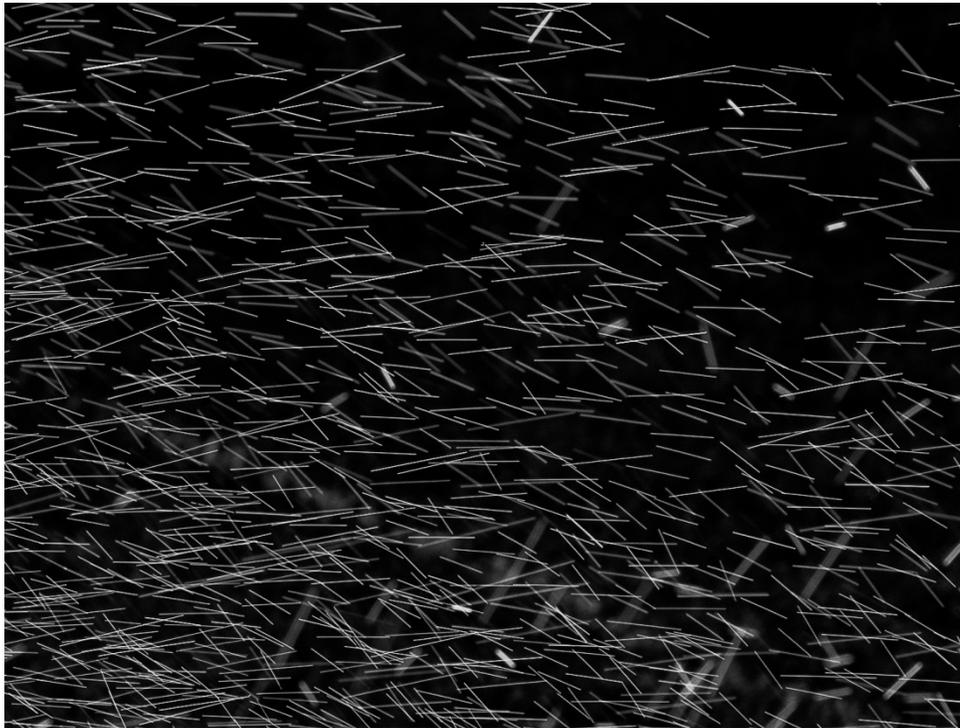
Reflective Sparks

The purpose of this photo was, again, to come together as team to produce another display of flow visualization. As a team, we wanted to explore some of the ideas of light physics and how light can be reflected and refracted with mirrors and water. The group consists of me along with Lotem Sella, Paul Sweazey, Wayne Russell, and Kelsey Spurr. In order to see how light could be affected by these mediums we chose to photograph sparks made from grinding a piece of steel. The end results were very unique and visually striking.

We bought a four foot mirror from Target that was stripped down to just the glass. It was then inserted into an old fish tank filled with water. The metal was ground so the sparks would fly over our set up. The following diagram depicts the setup we used.



The mirror was about 1ft x 4ft and the tank was about 1.5ft x 3 ft. The mirror did fit entirely into the tank but we managed with the materials we had. A piece of scrap steel and a grinder were used to create sparks. One phenomenon we were trying to observe was the reflection of light by use of the mirror. Reflection is the change in direction at an interface between two different mediums so that the wave front returns into the medium which it originated. In essence, it creates a mirror image of something at another location than where it is originally located (“Reflection”). Additionally, we wanted to observe refraction as well, which is quite different from reflection. Refraction is the change in direction of a wave due to a change in its medium (“Refraction”). In this specific design we wanted to try and observe light that is refracted, reflected, and refracted again. The light from the sparks was refracted by the water, reflected by the mirror, and then refracted again as it exits the tank. This experiment was done in a dark room so the sparks could be the main focus of the picture. The final image I chose to submit is seen below.



Several different angles were taken with different exposures, and different shutter speeds in order to get a variety of images. The angle of this photo is slightly offset and above the tank. The reflected and refracted light showed up good on a dark background. Exposure was increased slightly to get as much detail as possible in the dark room. I had decided to slow down the shutter speed so you can see the paths of the sparks in the

image. From an engineering point of view, this is almost like showing the velocity vectors of the particles. In a sense, this picture resembles a vector field.

The field of view is approximately 2 feet. I wanted most of the image to be engulfed with the sparks. I enjoy images where the circumstances and setting are unknown because it allows the viewer to use their imagination to decide what it is. The distance is about 4 feet away. If reproducing this image, the photographer needs to cautions of the sparks, which are essentially small chunks of hot metal. This could cause damage to the user and the camera. The shutter speed for this pic was 1/15 of a second. The post processing technique used was simply and increase in contrast.

At first glance, it is very hard to depict what is going on in this image. The foreground photo that is in focus are the sparks coming off of the steel. The trajectory of their lines depicts a velocity vector of the particle. From this information we can see the general direction of the sparks flying. Additionally, the background displays some of the light from these sparks that is being reflected and refracted. There are several “vectors” in the image that seem to be out of place, like they are traveling in the wrong direction. In future designs similar to this, there might be a better angle to capture a distinct different in the actual sparks and the refracted ones. I think it would also be interesting to play around with the field of focus with these types of images as well.