Image- Video 4 - Circular Motion Displayed by Paint

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1. Introduction

This report will go over the purpose, setup, capturing, and physics involved in my final Image- Video assignment. The purpose of this final assignment was to allow us one last chance to explore new flow phenomena as well as new photographic techniques. I chose to explore one of my favorite physics topics, circular motion.

2. Flow Phenomena

My project involved paint on a foam disk spinning in an ellipse. Circular motion has fascinated me since I first learned about it in high school physics. One trait of circular motion that was particularly interesting to me was tangential velocity. Tangential velocity is the linear speed of an object moving in a circle. In the case of my project, this means that as soon as the paint leaves the foam disk, it starts moving linearly. In my video, the paint makes circular splatters on the canvas. This happens because the paint is moving in a stream so each point in the stream starts moving linearly when it leaves the disk, but because there's a constant stream, the paint creates a circular pattern. The tangential velocity is equal to the angular speed multiplied by the radius ($v = \omega r$).

3. Flow Visualization Techniques

To make my video pop as much as possible, I used fluorescent paint and a UV light to create contrast in my image. To increase the contrast, I used black poster board so that it wouldn't reflect any of the UV light. To create the best paint pattern possible, I used a foam disk and attached it to a string hanging from the ceiling. I poured paint on the disk and had my sister apply a tangential force to spin the disk fast enough for the paint to leave the surface.

4. Photographic Techniques

To capture this video, I used my iPhone 11 held about two and a half feet about the setup. Because I was using my phone camera, I had little control over the aperture and ISO. The final video captured was 1080 × 1920 and 240.26 fps. While editing my video, I decided to slow it down to make the actual physics clearer and easier to see. My final video was slowed down 14%. I did not make any visual edits to the image because I felt that the image popped well enough on its own.

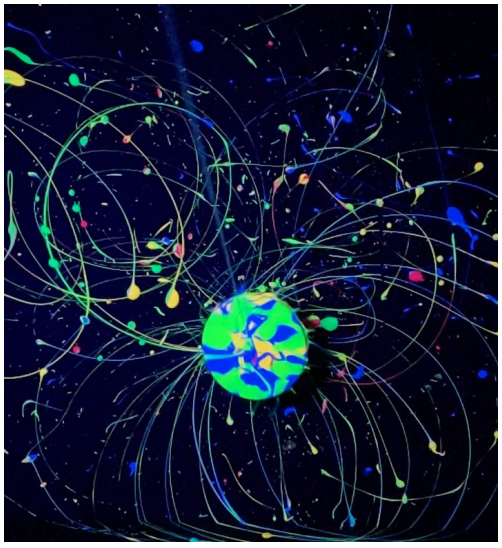

Figure 1: Frame captured from my video

5. Results

Overall, I was pleased with my final video. I think my decision to make the image fluorescent really makes the video pop. If I were to recreate this video, I would have used fishline to secure the disk to the ceiling to make it less visible in the video. My only complaint is that the string is visible and in my personal opinion, I believe it's a little distracting.

6. References

"Mathematics of Circular Motion." *The Physics Classroom*, www.physicsclassroom.com/class/circles/Lesson-1/Mathematics-of-Circular-Motion.