

Orientation Effects on the Damping and Plane Rotation of a Giant Pendulum

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1 abstract

Our goal was to experiment using a 10 meters long giant pendulum, and test simulated pendulum models. Firstly, we calculated 3 motion models, and later tested how different support materials will affect a pendulum's motion. Overall, we could only reproduce 2D behavior, and observed the effects of pendulum support materials on rotation.

2 Introduction

In our school, there is a pendulum over 10 meters long. We measured the behavior of that pendulum and simulated it and there was a difference between the simulation and experiment.

Thus, we performed experiments to observe what was causing this difference and research what affects a pendulum's motion.

3 Theory and Experiment

In our first experiment, we used 4 methods of approximation to simulate a pendulum's motion, and we calculated 3 models. In our second experiment, we hypothesized that a pendulum's support affects its motion, so we measured its effects. Specifically, we paid attention to the difference between two types of initial planes for our pendulum: parallel and vertical.

In our third experiment, we hypothesized that there was an effect on a pendulum's damping due to its wire material. Thus, we measured the effect of frictional force and wire material by using a small pendulum.

4 Results

Our simulations, were able to accurately reproduce 2 models, one but one model couldn't

be reproduced well. There was a difference between the calculated result and the experiment results of the rotation.

In our second experiments, we could see that there was certainly an effect to the pendulum based on its initial plane. In the parallel plane, the rotation of the pendulum was reversed. In the vertical plane, there was a strong effect on damping.

In our third experiment, we could only see a slight effect in the pendulum due to wire diameter and the wire's material.

5 Conclusion

In the simulation, 2D behavior could be reproduced, but 3D behavior couldn't. So we hypothesized that we found the effect of pendulum support. As experiment 2 shows, the two setups had effects on damping and rotating. In parallel setup, the direction of rotating was reversed. In vertical, more effects appeared in damping. Also, the difference between the two directions of the initial plane affects damping more than that of the wire materials and wire's diameter. We wanted to make the ideal moving Foucault pendulum, but we couldn't want to take over our experiment.

6 References

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