Interactive Physics

Background

The client is developing museum exhibits for children intended to teach concepts in physics. Their exhibits aim to be interactive and engaging while naturally communicating these physical phenomenon. A solution under consideration involves allowing the children to construct simulated experiments in a “sandbox” environment which they would then replicate with real world physical objects. This may prove to be particularly effective as this engages multiple modes of interaction and combines existing experience with touchscreen-based devices and physical toys. Further, as an exhibit, this solution has the potential to be particularly visually engaging, allowing for a larger number of children impacted by the exhibit.

Executive Summary

Physics engine solutions already exist in abundance and flexibility. Libraries like Google’s Liquidfun could allow for ease of development of effective approximations of real world experiments. This library can be used in web environments allowing for further ease of development and vast platform support (Android, iOS, Windows, MacOS, Linux, etc...). The software could provide an interface allowing users to select a template scenario which they could then modify and play around with. Users could drag and drop objects in the sandbox while also being able to adjust sliders controlling their physical properties. Depending on the physical objects available, these could be constrained to match, allowing for simulations that could be mirrored in the real world testing environment. As for the physical environment, it could be enough to just provide the objects and markers indicating relative properties (such as distance or weight).

Viability Analysis

Realistically, Liquidfun’s JavaScript implementation isn’t as easy to understand through documentation as it’s C++ parent. It may be beneficial to find a native web-based physics library with appropriate documentation. Liquidfun utilizes Node2D for it’s JavaScript implementation, which is more widely used and has more resources available to it. Further, web technologies may not perform well enough with larger simulations, though the increased ease of development and platform support outweighs this potential issue and it’s not likely the experiments will become complex enough to cause issues.

Risks and Rewards

This project could inspire a fresh wave of children excited about physical systems that go on to become physicists or engineers. The code itself and documentation generated for it could improve the state of related software tools. In particular it could inspire a wave of new simulations created with Liquidfun, as it’s biggest barrier for use is its relatively poor JavaScript documentation.

Closing

This approach is flexible, easily extended, and quick to develop. Children’s experience with mobile devices mean that it can be very approachable, avoiding the technology getting in the way of learning. Further, this approach is very easily made visually appealing. Actual investment costs are relatively low, requiring only the hardware to display a webpage while accepting touch input and any hardware required for building the interactive physical blocks.