**Problem**

Due to the addition of the <canvas> tag in HTML5, the possibility to create Javascript games that run on a user’s browser is becoming more accessible. A lot of games include common physics such as gravity or collision detection. Without a library, the physics must be defined and written each time a creator wishes to make a game. By writing a Javascript library that solves these physics problems, development time would be decreased and game development would become increasingly accessible.

**Approach**

The core physics game engine will be written in Javascript with an object oriented approach so as to focus on reusability and maintainability. Aside from the library, documentation will be produced that will describe the objects and methods within the library and support a new user trying to implement the physics engine into their system. Demos and examples will be produced, for instance, an app that lets a user drop shapes (bodies) into a scene, view how the shapes interact with other shapes and the surrounding world based on the applied physics. The app could include ways to affect the gravity with sliders and settings. A simple platforming game could be produced or a sidescrolling Flappy Bird style game. Depending on time, a website will be created to present the documentation and examples/games. The source code will be uploaded to Github along with the documentation and any examples.

**Objectives**

With the goal of a sandbox physics app in mind, certain key features of the library must be implemented before a demo could be created. These features would include:

* Rigid bodies – The core objects that have physics applied to them (position, mass)
* Movement calculations – Velocity, acceleration and how these are affected by gravity
* Collision detection – Allowing objects to interact and affect other’s physics
* Bounce – How a body’s movement is affected by a collision
* Joints – Anchoring objects to each other in order to build more complex bodies
* Elasticity – The ‘springiness’ of a joint or maybe even an individual body

Once these core features are implemented, a sandbox demo as well as a range of demo games such as a platformer could be made. The library could be extended past these but this is a good range of core functionality to aim for.

A major objective with this project is to design the library to be easily used, reused and modified. This means it must follow good Object Oriented design practices with well commented and easily read code. Furthermore, the documentation must make it clear how to library works and how it can be used. This is necessary for two reasons. It will help a user use the library within their system and understand how to integrate it and it will also help a programmer to contribute to the library if they wish to do so.

In order to present the documentation, demos and the source code a well designed website will be another objective. This will include a way to navigate the documentation within the browser. The demos can also be showcased and rendered on the browser. The demos could possibly have links to relevant aspects of the documentation for learning purposes.

**Timetable**

06/05/19 – Vectors, simple body physics, velocity, acceleration, gravity

13/05/19 – Refine kinetic physics, add controls

20/05/19 – Start on collision detection, start on website

27/05/19 – Continue work on collision, have UI for the documentation aspect of the website done

03/06/19 – Have collision detection mostly functional, start adding world bounds type of stuff

10/06/19 – Start work on Bounce, continue work on website

17/06/19 – Finish Bounce, start work on sandbox demo

24/06/19 – Finish sandbox demo, test engine, refine what has been done so far

01/07/19 – This will be a benchmark to have a simple but stable version of the engine with documentation written up. Testing and clean up.

08/07/19 – Finish documentation aspect of website and upload documentation for the first stable version of the physics engine

15/07/19 – Have all demos created and website done

22/07/19 – Make the demo video and work on dissertation

01/08/19 – Have dissertation and project done, maybe just make wee games to put up on the website (fix issues that arise when testing and trying to make wee games)

08/08/19 – Hand in

Throughout this schedule there will be regular uploads to Github. It is also important to note that testing will occur alongside the development of the physics engine at all stages.