matter-attractors by liabru

On looks:

smooth grass(fricCoeff = 0) & ground (visible rectangle/sprite of groudn (fricCoeff > 0);

Collision filtering to turn off/on objects?

Checkbox for FBD’s!!! Gravity always down, Fn perp to surface, friction parallel, tension pointing at sprint; get velocity indicator too

Logistics:

Max user inputs to avoid crashing matter.js

* Dynamic graph drawing of velocity and position
* Use an SVG to make a concave pit and other stuff
* Objects (let user set w, h, r, etc): Box; Car; Disk (different sizes, radii, lengths, and hollow vs dense; since u can set mOinertia, u can have user set the 2 radii, u draw it w the 2 radii, then do the calculatiosn behind the scenes to get mOi), Sphere, pendulum, 2 masses w light cord on frictionless pulley
* Free body diagram: Always displaying forces that will act on the object on “Play”; FBD is ON the object in the screen; how to display Fforce on FBD?
* Forces: Can select where on object to apply force (exactly what point, direction, and magnitude)

Gravity, air resistance, restitution, friction (static, kinetic): Can toggle on and off as a force; can change value

|  |  |
| --- | --- |
| Friction | Frictionless surface w a box of mass 1 slides across; user measures w ruler; measures again when changing mass (if same force, no effect cuz no friction) |
| Momentum |  |
| Incline | Box  Circles (cylinder, sphere, etc; diff moments of inertia; get 2d pics of 3d objects to put in for sprite) |
| Pendulum |  |
| Static equilibrium | Catapult see-saw thing |
| Attraction (grav, electric, magnetic) |  |

Add sand for more friction

Give users option to scale objects automatically based on mass, change color/darkness based on density, etc

use sensors to increase/reduce friction of objects to simulate surfaces changing (only now needa figure out how to show that visually – could just be a color change of object/area)

on play, have a timeline w linemarkers indicating pts in time where collisions occurred (for user to skip to and record data); auto resizes based on # of collisions (ex if 3 collisions and then no collisions for 20 seconds, can truncate that whole end of the timeline cuz objects r either off screen or not moving)

collision filtering and transparency for like when you want to see multiple cylinders slide down a ramp and see how diff moments of inertia affect rotation and time to get to bottom of ramp

Surface: incline (adjustable angle), downward circular hill, flat cliff with edge to fall off of (projectile motion);

Create path of object (to visualize projectile motion; wouldn’t be hard if u use draw to canvas based on coord of the object)

General: x-axis and y-axis labeled for measurements

Strings and tension forces need to be available as well!!! (obviously pendulum strings will exist, but I’m referring to like two blocks connected by a string, but the heavier one is pulled down by gravity and hanging on a pulley, etc etc

**Dashboard:**

Options: Pause, play, reset (to customizations b4 pressing play), clear (empties whole board/window)

On play: can edit forces incrementally or enter a force to change to at any time (this can help show static friction for example); can drag objects manually around (will prob have to base force on mouse speed?)

Values to display on screen/dashboard (can toggle on/off these values from dashboard): ΣF (magnitude, direction); velocity (dynamically changing), angVelocity, momentum, work, etc

After world functions:

Note collisions = perfectly inelastic when restitution = 0 I believe

Contact form for feature requests, bugs, etc

Some type of interactive tutorial

Way for Kipp to know you did it? (name/ID submit? etc)

Interactive problems (Ask Kipp makes lesson planning easier…):

What force is necessary to get object from pt A to pt B (person does math on paper, then puts in force # into program)? Visual dotted object at point b to show destination kinda thing (and can use the detector or whatever in p5 or matterjs to indicate success)

What torque is necessary to get circle object from pt a to pt b? (so person would need to know where to put the force vector on the screen — perpendicular and some magnitude).

What coefficient of friction necessary to stop object exactly 5 m away from bottom of ramp?

Extra:

Formula sheet (organized by units)

Sharing Physics Simulator setups for others to use/interact w (passport auth for this) (teachers can use this) (when do this, you save setups by saving the objects of the user (which contain position, size, etc)

? help icons to explain physics concepts perhaps (ex on inclines w a square, ability to show component forces, how to calculate, etc in ? bubble, things like that)

Add this as cool demonstration of forces (<https://www.youtube.com/watch?v=jsYwFizhncE>) (ask user to input how many digits of pi wants to approximate)

Have one giant [] at the top and .push / .remove to let the user add/remove objects from the pg and to make it easier ecode wise to find/access all the objects and set/change their values

Magnetism stuff

Positive / negative particle stuff + electric fields