EpicSam: BatteriesNotIncluded2
Project idea proposal

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Project ideas

Idea	Description
Haorui: interactive periodic table	A periodic table with all the elements being interactive
Kevin: mechanics simulation	A simulation that encompasses most/all the topics in the NYA mechanics course
Darius: waves simulation	A simulation that encompasses most/all the topics in the NYC waves & optics course
Ilyas: chemical reaction rate visualizer	A chemical rate visualiser using different concepts.
Selected idea: mechanics simulation	We are more familiar with and interested by the of mechanics topics

1) **Haorui: interactive periodic table of elements**

Main page features a periodic table. The user can interact with any elements and discover more about each element with models/animations. Additional features could also be implemented to further demonstrate different interactions involving one or more elements.

This will be an application that can help students learn more about all the elements in chemistry in a visual and interactive way.

The user will be able to control elements of the UIs such as sizes, animation playback speeds

- **Expected inputs:** from an enlarged periodic table, the user is expected to select any elements of their choice, then depending on the element they would then select values from sliders, spinners and buttons alike to for example change the temperature an element is under to see how that element would then react
- **Expected outputs:** outputs will include animations, text displays, graphs and such.
- **JavaFX components to be utilized:** timeline animation, JavaFX UIs, SceneBuilder
- **Feasibility:** The project will take up the entirety of the allotted time to complete. With enough effort it should be doable
- **Individual parts:**
  Haorui: will implement ⅓ of all elements
  Darius: will implement ⅓ of all elements
  Ilias: will implement ⅓ of all elements
  Kevin: will implement external simulations that can help demonstrate concepts related to the periodic table

2) Kevin: All-in-one Mechanics Physics Simulation

The main page of the will show different types of physics simulations based on mechanics concepts such as Free-fall motion, Projectile motion, Friction, Collision, etc. In each of the simulations, the user will be able to change some parameters to change how the simulation will run when played.

The simulations will help users visualise the subjects learnt in Mechanics.

- **Expected inputs:** users are expected to to input any values such as the angle of launch, the speed of the object, the height, the surface type, etc.
- **Expected outputs:** The outputs will include an animation, graphs, and the calculated result.
- **Feasibility:** We will be able to use the JavaFX timeline animation and as well as its UIs. If each of us do our separate tasks for projectile motion, free-fall, etc, we will be able to finish with our allotted time.
- **Individual parts:**

    Kevin: Projectile motion

    Haorui: Dynamics

    Darius: Friction/Collision

    Ilyas: Freefall

3) Darius: Waves Physics Simulation

It would be a simulation that helps the user with topics learnt in physics. They will be able to look broadly at the many topics, like simple harmonic motion, harmonic waves, doppler effect, interference and diffraction. The main page would lead to each different topic. The user will be able to interact visually with the concepts.

- **Expected inputs:** depending on the topic, the user will be able to adjust many values such as the frequency of a source wave, slit width and distance, the medium, by using sliders, buttons, and dragging objects around.
- **Expected outputs:** The simulations will update after every change and show the user the new result through animations and graphs.
- **Feasibility:** we will be able to complete the task within the allotted time by using JavaFX elements like buttons, graphs, and animations.
- **Individual parts:**
    - Haorui: simple harmonic motion
    - Darius: doppler effect
    - Kevin: interference and diffraction
    - Illyas: harmonic waves

4) Ilyas: Chemical Reaction Rate Visualizer

This project will simulate and visualize the effect of different factors on chemical reaction rates. It will help users understand key chemistry concepts such as the Arrhenius equation, rate laws, and catalysts. The program will allow users to interact with various parameters and observe their impact on reaction speed through animations and graphs.

- **Expected inputs:** Users can modify reaction parameters like temperature, concentration, catalyst presence, and reaction order using sliders, dropdown menus, and buttons.

- **Expected outputs:** The simulation will dynamically update based on user input, displaying real-time animations of reacting particles and a graph showing concentration changes over time.

- **Feasibility:** The project is achievable within the given time using JavaFX components such as animations, charts, and UI controls.

- **Individual parts:**

Haorui: Effect of temperature on reaction rates (Arrhenius equation)
Darius: Concentration-based rate laws
Kevin: Catalyst effect on reaction speed
Ilyas: Reaction order and its influence on rate laws

Selected project idea

We have chosen Kevin's **all-in-one mechanics simulation** as our final project idea because we are all more familiar with topics in the mechanics course, it sounds more interesting to the majority of us, and we can feasible be able to complete all the necessary features in by the deadline.

Thank you