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Project Proposal

Our project involves drawing a physical pendulum in 2D and having it oscillate around a chosen fixed point. Our program will calculate the center of mass and we will attempt to allow the user to create the pendulum with varying density, based on color of material used. Once the user chooses a point to oscillate around and an initial angle (small enough to warrant small angle approximation), the drawn figure will begin to oscillate. The physical principles illustrated are conservation of energy and simple harmonic motion. We plan to make the project in NetLogo.

Our first button is the draw shape button. Once the user has selected this button, they can click and drag their mouse on the screen to create their physical pendulum. We will offer an assortment of colors in an attempt to mimic different materials of varying density (this may not be a feature in the program if time runs short. Implementing the oscillation is the top priority as of now). There are no restrictions on what the shape has to look like. It doesn't have to be closed and it can cross over itself. Once the user is satisfied, they can reclick the button to stop drawing. Then they can click the COM button which finalizes the drawing and marks the center of mass. This is done by taking a literal weighted average of the y-coordinate and x-coordinates of the parts of the physical pendulum with the weights being determined by the color of each piece. It should be noted that once the user performs this action, they will be unable to draw more to their pendulum. The only way to alter the pendulum would be to click the reset button and start over. Once that is all complete, the user will choose their pivot point by selecting the pivot button. Once this button is selected, they can select one and only point for which their pendulum will oscillate about. This point is appropriately shaped like a metal point to portray the physical pendulum being fastened to a wall at this point. Once the pivot point is selected, the pendulum will rotate to equilibrium position so that the the center of mass lies on the same vertical line as the pivot point. In this rotation, the center of mass moves so that its y-coordinate is never increasing. Of course, the pivot point stays fixed. Now the setup is complete. All that remains for the user to do is select an initial angle. We have set up a slider ranging from the angles of -15

degrees to 15 degrees that the user can choose from to set up an angle with respect to the vertical. We determine what the period of the pendulum should be by approximating the moment of inertia by using small squares and then the pendulum will start oscillating so that it matches that period and has roughly the same angle acceleration that a real pendulum of same mass and shape would have.