Physics Behind the Simulation: A CS251 Report by Group 21.

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Overview

Introduction

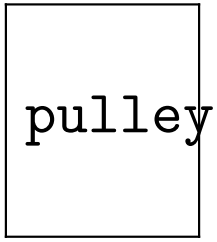
The purpose of the report is to explain the physics behind the working of the Rube Goldberg machine. It carefully documents all the physical laws and axioms which are being followed in doing the simulation by using Box2D.

Overview

Body

- Pulleys
- Dominos
- Newton's Pendulum

Pulleys



Pulley is a simple form of machine. They make jobs easier to do. The pulley in our project is used to transfer the horizontal energy of the ball into the vertical energy of the plank attached to the pulley. The force on the left side of the pulley is the force applied on the ball falling from the shelf due to gravity(newtons laws reference to newton's paper here)

$J * R = I * \alpha$

where

J is Impulse on the domino from the previous domino

R is height of domino

I is moment of inertia of the domino about point of contact with ground

α is angular acceeleration of dominoes

Dominos

Dominos are a series of thin planks placed closed to each other. They give rise to a chain reaction when the first domino topples as each domino, on toppling, in turn topples the next domnio and so on. This a grreat exapmlpe of impulse transfer resulting in a chain reaction.

$\sum_{i=1}^{n} m_i * v_i = \kappa$

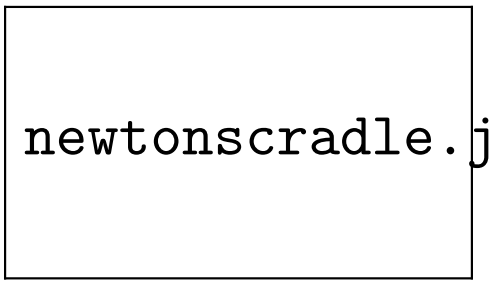
where

m_i is the mass of the ith element

v_i is the velocity of the ith element

κ is a constant

Newton's Pendulum



Newtons Pendulum named after Sir Isaac Newton, is a device that demonstrates conservation of momentum and energy via a series of swinging spheres. When one sphere on the end is lifted and released, it strikes the stationary spheres; a force is transmitted through the stationary spheres and pushes the last one upward.

$p_i = p_f$

where

p_i is initial momentum

p_f is final momentum

Overview

Conclusions

The report gives a brief description of three elements used in our Rube Goldberg machine and the physics behind each of them. Along with each physical entity are an image and a physical equation related to that entity.

Overview

References

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