HANDS-ON WITH SIMULATION TOOLS:

FALSTAD CIRCUIT SIMULATOR AND ALGODOO

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Falstad's Circuit Simulator

A circuit simulator is a great way to learn about circuits, test new designs, or troubleshoot a design prototype that has failed on the breadboard.

It offer a range of features, from simple interactive models to complex system dynamics simulations.

A collection of free online simulations for physics, math, and engineering.

https://www.falstad.com/circuit

This program is free software: you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation, either version 2 of the License, or (at your option) any later version.

See the GNU General Public License for more details.

For details of licensing see http://www.gnu.org/licenses/.

Source code (Paul):https://github.com/pfalstad/circuitjs1

Source code (Iain):https://github.com/sharpie7/circuitjs1

Important features

Free software	Standalone(offline) versions can be saved to your system.	More applets
Circuit - level Simulation	Full screen version is available.	It yields results in seconds!

This tool can be used to demonstrate many concepts of grade 10^{th} and 12^{th} like…

- **Resistor in series and parallel**
- **Ohm’s law**
- **AC circuits**
- **Logic Gates and many more.**

Key Tools

1. File menu: It allows you to load or save circuit description files. You can also export a circuit description as a link so you can share a circuit with others.

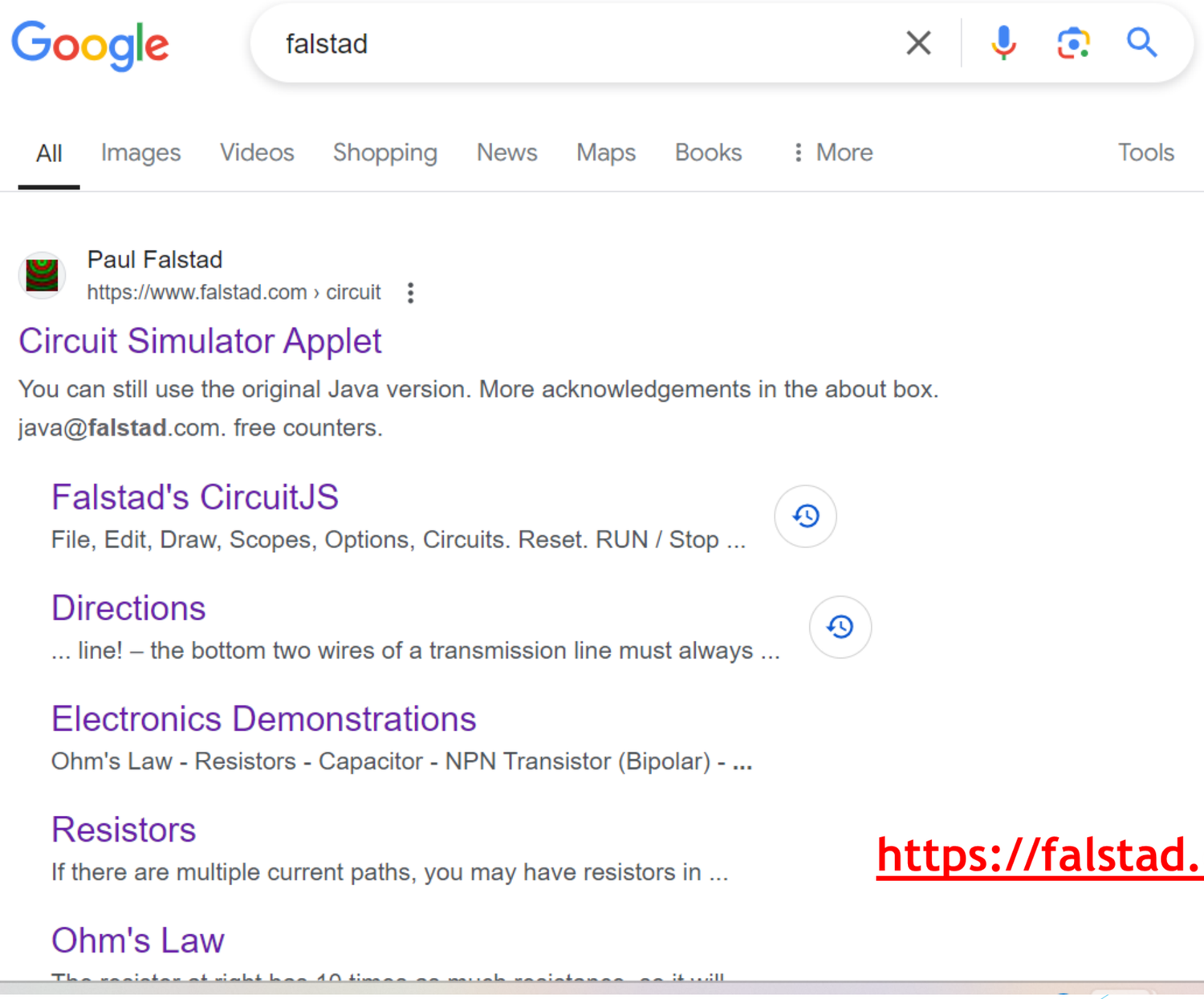
2. Reset: This button resets the circuit to a reasonable state.

3. Run/Stop: This button allows you to stop the simulation.

4. Simulation Speed: This slider allows you to adjust the speed of the simulation.

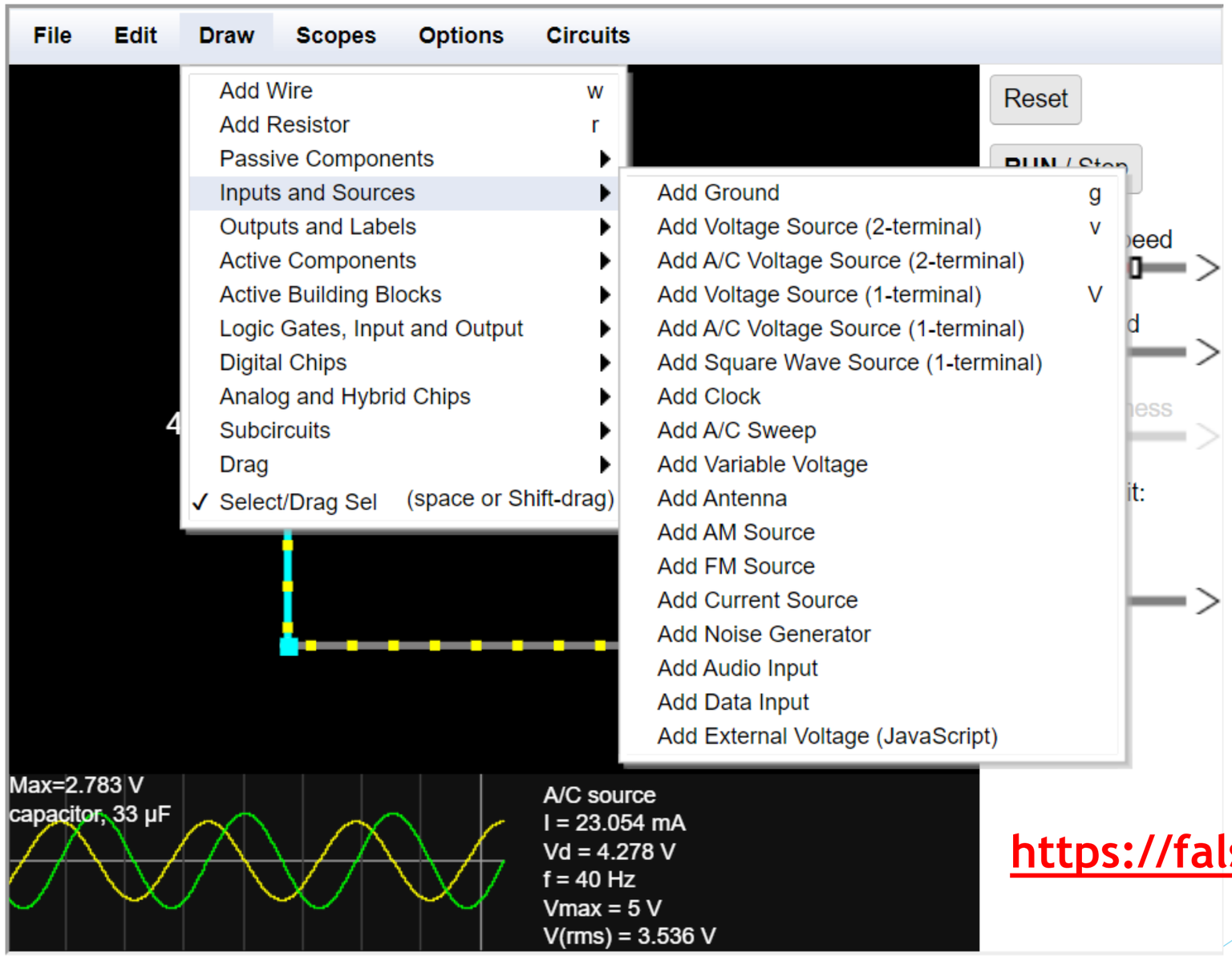
5. Current Speed: This slider lets you adjust the speed of the dots, in case the currents are so weak (or strong) that the dots are moving too slowly (or too quickly).

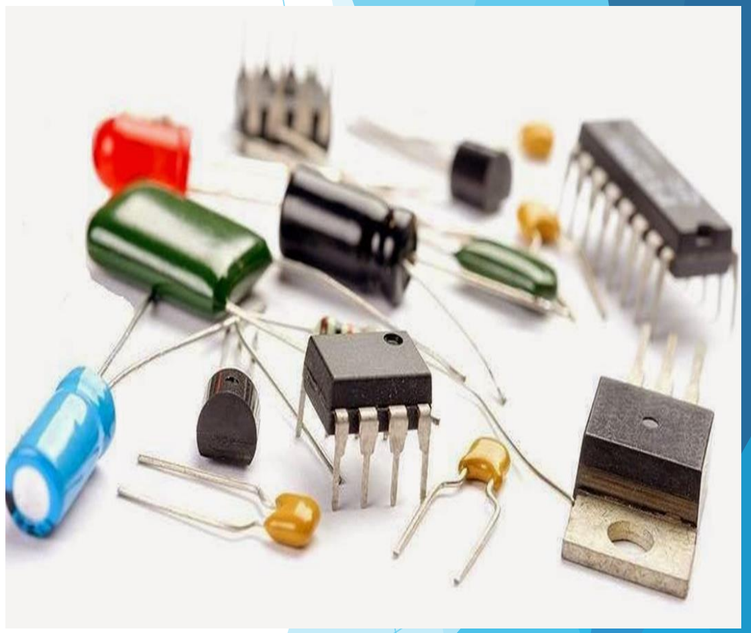
6. Circuits menu: It can be used to view some interesting pre-defined circuits. Once a circuit is selected, you may modify it all you want.



https://falstad.com/circuit/circuitjs.html

Tools for developing Circuit simulator





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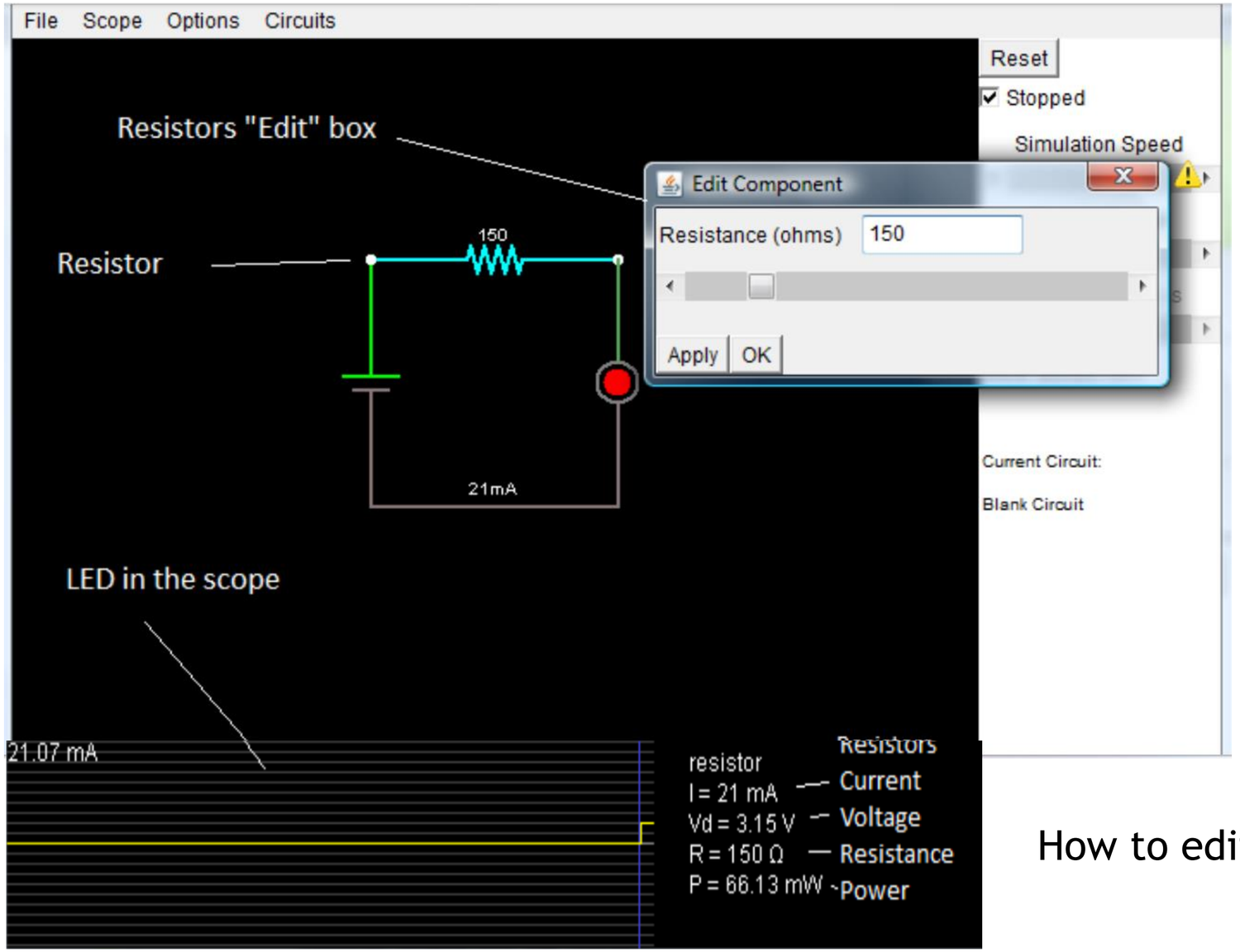
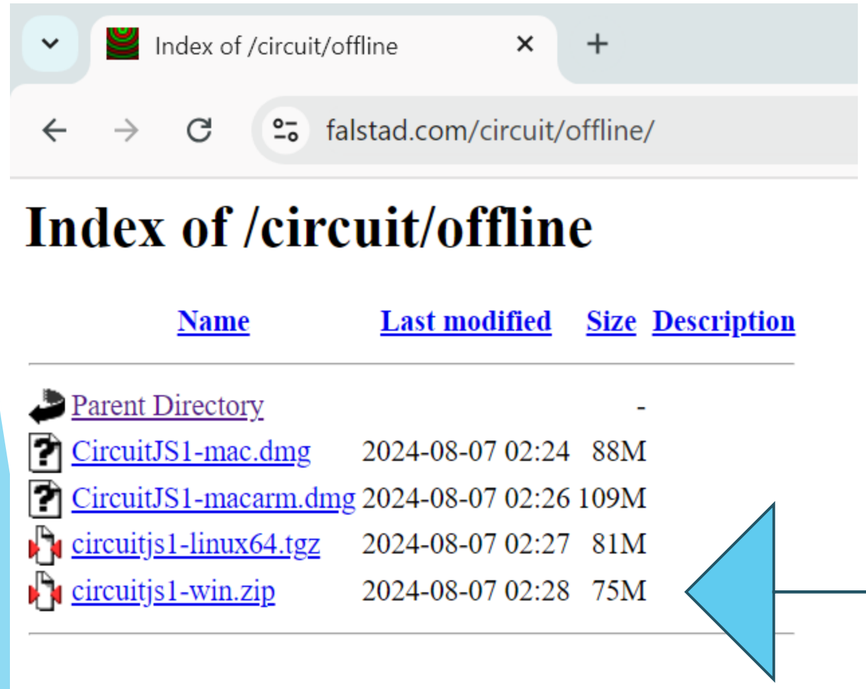


How to edit values of electrical circuit???

How to download standalone(offline) version?

https://www.falstad.com/circuit

Click on circuitjs-win.zip file and download it.



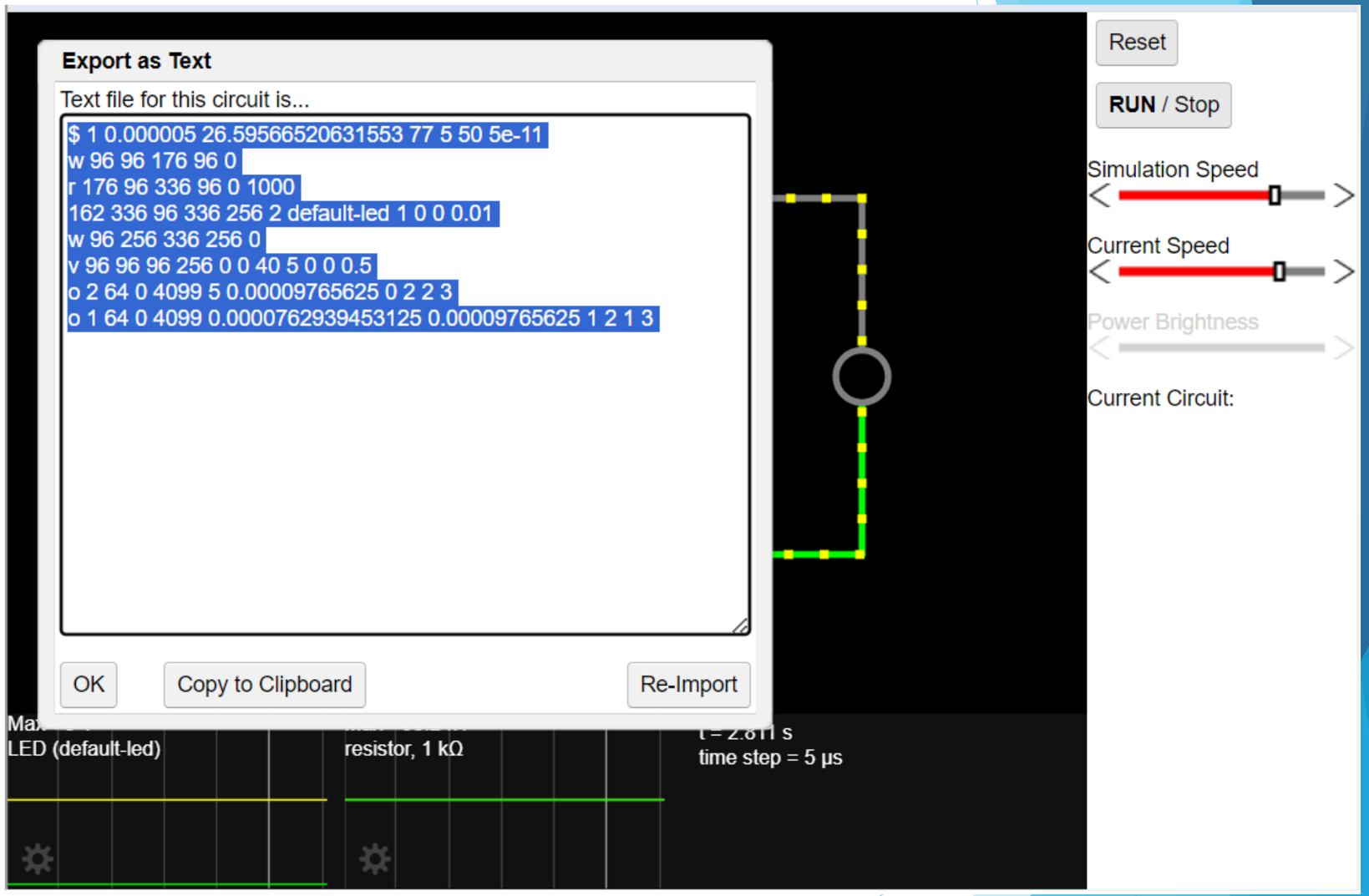
To save a circuit that you have made go:

File > Export > (Copy the code in the export box) > (Paste into a .txt document or similar) > Save the code.

When loading a circuit:

Find the .txt (Or similar file) > Copy the code > (File > Import) > If there is any code in the import box, clear it and paste your code into that box.

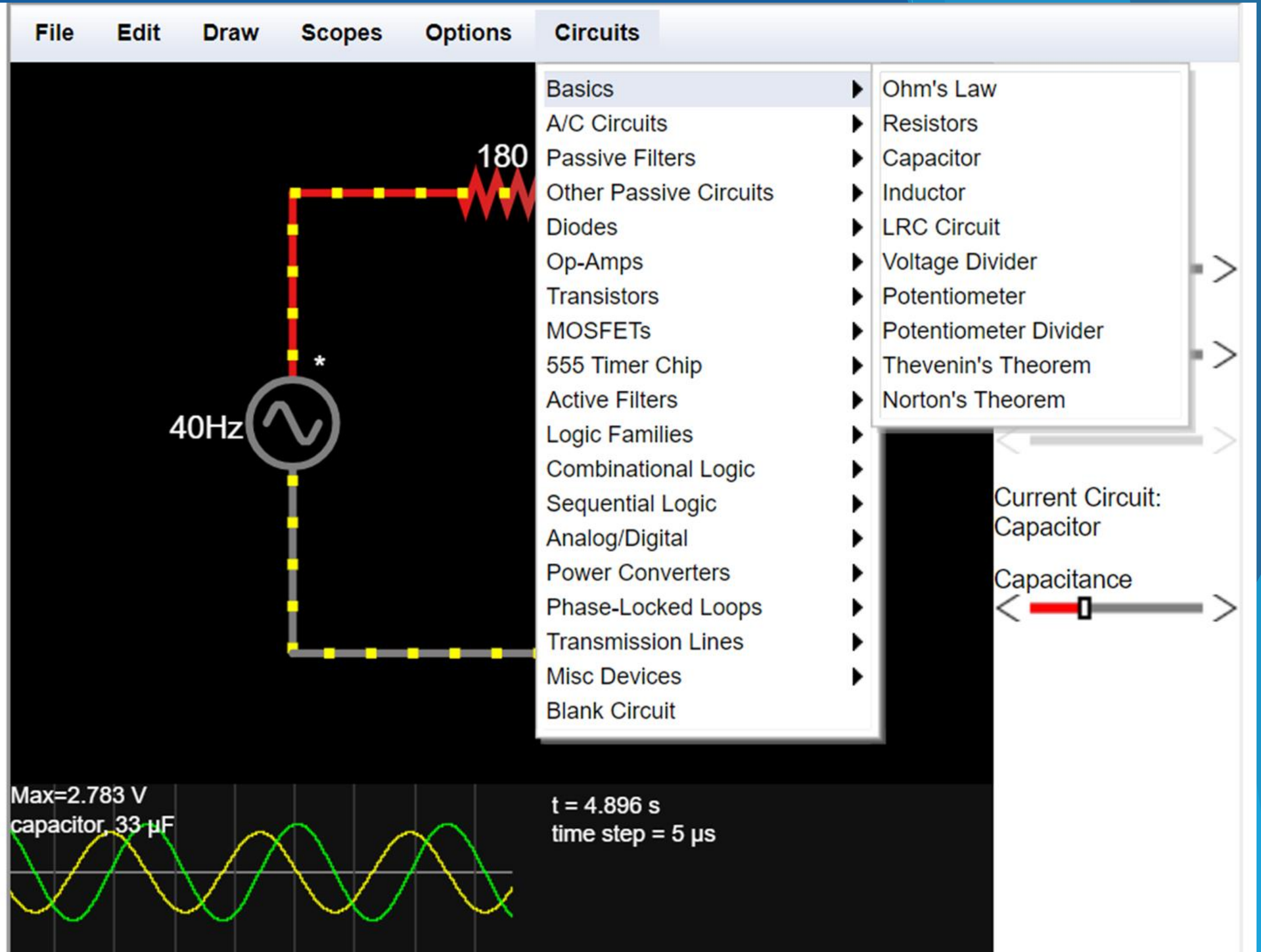
New Text Document.txt



BASIC CIRCUITS

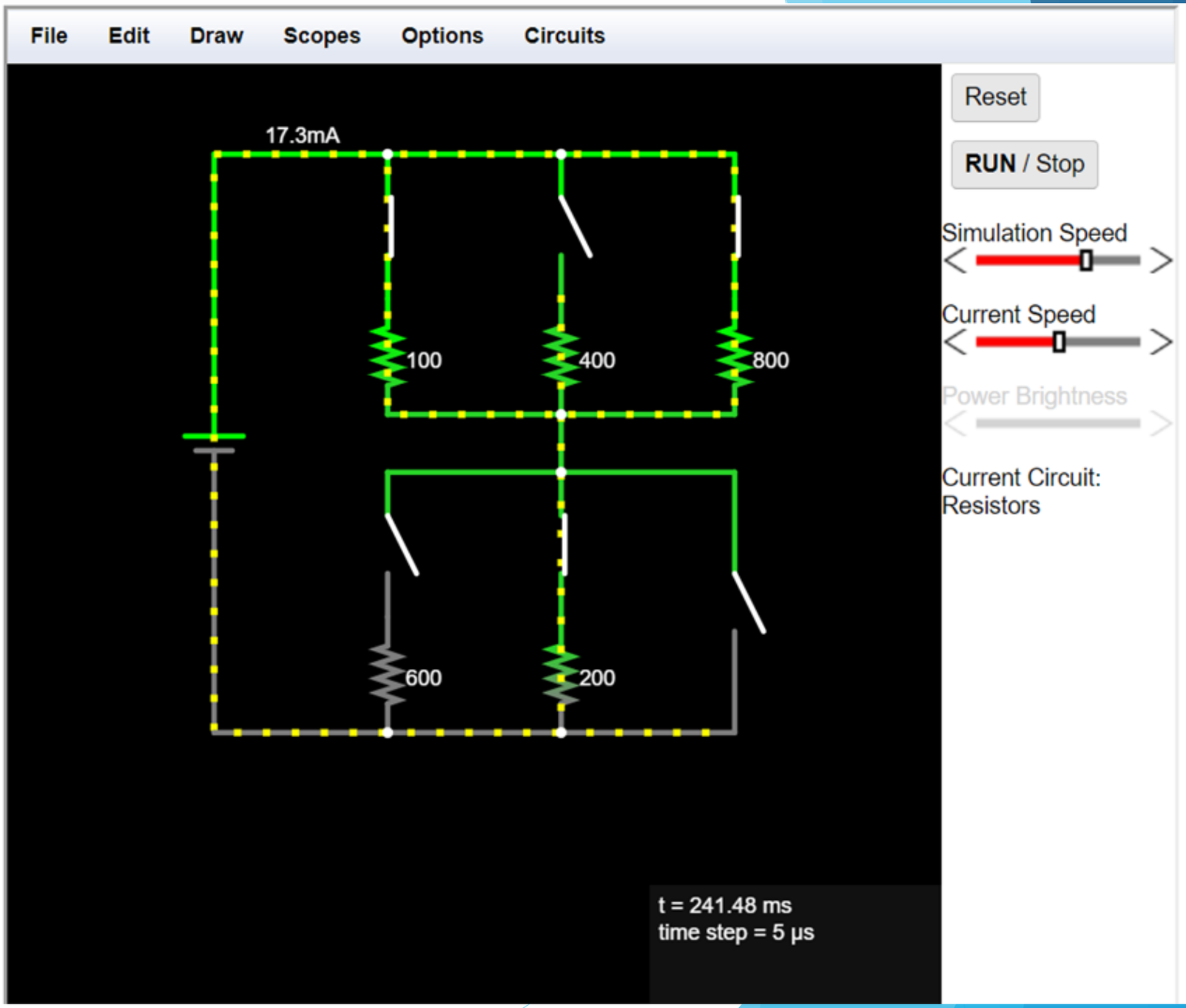
	RESISTOR		VOLTAGE DIVIDER
	CAPACITOR		POTENTIOMETER
	INDUCTOR		OHM'S LAW
	LRC CIRCUIT		THEVENIN'S THEOREM

All many circuits!!!



Resistor-This is a java applet showing a simple resistive circuit.

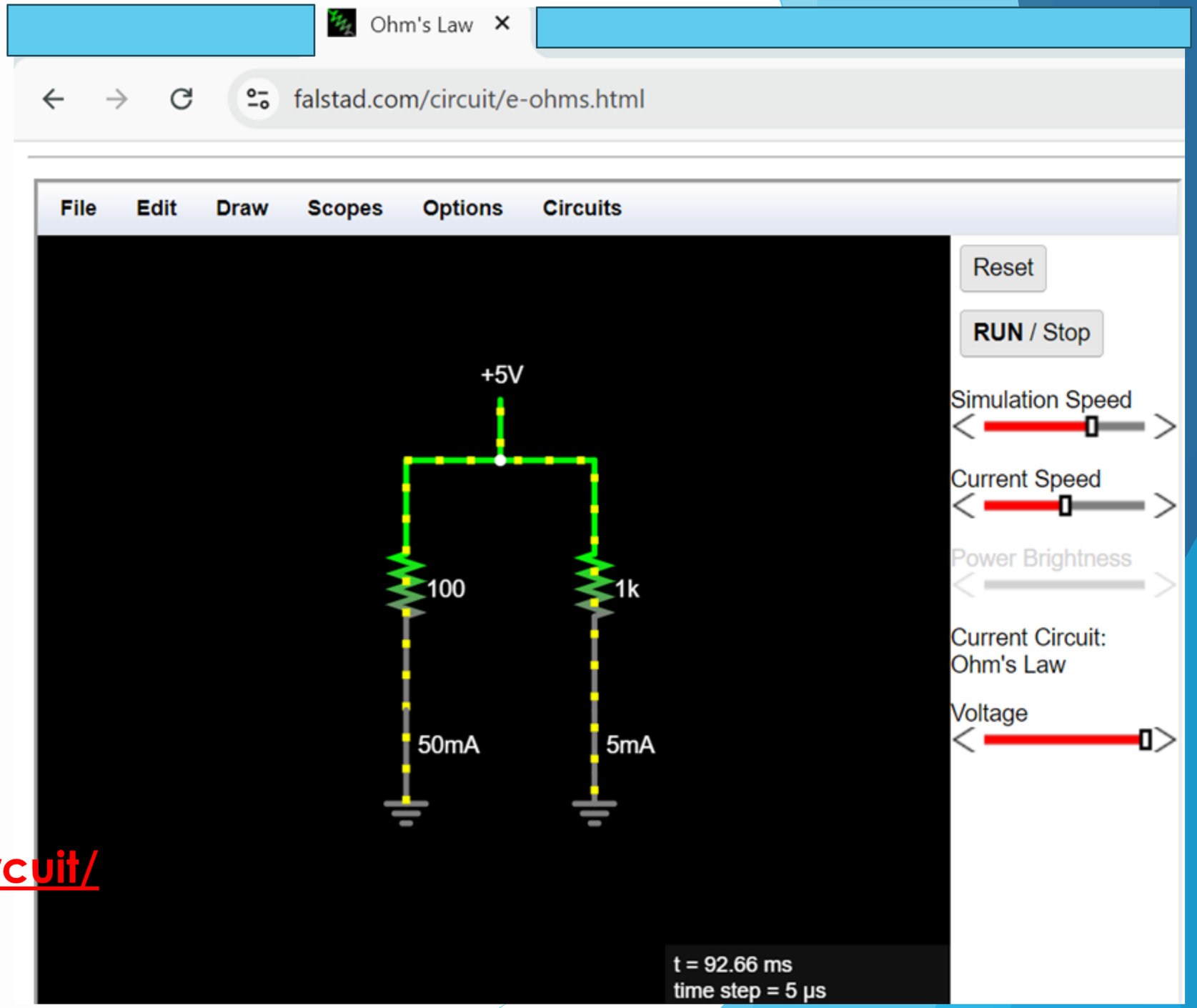
https://www.falstad.com/circuit/



Ohm's law states the relationship between electric current and potential difference. The current that flows through most conductors is directly proportional to the voltage applied to it.

Ohm's Law-This is a java applet showing a simple demonstration of [Ohm's Law](https://www.falstad.com/circuit/).

https://www.falstad.com/circuit/

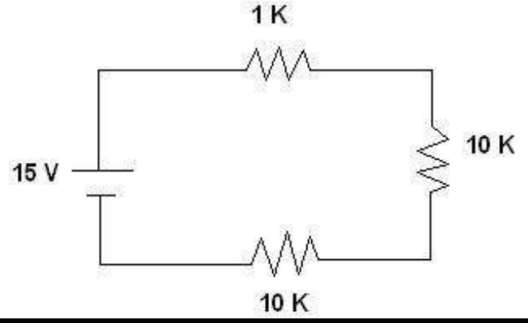


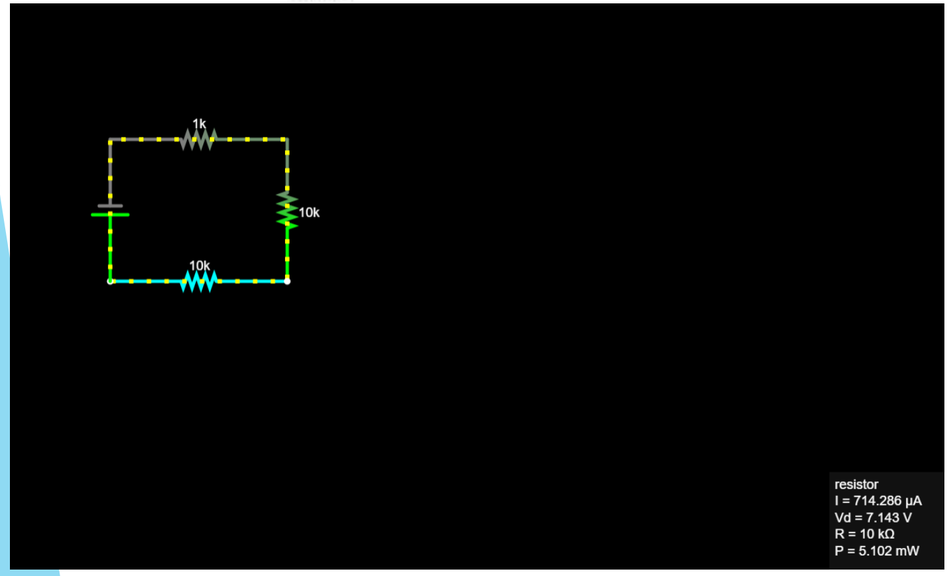
HANDS-ON EXERCISE

Exercise1: Given the circuit shown in the figure:

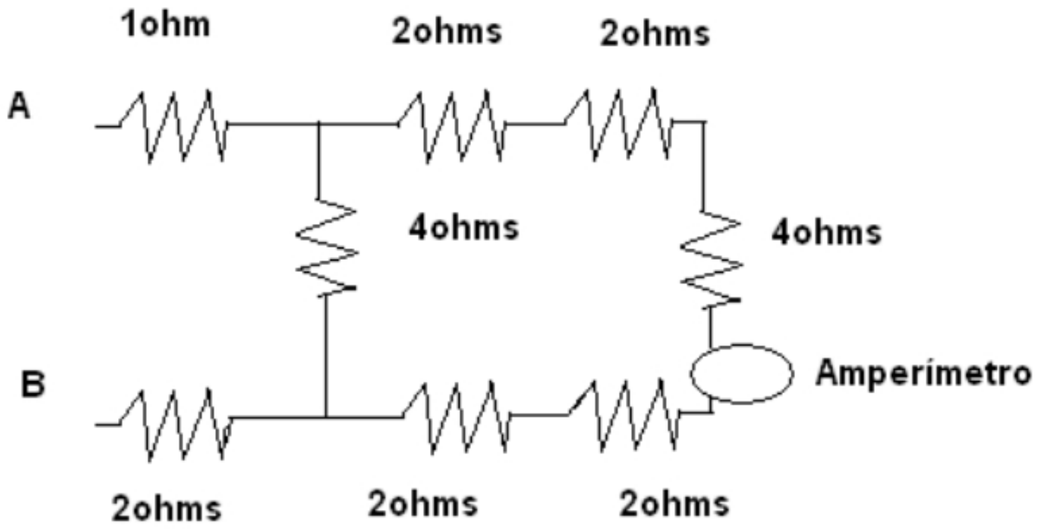
Measure the total resistor of the circuit

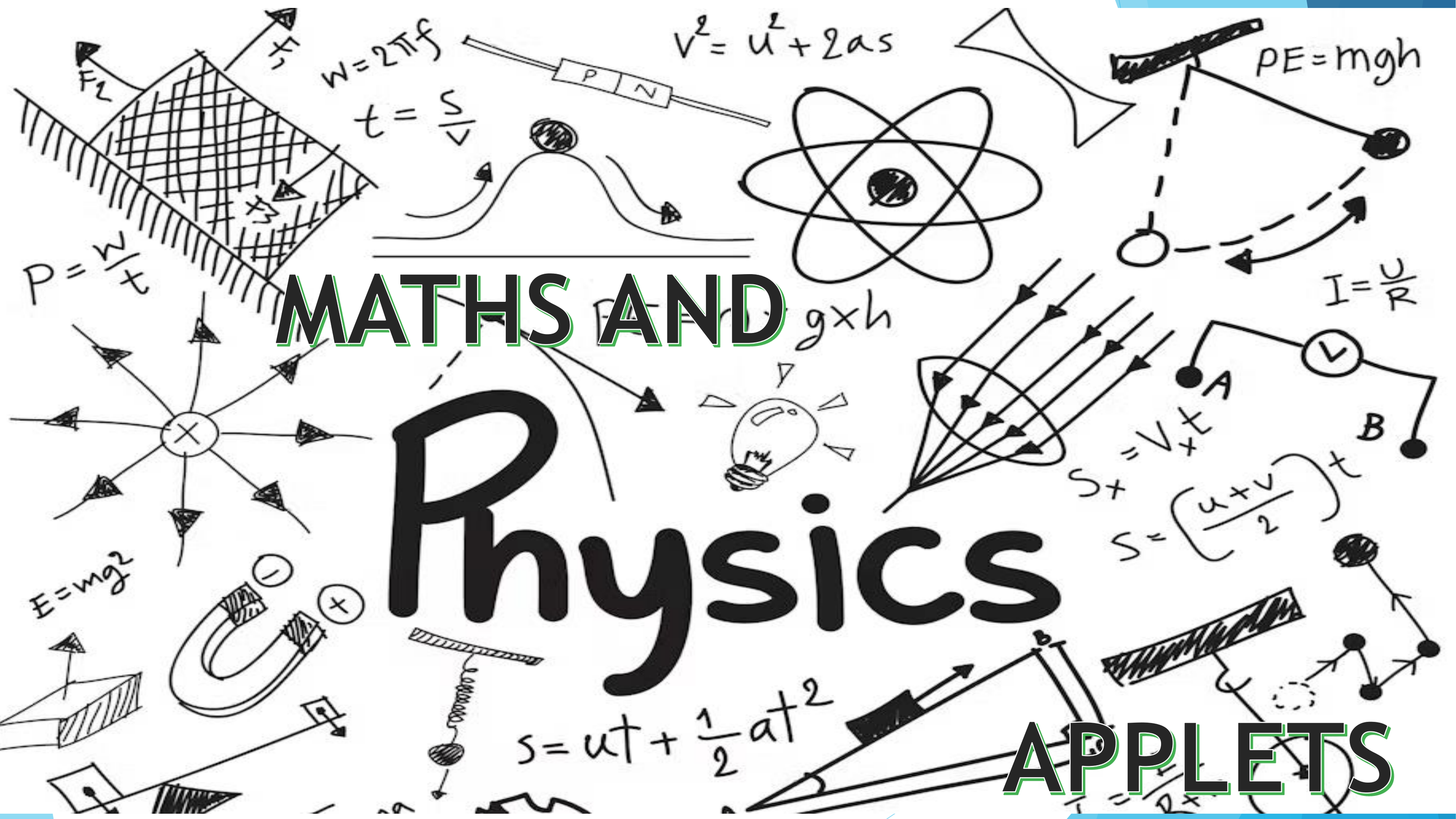
a) Do a screen capture for the circuit
b) Calculate the voltage drop of 1 KΩ resistor
c) Calculate the voltage drop of 10 KΩ resistor





Exercise 2:. Determine the equivalent resistor of the network in the following figure. What is the voltage drop between A and B if the ammeter shows 1 A? Also, do a screen capture for the circuit.




MATHS AND
Physics
APPLETS

CONCEPTS learner can understand !!!

Oscillations and Waves

Electricity and Magnetism: Statics

Electrodynamics

Thermodynamics

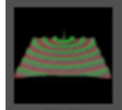
Quantum Mechanics

Mechanics

falstad.com/mathphysics.html

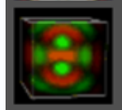
These are some educational applets I wrote to help visualize various concepts in math, physics, and engineering. They were originally written in Java, but they've mostly been converted to Javascript, so you should be able to view them without a Java-capable browser.

Oscillations and Waves



Ripple Tank (2-D Waves) Applet
Ripple tank simulation that demonstrates wave motion, interference, diffraction, refraction, Doppler effect, etc.

2-D Waves Applet
Demonstration of wave motion in 2-D.

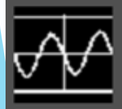


3-D Waves Applet
Demonstration of wave motion in 3-D.

Coupled Oscillations Applet
Demonstration of longitudinal wave motion in oscillators connected by springs.

Dispersion Applet
Dispersion and group velocity.

Acoustics

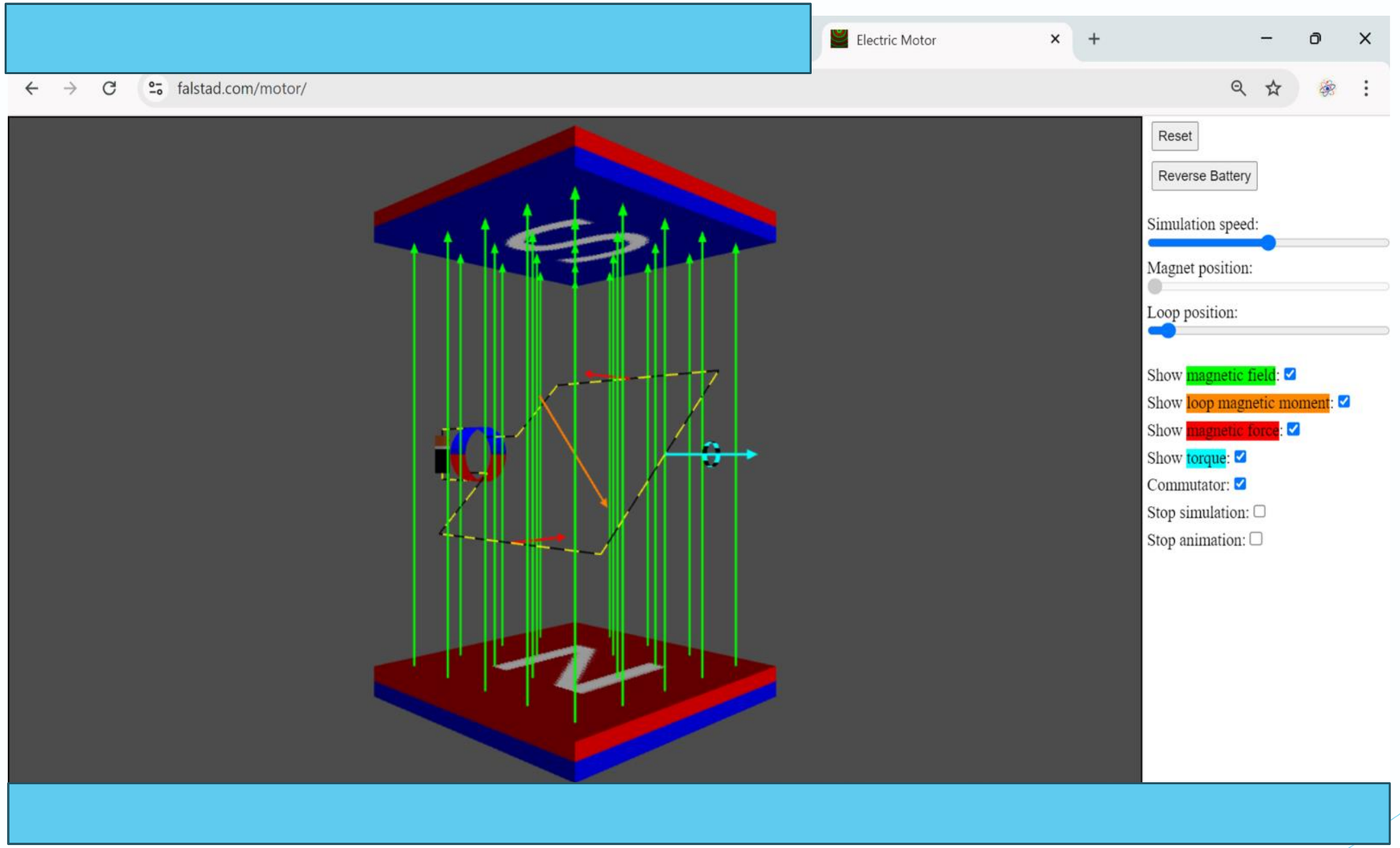


Loaded String Applet
Simulation of wave motion of a string.

Rectangular Membrane Waves Applet
Vibrational modes in a 2-d membrane.

https://www.falstad.com/mathphysics.html

ELECTRIC MOTOR



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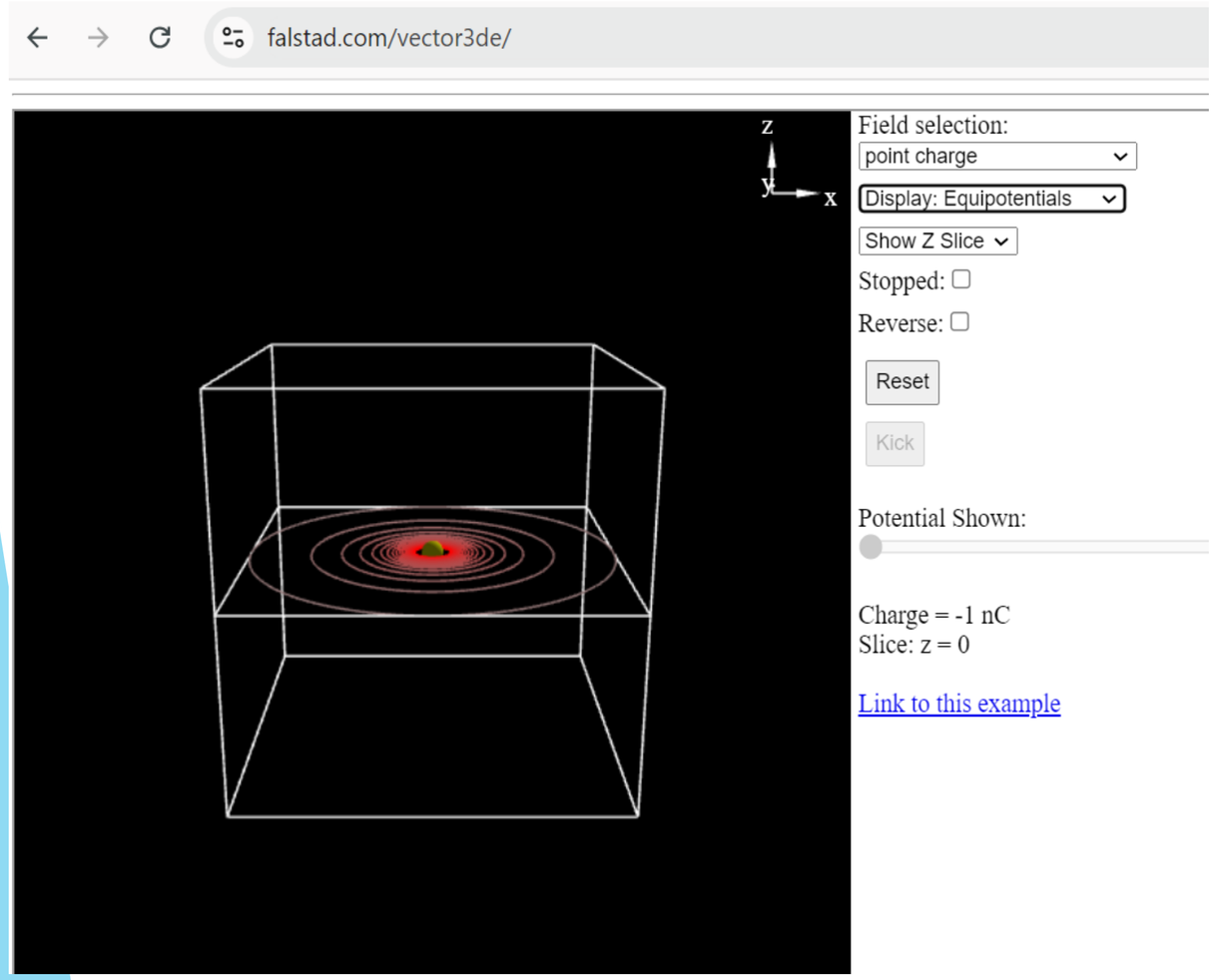
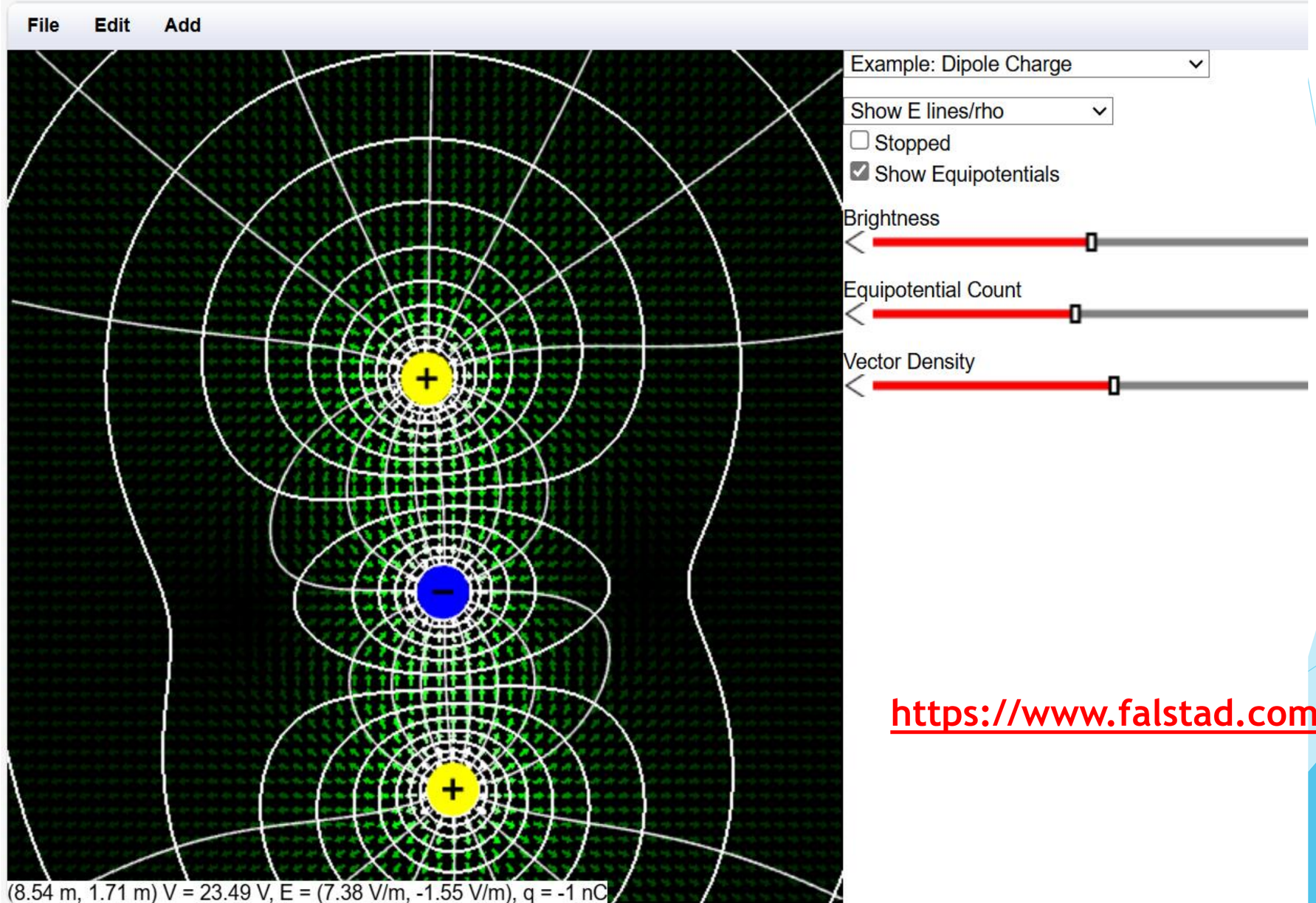
Electrostatics 3-D demonstration



- This java applet is an electrostatics demonstration which displays the electric field in a number of situations.
- You can select from a number of fields and see how particles move in the field if it is treated as either a velocity field (where the particles move along the field lines) or an actual force field (where the particles move as if they were charged particles).
- This helps you visualize the field.

https://www.falstad.com/mathphysics.html

Exercise- Illustrate the effect of electric field and electrostatic potential on point charge due to a dipole and do a screen capture of it.



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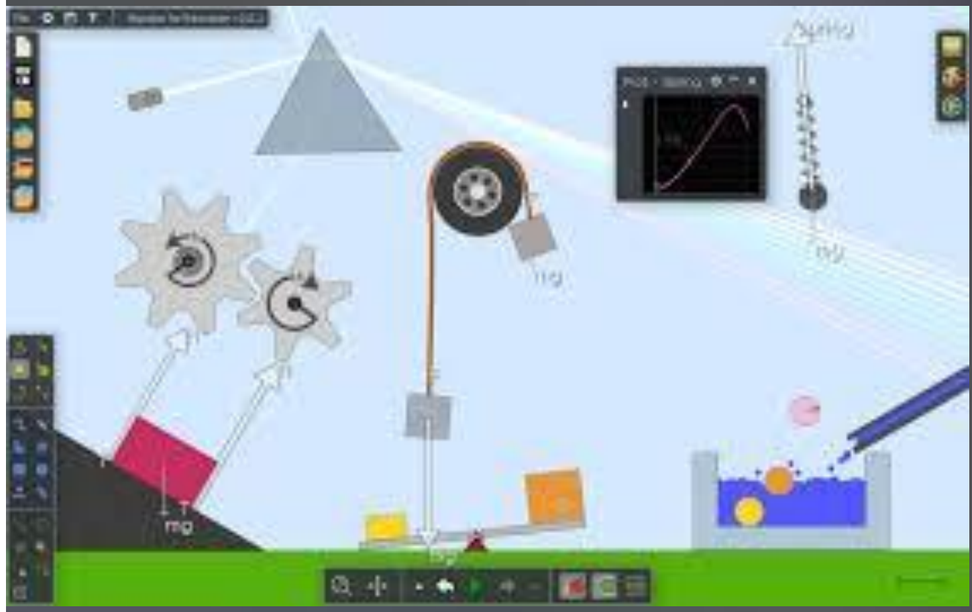
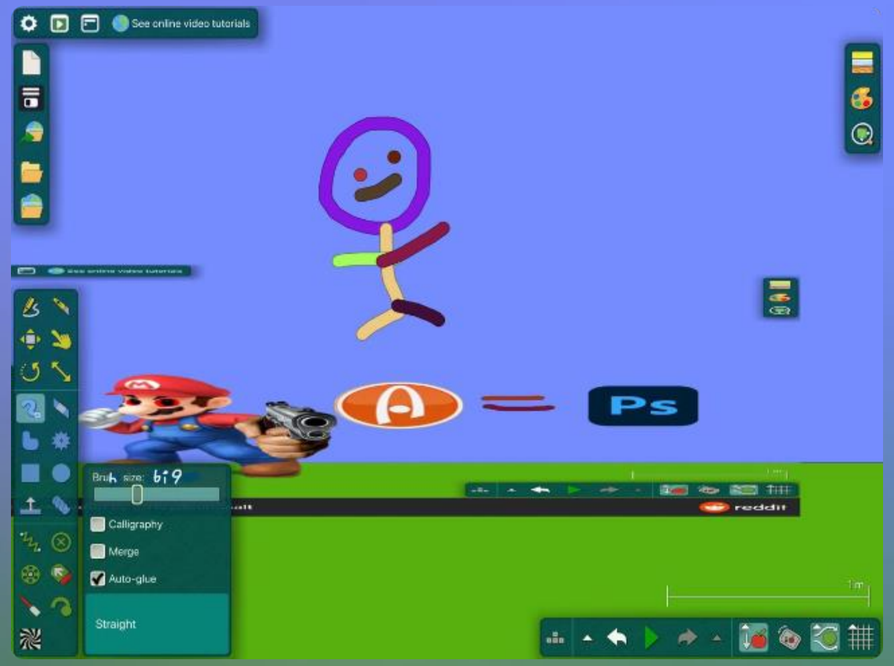
Algodoo





What is Algodoo?

Algodoo is a user-friendly physics simulation software that allows allows users to design and build interactive 2D worlds. This intuitive intuitive software makes it easy to create objects, apply forces, and forces, and observe the resulting motion and interactions.

Physics Sandbox

Algodoo offers a playground for for experimenting with physical physical concepts like gravity, friction, and collisions.

Visual Programming

Its visual programming interface interface enables users to create create complex scenarios with with ease, promoting hands-on on learning.

Educational Tool

Algodoo is widely used in education to teach physics concepts and inspire and inspire creativity in students of all ages.

Key Features of Algodoo

Algodoo offers a range of features that make it a versatile and powerful tool for physics simulations and creative exploration.

1 **Object Creation**

Algodoo provides a diverse set of objects to create interactive simulations, including balls, blocks, ropes, springs, and motors.

2 **Material Properties**

Users can customize material properties like density, elasticity, and friction to create realistic simulations of different materials.

3 **Force Application**

Algodoo allows users to apply forces like gravity, wind, and friction to objects, simulating real-world scenarios.

4 **Simulation Control**

Users can control simulation speed, pause, and rewind to analyze the results and understand the physics behind the interactions.

Applying Physics Principles in Algodoo

Algodoo offers an interactive platform to explore fundamental physics principles in action.

1

Newton's Laws of Motion

Simulate and observe the effects of inertia, acceleration, and force on objects.

2

Conservation of Energy

Create simulations that demonstrate the transfer of energy between different forms, such as potential and kinetic energy.

3

Gravity and Friction

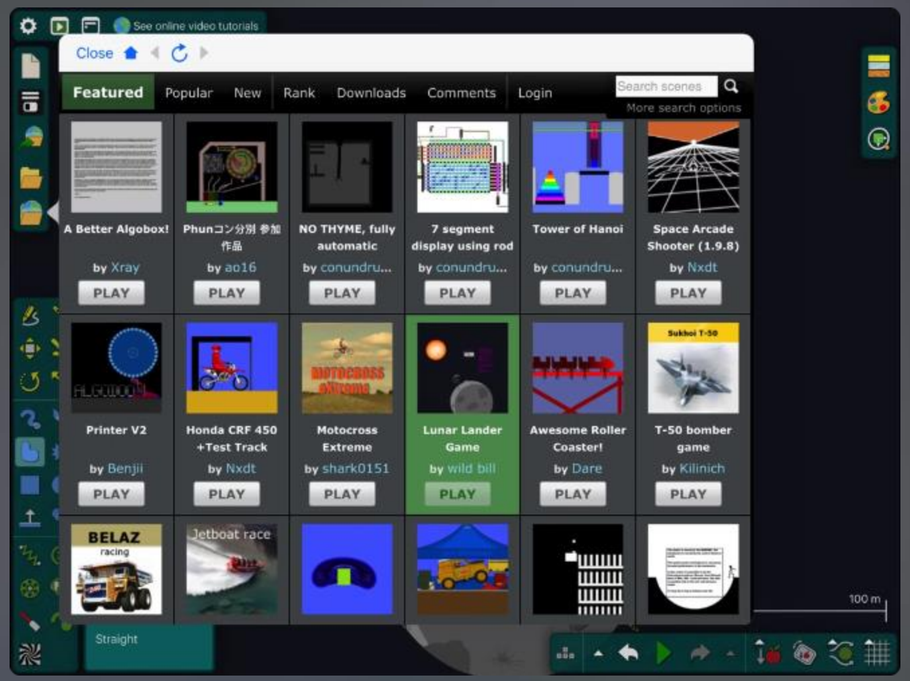
Explore the influence of gravity and friction on the motion and interactions of objects.

4

Collisions and Momentum

Investigate the impact of collisions on objects and the conservation of momentum.

http://www.algodoo.com/download/




File
Algodoo for Education
TOP MENU
Change language, Toggle fullscreen, Open options, Hide windows, Run tutorials and much more.
Source: http://www.algodoo.com/
BROWSER
Browse & Save scenes.
Find & Share scenes online.
Drag & Drop components.
PROPERTIES
Set material and color.
Welcome!
Hello, and welcome to Algodoo!
Setup
Set language and the Algodoo look and feel
Tutorials
Learn the basics of Algodoo in a minute
Lessons
Use Algodoo as a teaching aid
Do not show this message again
RIGHT-CLICK (or DOUBLE-CLICK)
Make water, Clone, Show info, Add mechanics, etc.
TOOLBAR
Tools for Drawing, Editing and Interact with your scenes.
TOOL OPTIONS
Options for the selected tool.
SIMULATION CONTROL
Play, pause, undo and redo.
ENVIRONMENT
Turn on/off Gravity, Air friction and Background grid.
Select by encircling
Sketch
1 m

HANDS-ON EXAMPLE LESSON 1-MOTION

ecure algodoo.com/lessons/Algodoo-_Motion

Algodoo by algoryx

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TRANSLATE/COPY EDIT

MOTION

LANGUAGE:	**English**
DESCRIPTION:	Motion is a fundamental concept in science. This lesson explores different causes of motion, such as pull, push, drop (gravity), and also introduces the term force.
TARGET:	**Key Stage 1**, **Key Stage 2**
CATEGORY:	**Demonstration**, **Exercise**, **Laboratory**
DISCIPLINE:	**Static forces**, **Dynamic forces**, **Gravity**, **Motion**
LEARNING OBJECTIVES:	Knowing different ways of setting an object into motion. Knowing a cause of motion (push, pull, drop, slide) in terms of influence of a force. Knowing about the relation between speed, distance and time.
IN CLASS:	Discuss what causes an object to move. Let the students suggest different ways of setting an object into motion and list them on the whiteboard. For example pushing, pulling, throwing, dropping, sliding, adding a motor. Discuss that the cause of motion is called force. Discuss how the size of the force influences the motion. Discuss relation between speed, distance and time. Discuss how this can be visualized and explored in Algodoo. Let the students create scenes in Algodoo using the suggestions you came up with together or let them use their own ideas. Help the students make decisions and ask guiding questions.

Create a scene

Create a horizontal plane and one plane as a slope. Make objets that can roll, slide, driven by a motor, fall.

Make a prediction

How can the object be set into motion? What makes the object stop?

Run interact

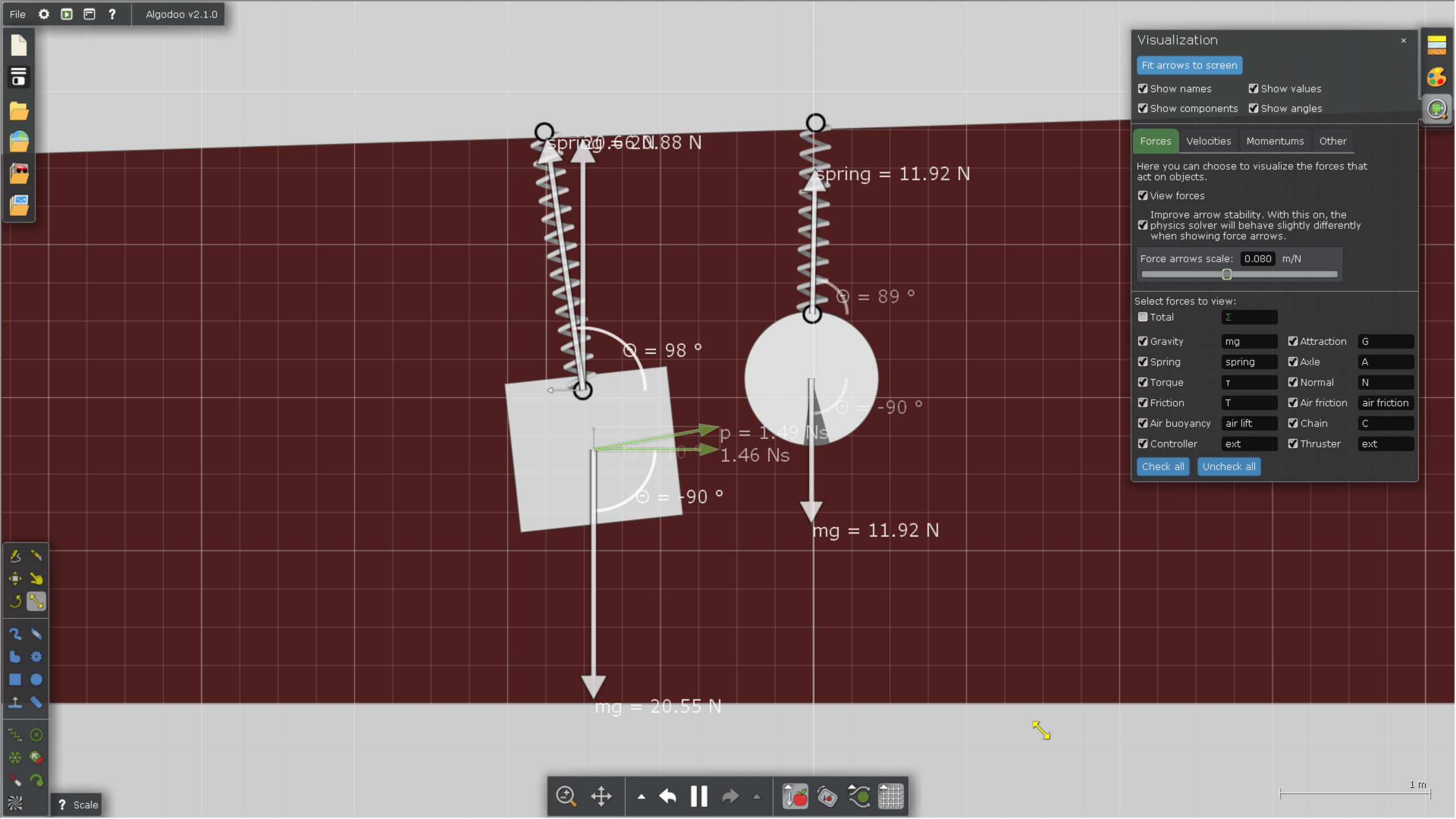
Explore different ways of moving the object. Rotate the planes (if you have a computer with accelerometer, tilt the PC) and move objects, watch the object slide down the plane or fall through the air. Turn off and on gravity and explore its influence on the motion. Grab the object by using the hand tool. Push and pull and make the objects move in different ways.

Evaluate

What behaviour is observed with the different wheel shapes?

How long do they roll?

C:\Users\Dell\Downloads\58877_motion.phz


File
Algodoo v2.1.0
spring = 20.88 N
spring = 11.92 N
Θ = 98 °
Θ = 89 °
Θ = -90 °
p = 1.49 Ns
1.46 Ns
Θ = -90 °
mg = 11.92 N
mg = 20.55 N
Visualization
Fit arrows to screen
Show names
Show values
Show components
Show angles
Forces
Velocities
Momentums
Other
Here you can choose to visualize the forces that act on objects.
View forces
Improve arrow stability. With this on, the physics solver will behave slightly differently when showing force arrows.
Force arrows scale: 0.080 m/N
Select forces to view:
Total Σ
Gravity mg
Attraction G
Spring spring
Axle A
Torque τ
Normal N
Friction T
Air friction air friction
Air buoyancy air lift
Chain C
Controller ext
Thruster ext
Check all
Uncheck all
Scale
1 m

THANK YOU