



NOVOSTI UPORABE SIMULACIJ PRI POUKU FIZIKE **NOVELTY USE OF SIMULATIONS AT PHYSICS CLASS**

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Osnovna šola Videm pri Ptujju

KARNJSKA GORA, 20. April, 2007

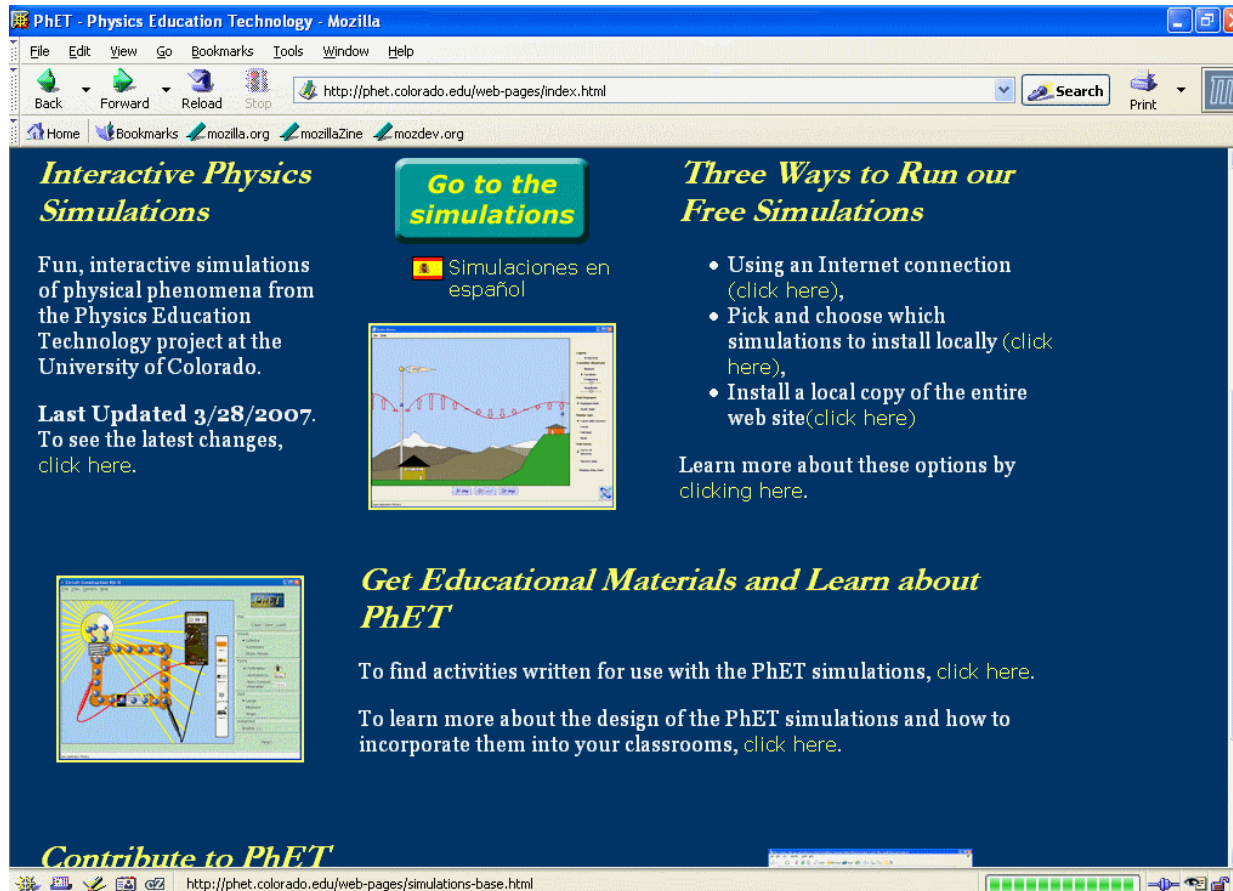


UPORABA SIMULACIJ PRI POUKU FIZIKE

- Motivacija
- Nazornost
- Višji nivo znanja
- Podpora realnim eksperimentom
- Ponovljivost
- Idealni pogoji

Uporaba

- <http://phet.colorado.edu/>



The screenshot shows a Mozilla browser window displaying the PhET website. The browser's address bar shows the URL <http://phet.colorado.edu/web-pages/index.html>. The website content is on a dark blue background and includes the following sections:

- Interactive Physics Simulations**: A section describing fun, interactive simulations of physical phenomena from the Physics Education Technology project at the University of Colorado. It notes the site was last updated on 3/28/2007 and provides a link to see the latest changes.
- Go to the simulations**: A green button with a Spanish flag icon and the text "Simulaciones en español". Below it is a small window showing a wave simulation.
- Three Ways to Run our Free Simulations**: A list of three options: using an Internet connection, picking and choosing which simulations to install locally, and installing a local copy of the entire web site. A link is provided to learn more about these options.
- Get Educational Materials and Learn about PhET**: A section with two links: one to find activities written for use with the PhET simulations, and another to learn more about the design of the PhET simulations and how to incorporate them into classrooms.
- Contribute to PhET**: A section at the bottom of the page.

The browser's status bar at the bottom shows the URL <http://phet.colorado.edu/web-pages/simulations-base.html>.



Možnosti instalacije

Three Ways to Run Our Free Simulations

	From the PhET Web Site	Full PhET Installation <i>Installs the entire web site</i> Click here	Phet SimLauncher <i>Installs a program that enables you to install individual simulations</i> Click here
What simulations are installed?	None	All simulations	Simulations selected by you
How often are updates made available?	Whenever you visit the web site	Three or four times a year	Any time you connect to the Internet, new or updated simulations are available
Size of download package	No download required	37MB, 63MB with Java VM	2MB, 27MB with Java VM, plus the size of the individual simulations you install (typically 500KB to 1.5MB each)
Internet connection required to run simulations?	Yes	No	No

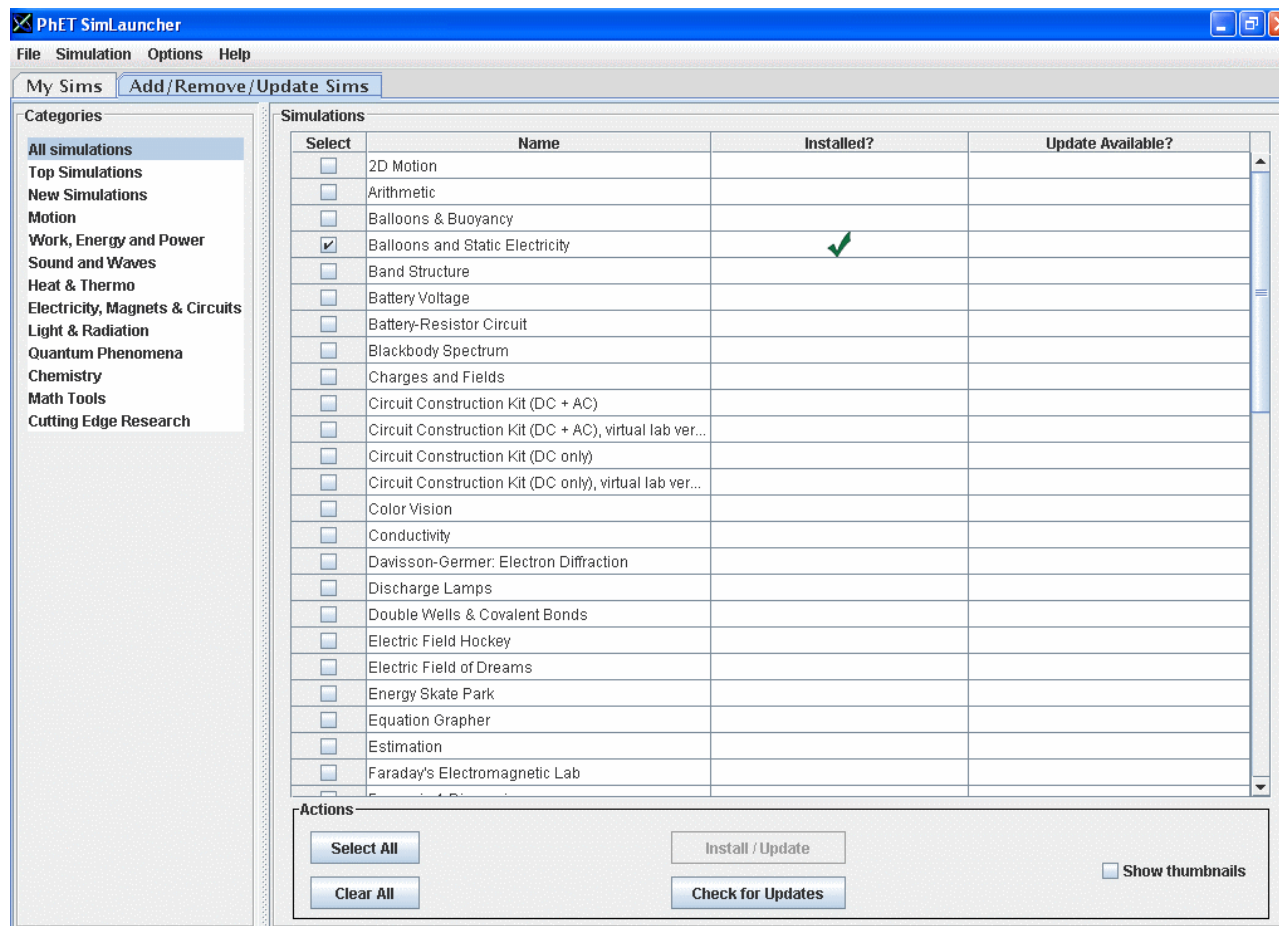


Instalacija na zahtevo

Phet SimLauncher

- Instalacija programa za izbiro in zagon
- Izberemo in prenesemo samo želene module
- Java v modulu

Izbirno okno


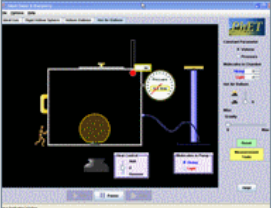
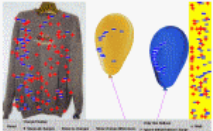



Izbirno okno z ikonami

The screenshot shows the PhET SimLauncher application window. The title bar reads "PhET SimLauncher" and includes standard window controls. The menu bar contains "File", "Simulation", "Options", and "Help". Below the menu bar are two tabs: "My Sims" and "Add/Remove/Update Sims".

On the left side, there is a "Categories" list with the following items: "All simulations", "Top Simulations", "New Simulations", "Motion", "Work, Energy and Power", "Sound and Waves", "Heat & Thermo", "Electricity, Magnets & Circuits", "Light & Radiation", "Quantum Phenomena", "Chemistry", "Math Tools", and "Cutting Edge Research".

The main area is a table titled "Simulations" with the following columns: "Select", "Name", "Thumbnail", "Installed?", and "Update Available?".

Select	Name	Thumbnail	Installed?	Update Available?
<input type="checkbox"/>	Arithmetic			
<input type="checkbox"/>	Balloons & Buoyancy			
<input type="checkbox"/>	Balloons and Static Electricity		✓	
<input type="checkbox"/>	Band Structure			

At the bottom of the window, there is an "Actions" section with the following buttons and options:

- Select All
- Clear All
- Install / Update
- Check for Updates
- Show thumbnails



Polna instalacija (PhET-1.0-windows-installer)

- PhET 1.0
- Java
- Vse že pripravljene simulacije
- Navodila
- Pomoč

Namizje PhET - offline



PhET *Physics Education Technology*
Offline Version

Made possible by  The William and Flora Hewlett Foundation  The Kavli Operating Institute  NSF

Home Simulations Downloads Educators Research Contribute Support Contact & Info

Interactive Physics Simulations

Fun, interactive simulations of physical phenomena from the Physics Education Technology project at the University of Colorado.

[Go to the simulations](#)

 Simulaciones en español



Updates Available Online

PhET simulations are updated frequently, so please check our web site ([click here](#)) for new releases periodically. Your copy was released on **2/26/2007**.



Uporaba v 8. razredu

- Merjenje sil
- Seštevanje sil
- Sile na klancu
- Trenje
- Segrevanje teles s toploto

Merjenje sil

The image displays the PhET 'Spring Lab' simulation interface. On the left, a vertical ruler is marked from 0 to 50 cm. Three springs are shown, labeled 1, 2, and 3. Spring 2 is stretched by a 250 gram mass. Below the springs, there are weights of 100 gram, 100 gram, and 50 gram. A bar chart titled 'Energy of 2' shows the following components: KE (blue), PE:grav (cyan), PE:elas (red), Heat (red), and Total (blue). The 'Total E' is indicated by a dashed line. The control panel on the right includes sliders for 'friction' (set to 'none') and 'stiffness spring 3' (set to 'soft'). It also has options for 'Show Energy of' (1, 2, 3, No show) and simulation settings like 'real time', '1/2 time', '1/4 time', '1/8 time', '1/16 time', 'pause', 'Jupiter', 'Moon', 'Earth', 'Planet X', and 'g = 0'. There are checkboxes for 'Stopwatch' and 'Sound', and a 'Show Help' button.

friction: none to lots

stiffness spring 3: soft to hard

Show Energy of: 1, 2, 3, No show

real time, 1/2 time, 1/4 time, 1/8 time, 1/16 time, pause

Jupiter, Moon, Earth, Planet X, g = 0

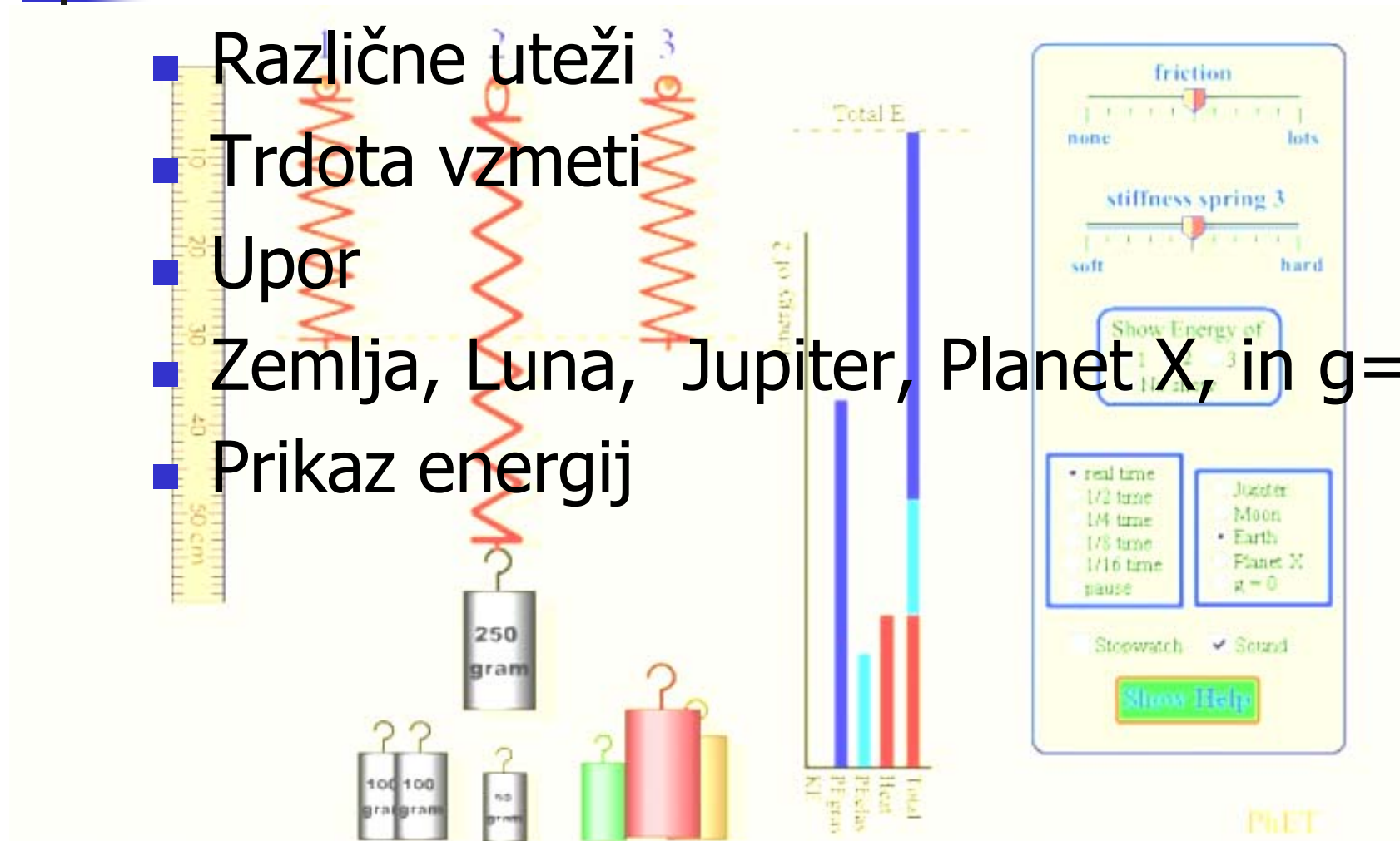
Stopwatch, Sound

Show Help

PhET

Interaktivni elementi

- Različne uteži
- Trdota vzmeti
- Upor
- Zemlja, Luna, Jupiter, Planet X, in $g=0$
- Prikaz energij



Sile na klancu

File Help

Introduction More Features

24,93 seconds
0,00 m/s

Normal

Friction

Weight

$h = 2,6 \text{ m}$

10,0°

Work Energy

Applied Force (N)
0,00

Pause
Clear

Parallel Force (Newtons)

$F_{\text{applied}} = 0,00 \text{ N}$
 $F_{\text{friction}} = 170,18 \text{ N}$

$F_{\text{gravity}} = -170,18 \text{ N}$
 $F_{\text{wall}} = 0,00 \text{ N}$

Energy Graph
Work Graph

Playback Slow Motion Pause Rewind Clear

PHET

Reset
Cool Ramp

Choose Object

- File Cabinet 100 kg, $\mu = 0,3$
- Refrigerator 175 kg, $\mu = 0,5$
- Piano 225 kg, $\mu = 0,4$
- Crate 300 kg, $\mu = 0,7$
- Sleepy Dog 15 kg, $\mu = 0,1$

Frictionless

Position
-6.0 0.0 1
8.44 meters

Ramp Angle
0.0 30.0 60.0 90
10.0 degrees

Pause
Clear
 Sound

Interaktivni elementi

The screenshot displays a physics simulation interface with the following components:

- Top Panel:** Includes a menu bar (File, Help) and navigation links (Introduction, More Features). It shows a 3D view of a yellow ramp with a brick wall at the top. A person is pushing a crate up the ramp. Labels include "Normal" (pointing perpendicular to the ramp), "Weight" (pointing vertically down), and "h = 2,6 m" (the vertical height of the ramp).
- Right Panel (Control Panel):**
 - Reset:** A button to reset the simulation.
 - Cool Ramp:** A button to toggle friction.
 - Choose Object:** A list of objects with their masses and friction coefficients (μ):
 - File Cabinet: 100 kg, $\mu = 0,3$
 - Refrigerator: 175 kg, $\mu = 0,5$
 - Piano: 225 kg, $\mu = 0,4$
 - Crate: 300 kg, $\mu = 0,7$
 - Sleepy Dog: 15 kg, $\mu = 0,1$
 - Frictionless:** A checkbox to toggle frictionless mode.
 - Position:** A slider set to 8.44 meters, ranging from -6.0 to 1.
 - Ramp Angle:** A slider set to 10.0 degrees, ranging from 0.0 to 9.
 - Pause:** A red button to pause the simulation.
 - Clear:** A button to clear the simulation.
 - Sound:** A checked checkbox to enable sound.
- Bottom Panel (Graphs):**
 - Applied Force (N):** A graph showing "Parallel Force (Newtons)" on the y-axis (ranging from -1.000 to 750) and time on the x-axis (ranging from 0 to 28). The graph shows three data series: a red line for applied force, a blue line for friction, and a yellow line for weight. The red line fluctuates between approximately 250 N and 300 N. The blue line is mostly at 0 N, with a negative spike to about -400 N. The yellow line fluctuates between approximately -400 N and 600 N. Text overlays on the graph indicate: $F_{\text{friction}} = 0,00 \text{ N}$, $F_{\text{friction}} = -170,18 \text{ N}$, $F_{\text{gravity}} = -170,18 \text{ N}$, and $F_{\text{wall}} = 0,00 \text{ N}$.
 - Work Graph:** A button to view the work done.
 - Energy Graph:** A button to view the energy.
- Bottom Center:** A "Pause" button and a "Clear" button.

■ Različni objekti na klancu (hladilnik, piano, zaboj, pes)

■ Različni nakloni klanca

■ Sile na klancu

Energije (grafi in histogrami)

Trenje

File Help

Introduction More Features

0,00 seconds
0,00 m/s

Apply a Force the Filing Cabinet

Normal
Friction
Weight

h=2,6 m

10,0°

Work Energy

Applied Force (N)
0,00
Go! Clear

Parallel Force (Newtons)

$F_{\text{applied}} = 0,00 \text{ N}$
 $F_{\text{friction}} = 170,18 \text{ N}$
 $F_{\text{gravity}} = -170,18 \text{ N}$
 $F_{\text{wall}} = 0,00 \text{ N}$

Energy Graph
Work Graph

Playback Slow Motion Pause Rewind Clear

PhET

Reset
Cool Ramp

Choose Object

- File Cabinet 100 kg, $\mu = 0,3$
- Refrigerator 175 kg, $\mu = 0,5$
- Piano 225 kg, $\mu = 0,4$
- Crate 300 kg, $\mu = 0,7$
- Sleepy Dog 15 kg, $\mu = 0,1$

Frictionless

Position
-6.0 0.0 15.0
10.0 meters

Ramp Angle
0.0 30.0 60.0 90.0
10.0 degrees

Go! Clear
 Sound

Java Application Window

Interaktivni elementi

The screenshot displays a physics simulation interface with the following elements:

- Main Simulation Area:** A yellow ramp is shown on a brick wall with a height of $h = 2,6 \text{ m}$. A green arrow labeled "Apply a force" points up the ramp. A yellow box labeled "File Cabinet" is on the ramp. A "Cool Ramp" button is visible.
- Top Left:** A menu bar with "File" and "Help". Below it, "Introduction" and "More Features" are visible. A timer shows "0,00 seconds" and "0,00 m/s".
- Bottom Left:** A graph titled "Applied Force (N)" with a y-axis from -1000 to 500 and an x-axis from 0 to 28. It shows a green arrow pointing to 0, a red arrow pointing to "Friction = -170,18 N", and a yellow arrow pointing to "Fwall = 0,00 N". Below the graph are buttons for "Energy Graph" and "Work Graph".
- Right Panel:** A "Choose Object" list with the following items:
 - File Cabinet: 100 kg, $\mu = 0,3$
 - Refrigerator: 175 kg, $\mu = 0,5$
 - Piano: 225 kg, $\mu = 0,4$
 - Crate: 300 kg, $\mu = 0,7$
 - Sleepy Dog: 15 kg, $\mu = 0,1$Below the list are checkboxes for "Frictionless" (unchecked) and "Position" (checked). A "Ramp Angle" section shows a slider from 0.0 to 90.0 degrees, currently set at 10.0 degrees. A "Go!" button is at the bottom. A "Sound" checkbox is checked.
- Bottom Center:** "Pause" and "Clear" buttons.

- Različni objekti na klancu (hladilnik, piano, zabo, pes)
- Različni nakloni klanca
- Led na klancu
- Predmeti na rolki
- Sile na klancu
- Energije (grafi)

Segrevanje teles s toploto

The screenshot shows a PhET simulation interface for a 'Hot Air Balloon' experiment. The main window displays a rectangular chamber filled with blue particles representing gas molecules. A thermometer on the right side of the chamber shows a temperature of 382K. A pressure gauge next to it shows a pressure of 0.38 Atm. A blue pump is connected to the chamber, and a person is shown walking next to it. The interface includes several control panels:

- Constant Parameter:** Radio buttons for Volume, Pressure, Temperature, and None. 'None' is selected.
- Gas in Chamber:** Sliders for 'Heavy Species' (set to 124) and 'Light Species' (set to 0).
- Hot Air Balloon:** A slider for 'Add' gas, currently set to 0.
- Gravity:** A slider ranging from 0 to 'Lots'.
- Tools & Options:** Buttons for 'Measurement Tools >>', 'Advanced Options >>', 'Reset', and 'Help!'.
- Heat Control:** A panel with a 'Heat Control' knob, 'Add' and 'Remove' buttons, and a '0' indicator.
- Gas in Pump:** A panel with radio buttons for 'Heavy Species' (selected) and 'Light Species'.

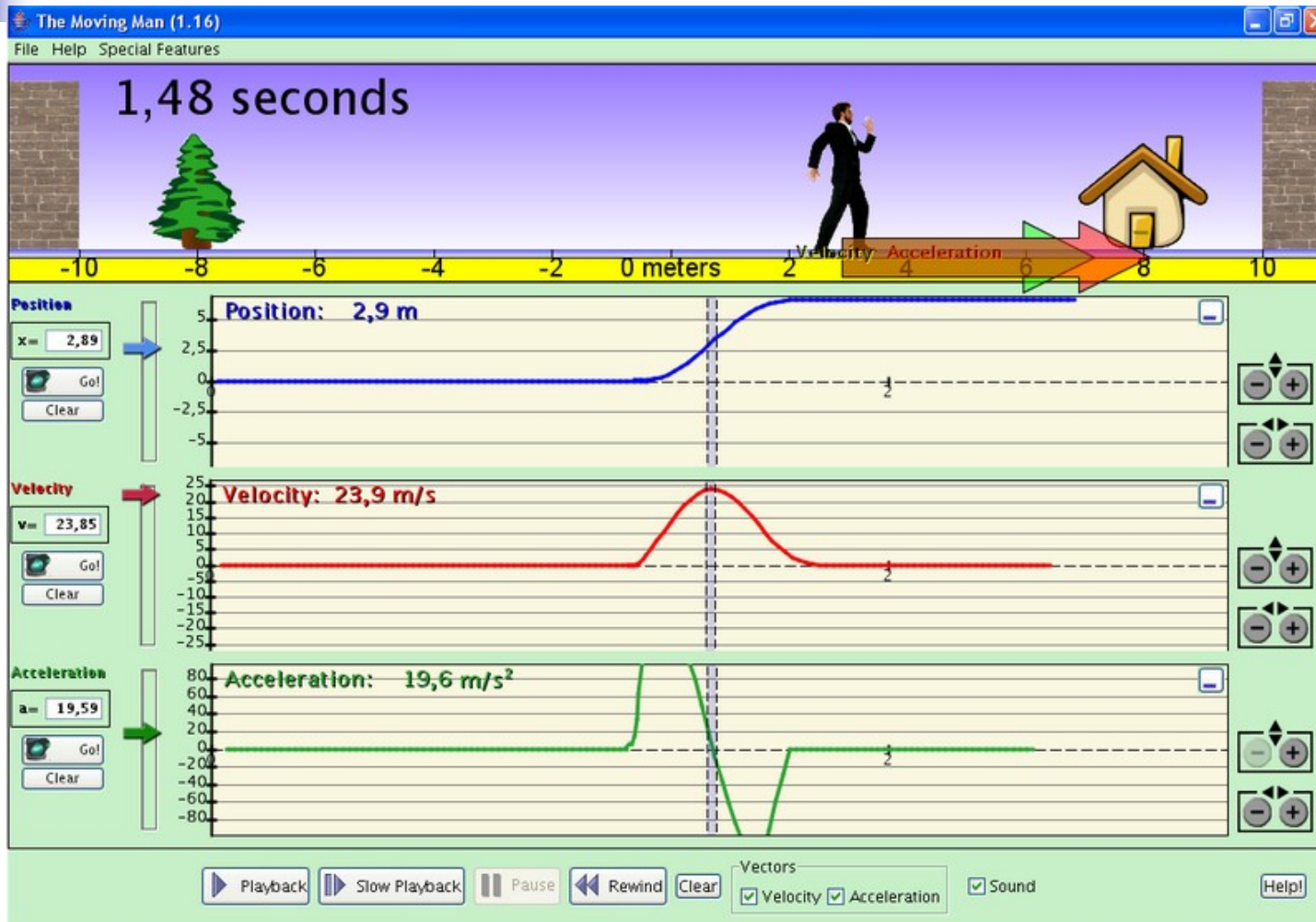
At the bottom of the simulation window, there are 'Play', 'Pause', and 'Step' buttons.



Uporaba v 9. razredu

- Gibanje (enakomerno in neenakomerno)
- Mirujoči električni naboj
- Ohmov zakon in upor
- Upor žic
- Magnetno polje

Gibanje (enakomerno in neenakomerno)

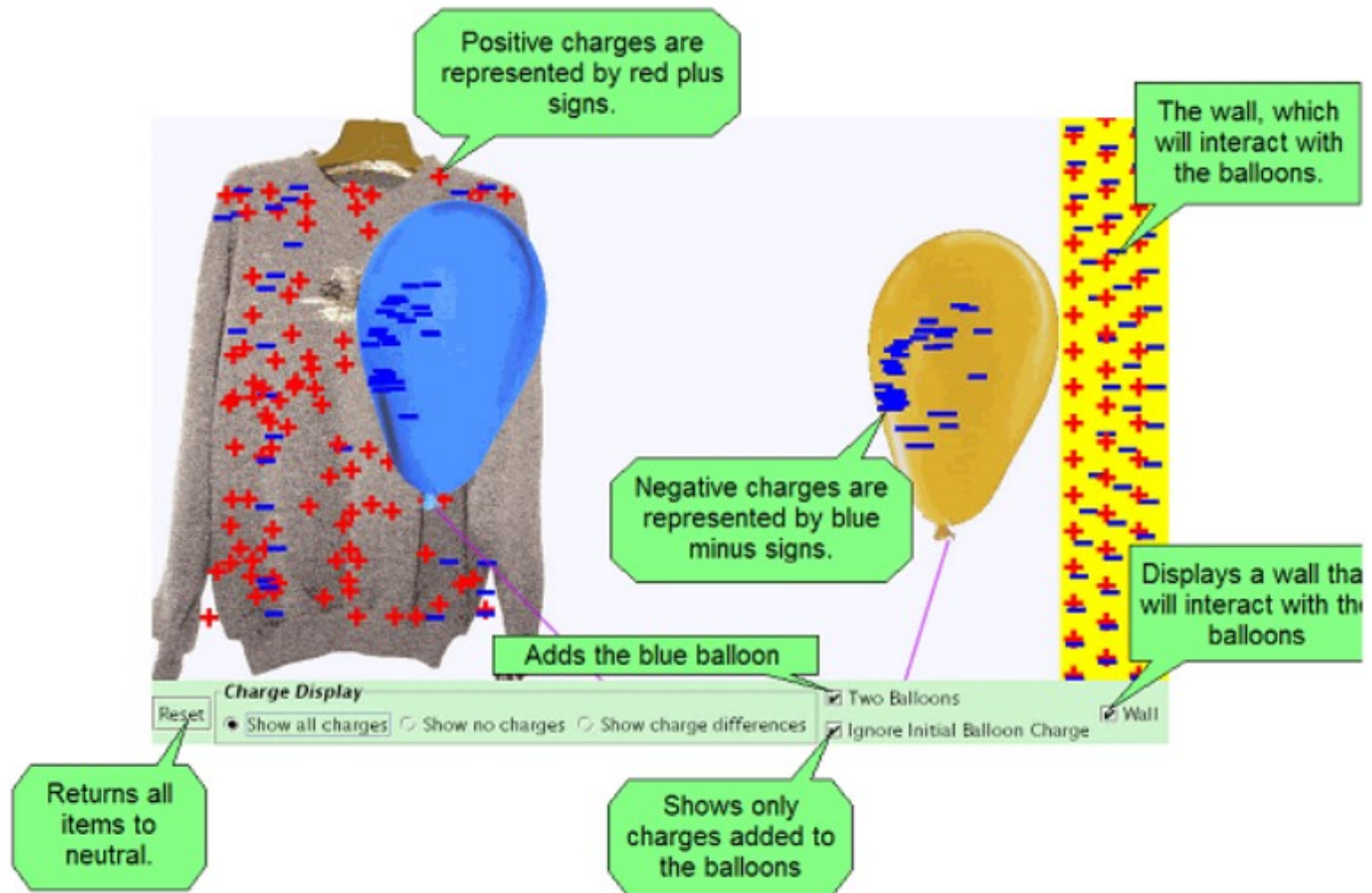


Interaktivni elementi

■ Z miško spreminjamo pozicijo osebe



Mirujoči električni naboj



Interaktivni elementi

- Drgnemo balon
- Izberemo 1 ali 2 balona
- Prikaz nabojev
- Brez prikaza nabojev
- Stena ali brez stene



Ohmov zakon in upor

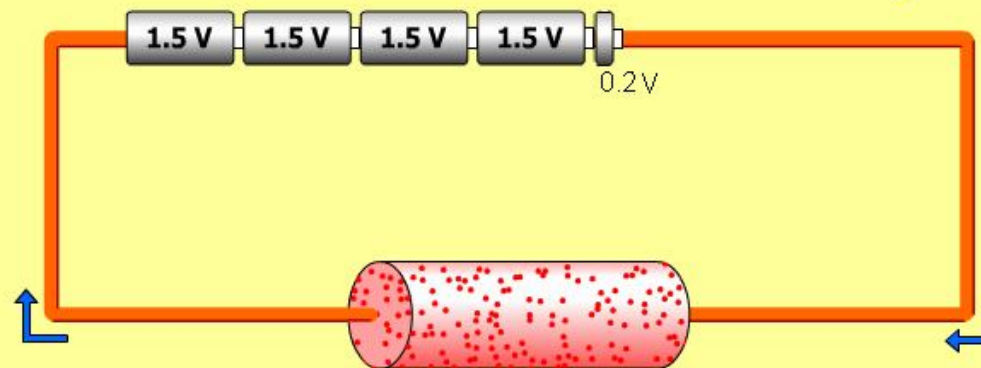
$$V = IR$$

6.2 V

500 Ω

voltage

resistance



current = 12.4 mA

- color code
- sound

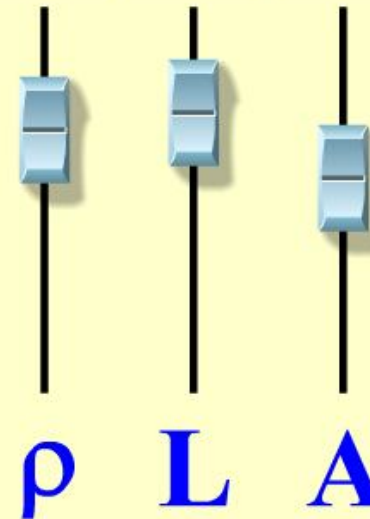
Project
PhET

Upor žic

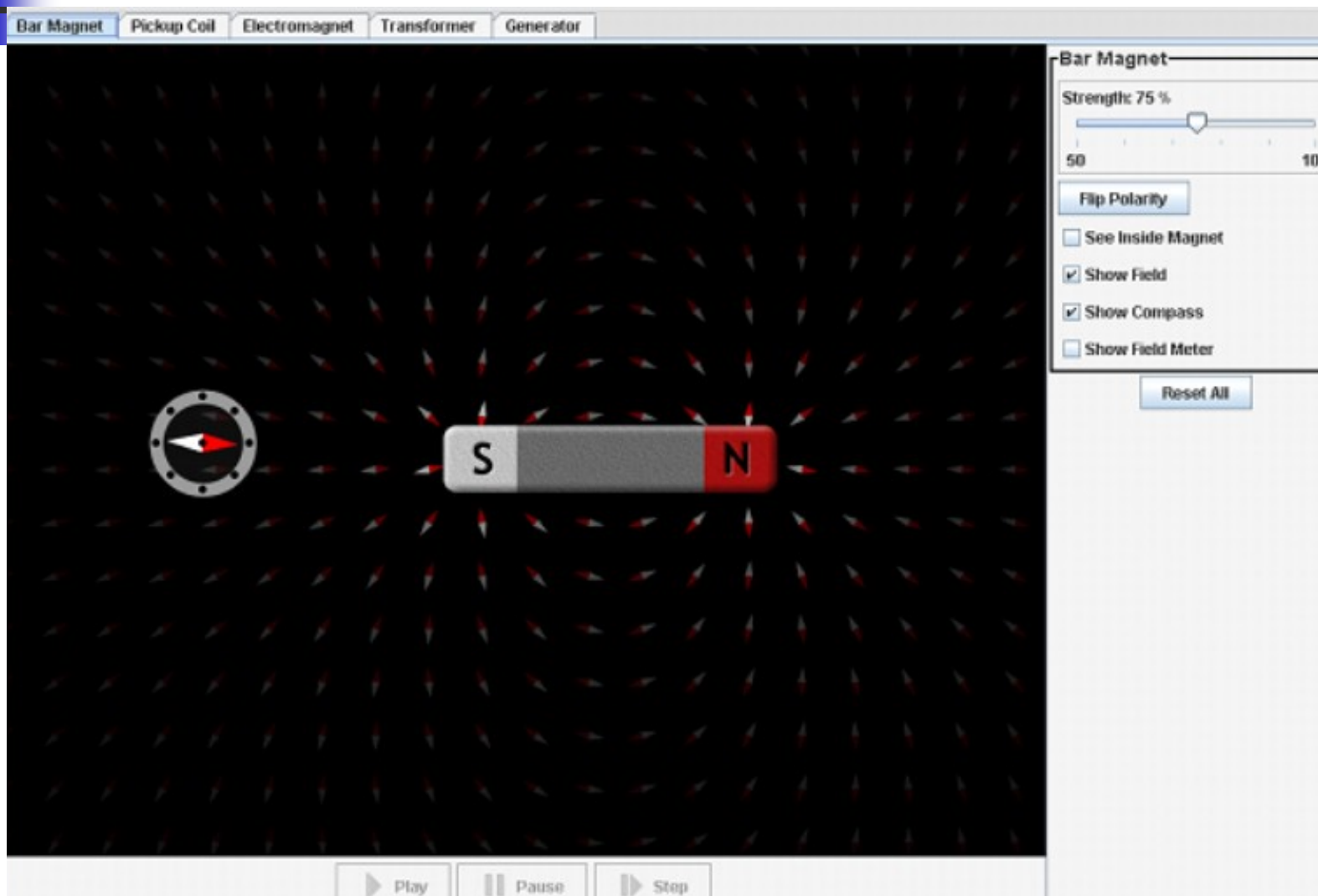
resistance =

$$R = \frac{\rho L}{A}$$

$\Omega \text{ cm}$ cm cm^2



Magnetno polje

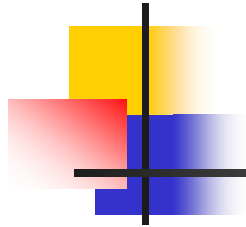




Interaktivni elementi

- Jakost magnetnega polja
- Pogled v magnet (silnice)
- Spreminjanje polov magneta
- Kompas
- Indukcija





HVALA

**USPEŠNO DELO IN
DOBRE SIMULACIJE**