Interactive Physics 2005 New Features

The Interactive Physics curriculum workbook empowers students to explore the physical world through easy-to-use, fast-paced simulations. Students are able to visualize the abstract concepts taught in the classroom, test hypotheses, and investigate "what-if" scenarios. Teachers appreciate the easy grading and disciplined structured environment with math and physics formulae.

Curriculum workbook and simulations - inquiry learning at its best!

NEW Chapters include…

Potential and Kinetic Energy
Gravitational and potential energy
Potential energy in a spring
Kinetic energy and mass
Kinetic energy and speed

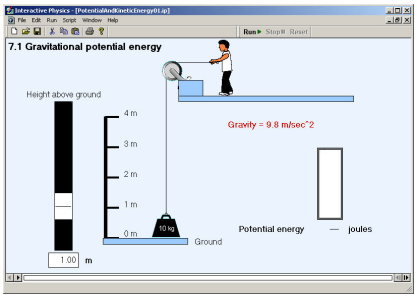
Conservation of Energy
Potential and kinetic energy in a pendulum
Conservation of energy in a roller coaster*
Conservation of energy for a snowboarder
Conservation of energy in a spring
Conservation of energy for a bungee jumper
Energy loss due to friction

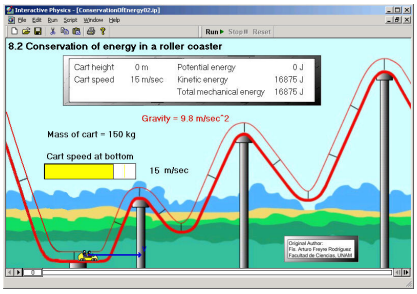
Temperature and Heat
Temperature
Heat capacity
Phase change
Thermal expansion

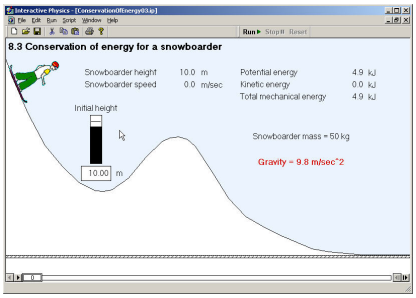
Heat Transfer
Heat transfer
Conduction
Convection
Radiation*

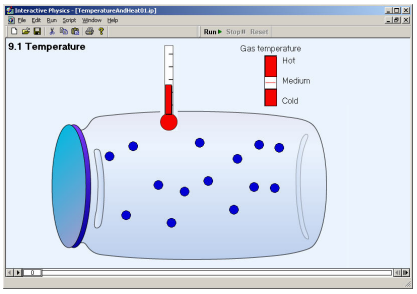
Wave and Sound
Wave motion
Wave speed
Speed of sound
Mach number
Doppler effect*

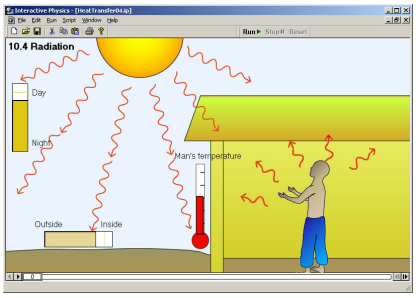
* Available for Microsoft® Windows® only (95/98/98SE/Me/NT®4.0/2000/XP)

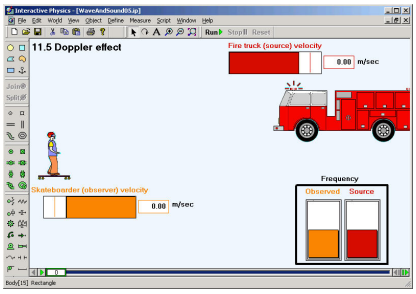




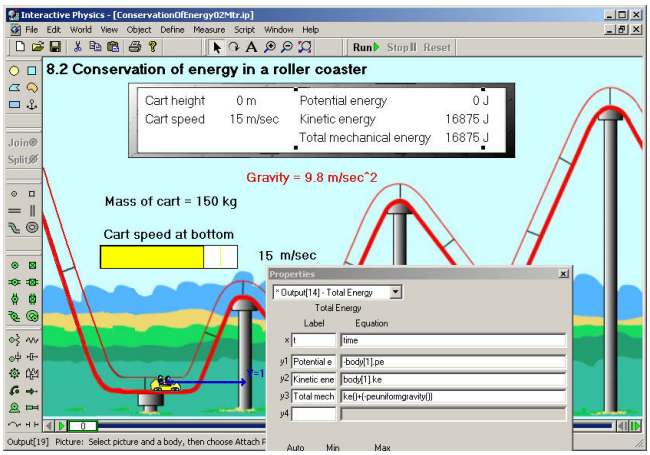






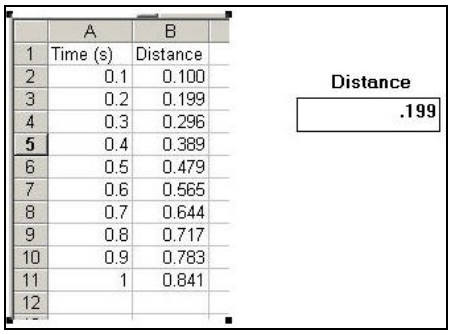


- **New formula language commands (see user manual for details)**



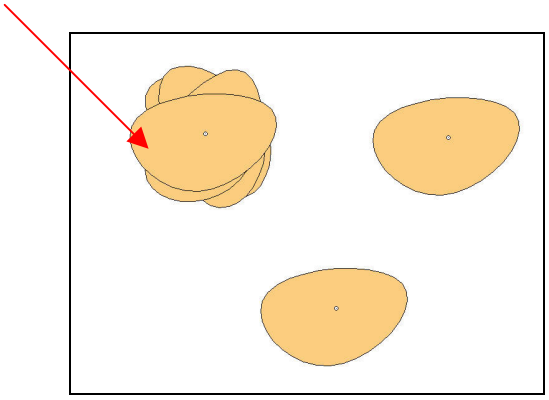
Simulation Functions	
ke()	Returns the total kinetic energy of all bodies
peuniformgravity()	Returns the total uniform gravitational potential energy of all bodies
uniformgravity()	Returns the uniform gravitational acceleration
length(id, id)	Returns the length between two points, two bodies (their centers of masses), or a point and a body (its center of mass)
lengthp(id, id)	Returns the first time derivative of the length between two points, two bodies (their centers of masses), or a point and a body (its center of mass)
lengthpp(id, id)	Returns the second time derivative of the length between two points, two bodies (their centers of masses), or a point and a body (its center of mass)
linearmomentum()	Returns the linear momentum of all the bodies in either the x or y direction
angularmomentum(id)	Returns the angular momentum of all the bodies relative to a body (id = body ID), the world (id = 0), or the system center of mass (id = 10012)
Object Functions	
body[id].restitution	Same as body[id].elasticity
body[id].cm	Same as body[id].cofm
body[id].momentum	Returns the linear momentum (.x or .y) or angular momentum (.r) of a body
body[id].pe	Returns the body's potential energy due to a uniform gravitational field
body[id].ke	Returns the body's kinetic energy
constraint[id].active	Returns whether a constraint is active, i.e., affecting the motion of its constrained bodies
constraint[id].isactivewhen	Returns the result of the condition in the constraint's "Active when" dialog
Math Functions	
dot(vectorA, vectorB)	Returns the dot product of vectorA and vectorB
cross(vectorA, vectorB)	Returns the cross product of vectorA and vectorB
angle(vectorA, vectorB)	Returns the angle between vectorA and vectorB
express(vectorA, B, C)	Given vectorA expressed in basis B, returns a vector expressed in basis C
gaussian / pulse	Various *Input Curves*. See user manual for usage and description
ramp / ramp2	
sawtooth / sinusoid	
squarewave / squarewave2	
step / step0 / step1 / step2	

- Excel input data increased from old limit of 4080 values to computer memory limit

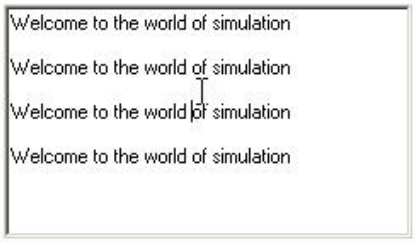


	A	B
1	Time (s)	Distance
2	0.1	0.100
3	0.2	0.199
4	0.3	0.296
5	0.4	0.389
6	0.5	0.479
7	0.6	0.565
8	0.7	0.644
9	0.8	0.717
10	0.9	0.783
11	1	0.841
12		

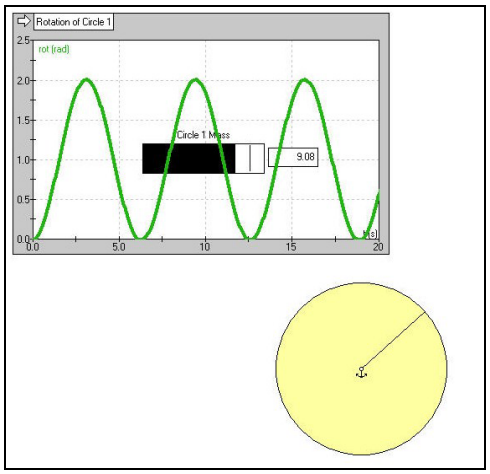
- Enables tracking of a single object (unable to track single object in IP2004)



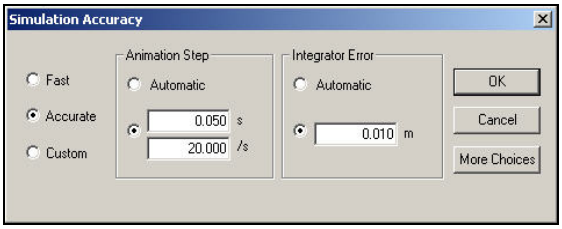
- Updated Text objects to work properly with mouse



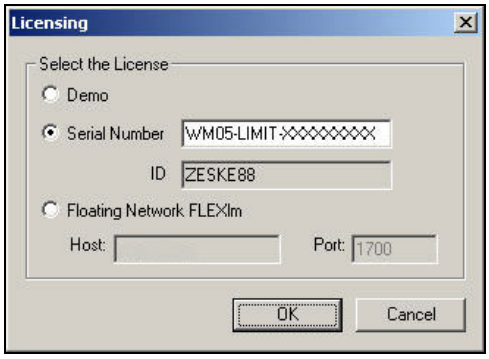
- Sliders can be placed on top of a graph without distorting graph output



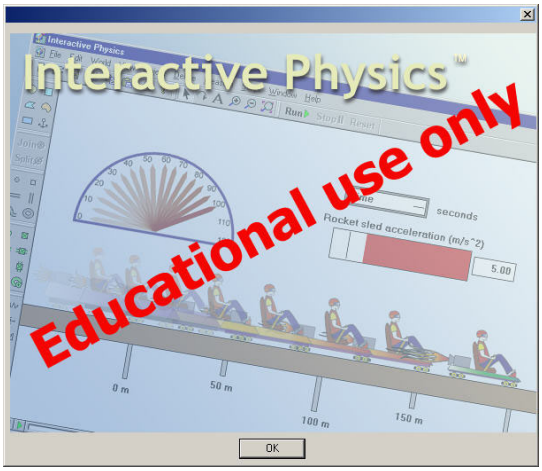
- Default animation step of **0.05 sec** and integrator error of **0.01 m** (in the Accuracy dialog box) for more accurate and predictable results by default



- New licensing schemes:
  - License that is node-locked to a single computer (based on computer ID)
  - License with time expiration
  - License with limits for bodies, constraints, inputs, and outputs



- "Educational use only" dialog box and installer license agreement for educational licenses



- CD-key installer message for educational single-user and homework licenses

Interactive Physics 2004 New Features*

Overview

1. **Curriculum workbook and simulations (for Windows and Macintosh)**
2. ***Interactive Physics Workbook* and simulations (for Windows and Macintosh)**
3. **Improved graphing capabilities**
4. **Instantaneous vector values can be displayed with vectors**
5. **Updated user interface**
6. **Color of bodies linked to formula language and can change on the fly**
7. **Feel the motion and/or collision**
8. **DC Motor and DC Actuator**
9. **Generic Coord-to-Coord Constraint**
10. **Generic Point-to-Point Constraint**
11. **Dynamic memory allocation for objects**

***All features (except items 1 and 2) are for Microsoft® Windows® only (95/98/98SE/Me/NT®4.0/2000/XP)**

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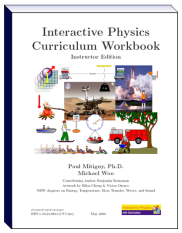
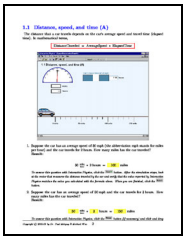
1. Curriculum workbook and simulations - inquiry learning at its best

The Interactive Physics curriculum workbook empowers students to explore the physical world through easy-to-use, fast-paced simulations. Students are able to visualize the abstract concepts taught in the classroom, test hypotheses, and investigate "what-if" scenarios. Teachers appreciate the easy grading and disciplined structured environment with math and physics formulae.

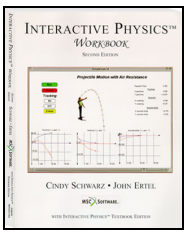
- Full-colored teacher edition and black-lined master student edition
- New interactive experiments explore distance, speed, time, acceleration, projectile motion, gravity, air resistance, friction, weight, mass, highway safety, springs, Newton's laws, …
- Aligned with national and state curriculum standards and objectives
- Provides simple explanations and instructions for essential math and physics topics
- Created by Stanford Professor Paul Mitiguy and MSC.Software education consultant Michael Woo





2. Interactive Physics Workbook and simulations - Advanced users (sold separately)

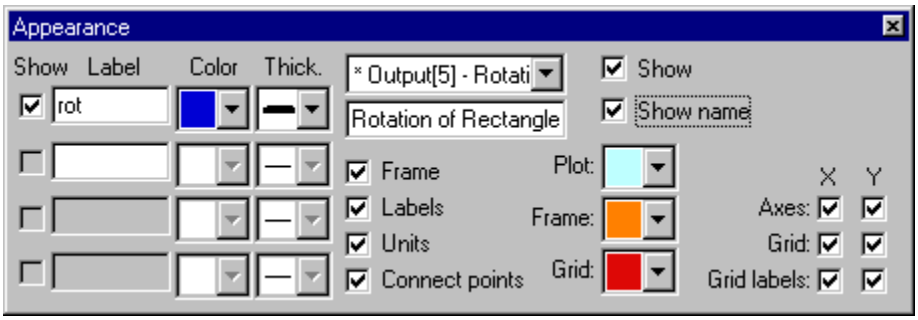
- Designed to help students visualize and work through physics problems with Interactive Physics simulations and accompanying worksheets
- 40 problems of varying difficulty require students to change parameters/make predictions
- The workbook/study guide provides instructions, physics review, hints, and questions
- The accompanying CD-ROM contains everything students need to run simulations
- Created by Professor Cindy Schwarz of Vassar College, Professor John Ertel of the U.S. Naval Academy, Prentice-Hall, and MSC.Software. ISBN - 0130671088



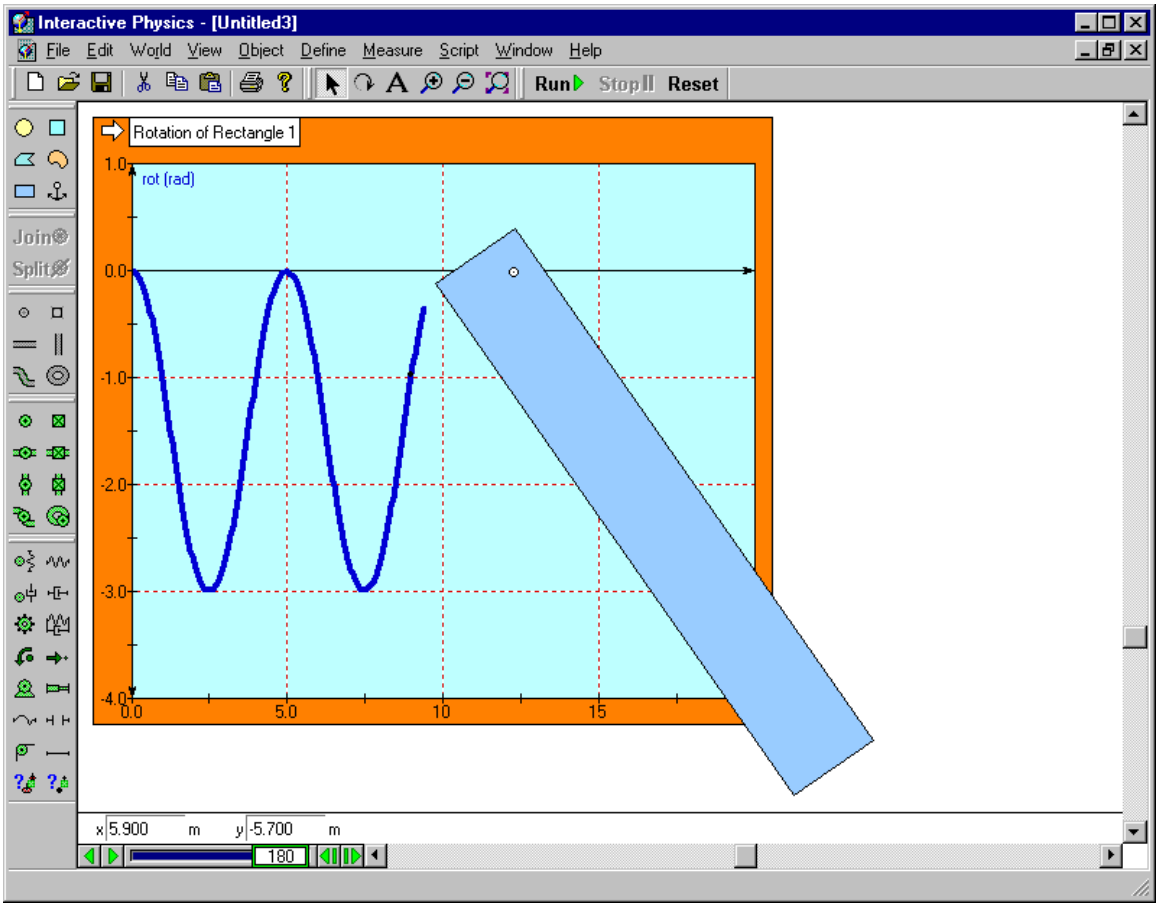
3. Improved graphing capabilities

New graphing capabilities allow you to control:

- Thickness of curves and lines
- Plot background and frame colors
- Scaling of curves and lines
- Display of **X** and/or **Y** axes, grid lines, or grid labels
- Grid line colors



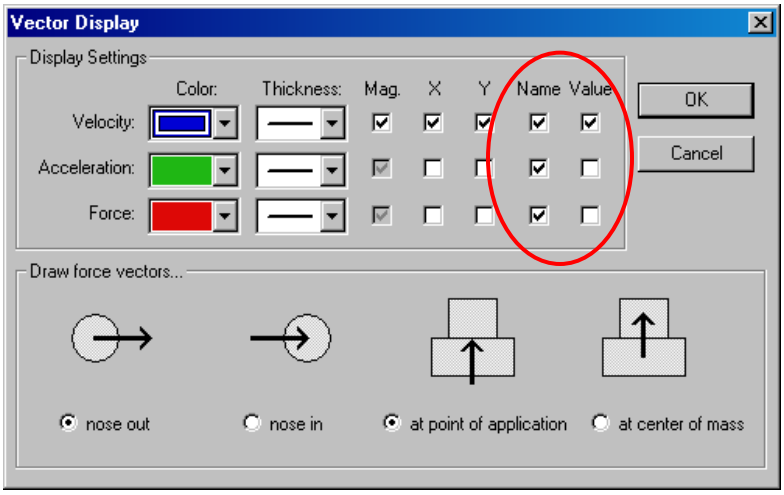
New: Appearance dialog box for graphs



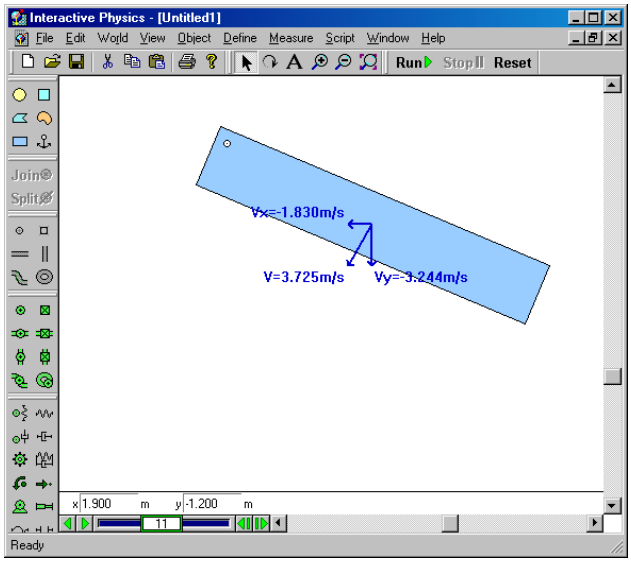
Showing a body's motion in an improved graph

4. Instantaneous vector values can be displayed with vectors

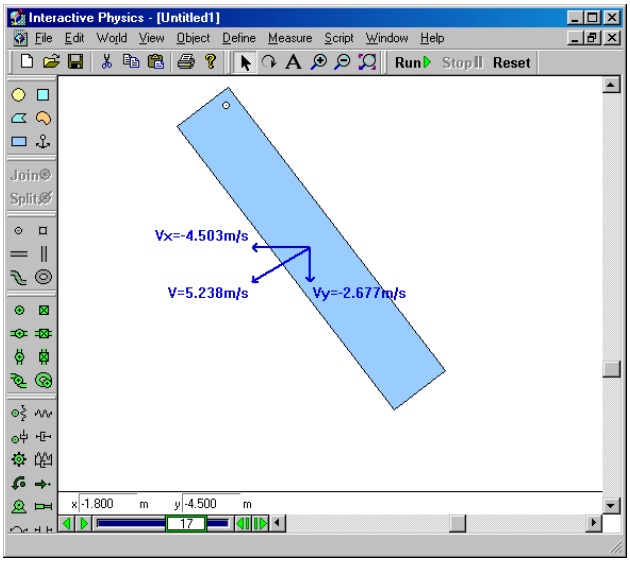
The value of various vectors and their components can be displayed on screen. The vector values change dynamically as the simulation runs and provides excellent visual feedback on the magnitude/direction characteristics of vectors.



Updated Vector Display dialog box



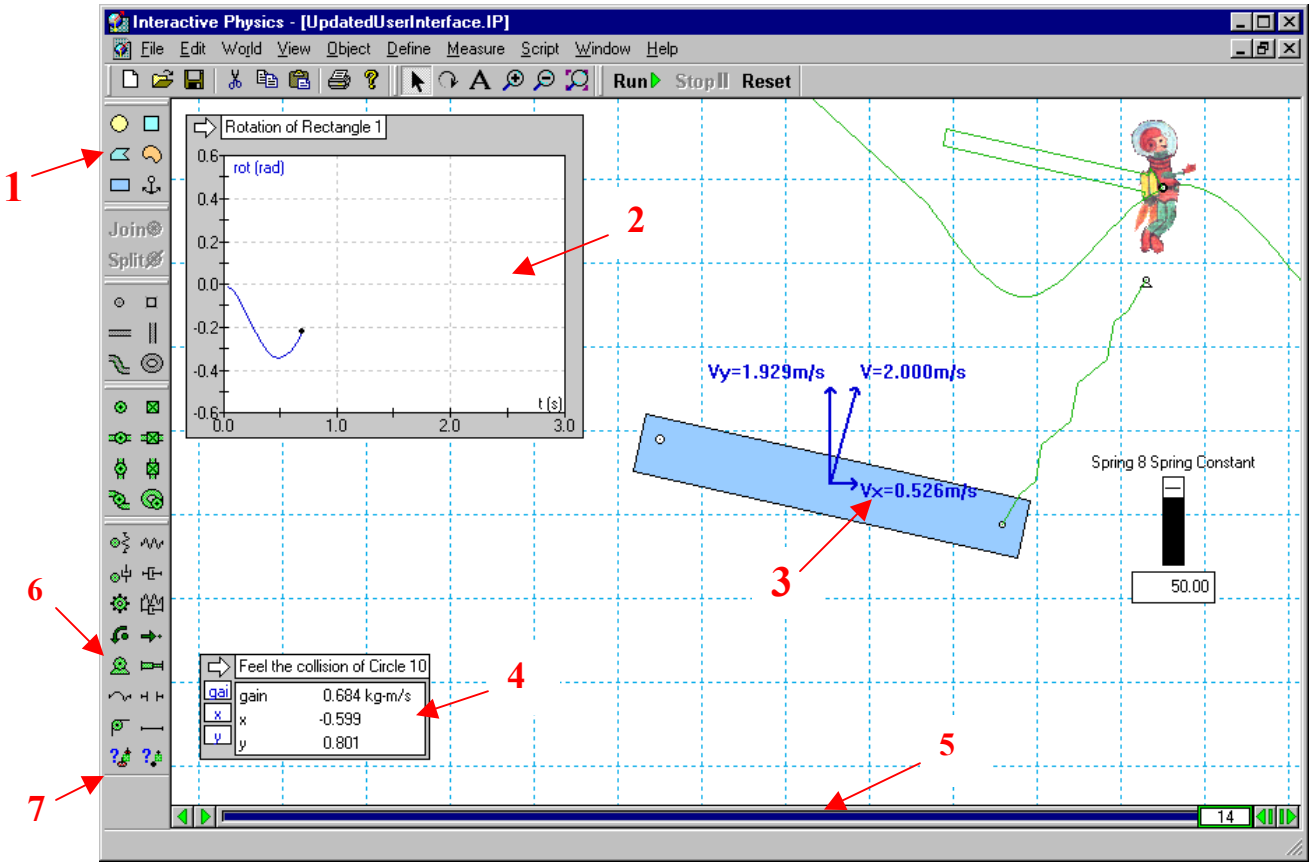
Instantaneous values shown with the vectors



Note: Vector values change as the simulation runs

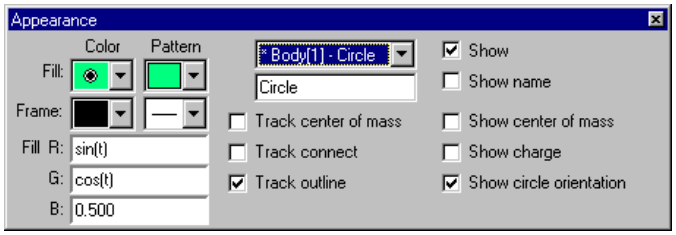
5. Updated user interface

1. New default colors for bodies
2. New graphs and graphing options
3. Vector values can be displayed with vectors
4. New meter for feeling motion and/or collision (requires a force-feedback mouse or joystick)
5. New colors in the Run toolbar
6. New DC motor and DC actuator
7. New generic joints

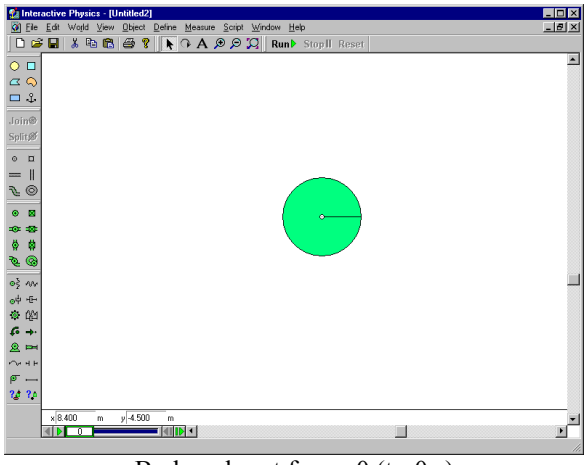


6. Color of bodies can be linked to a formula and vary with time, velocity, force, …

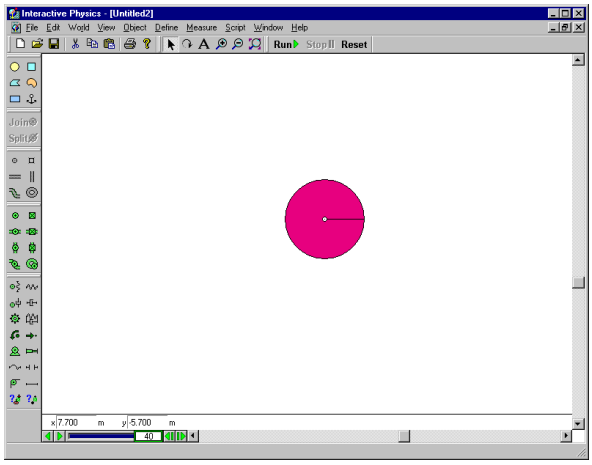
Color of bodies can be controlled with the extensive Interactive Physics formula language. Enter constants, equations, conditions, etc., in the RGB components of the body color.



Appearance dialog box for bodies



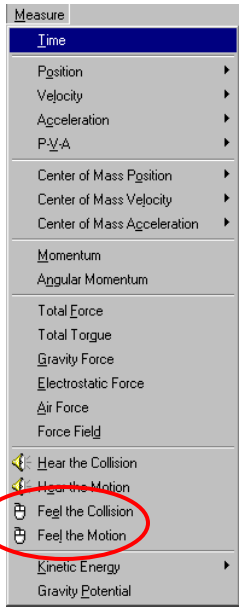
Body color at frame 0 (t= 0 s)



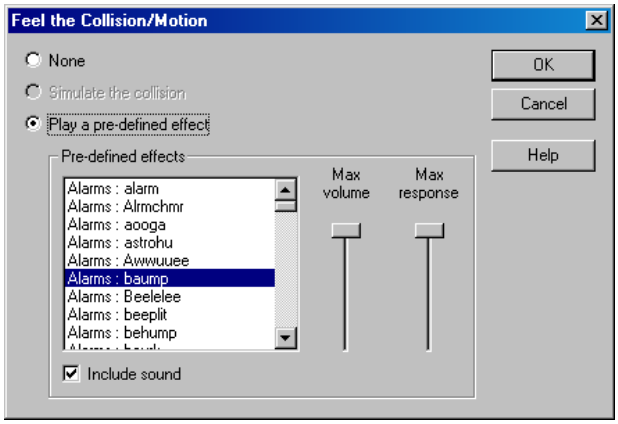
Body color at frame 40 (t = 2 s)

7. Feel the motion and/or collision (requires a force-feedback mouse or joystick)

Feel the motion and/or collision of bodies through a force-feedback mouse or joystick. Choose the default effect or an effect from the Immersion Studio library of mouse and sound effects.

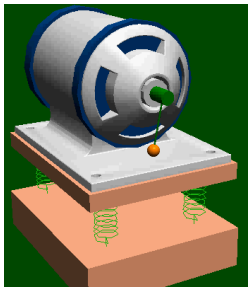


Select Feel the Motion or Feel the collision



Choose haptics effects, volume, and response

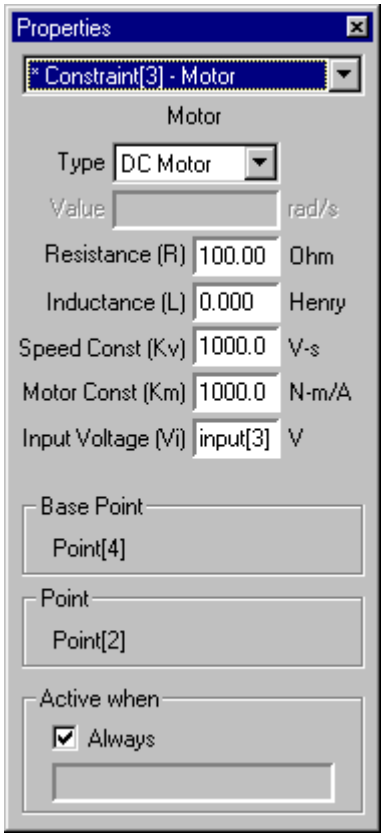
8. DC Motor and DC Actuator



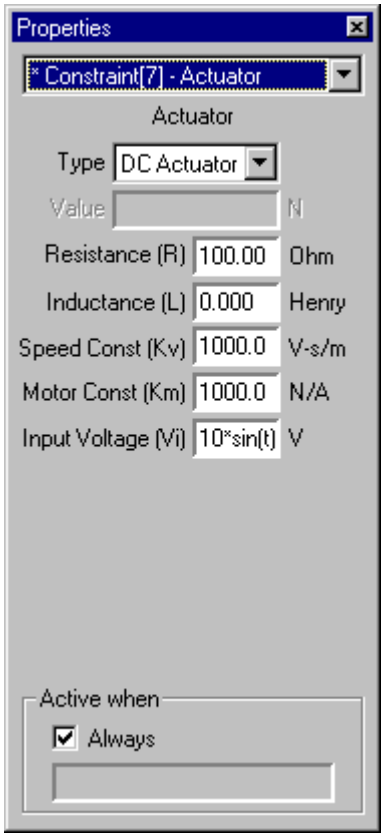
Model DC motors and DC actuators with the following input parameters:

- Motor Resistance (R)
- Motor Inductance (L)
- Motor Back-EMF Speed Constant (Kv)
- Motor Force/Torque Constant (Km)
- Motor Input Voltage (Vi)

The value of these parameters can be set with a number, slider, or any Interactive Physics formula.



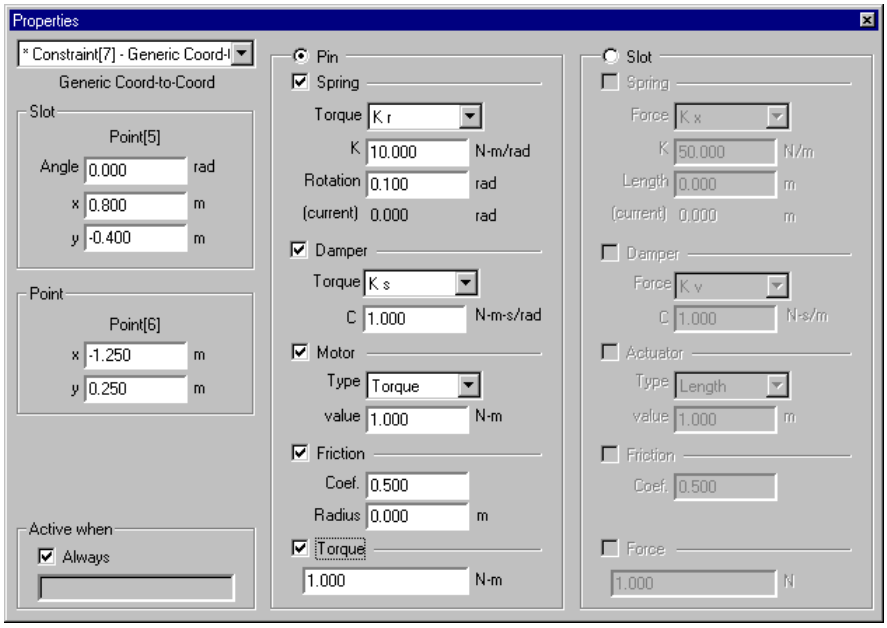
DC motor properties



DC actuator properties

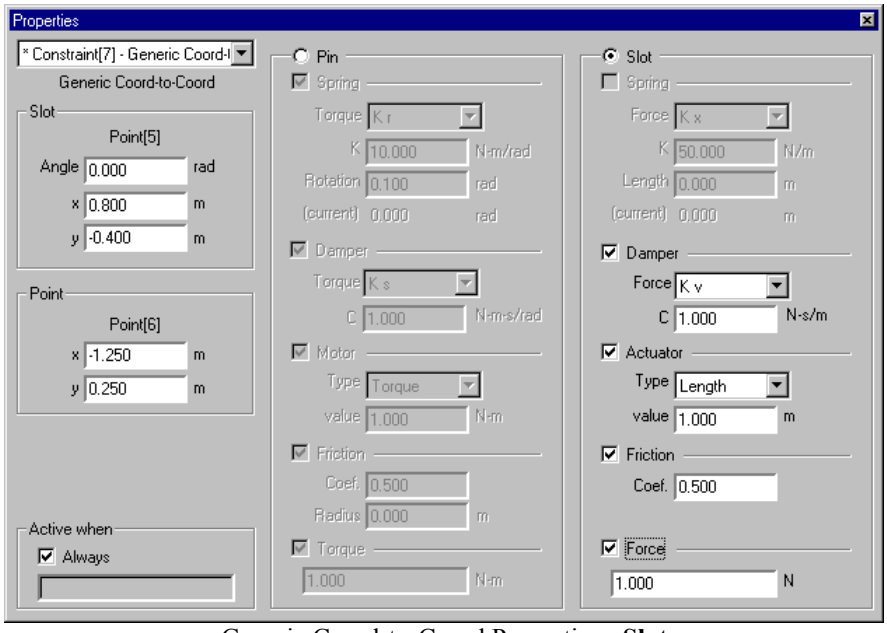
9. Generic Coord-to-Coord Constraint

The Generic Coord-to-Coord **Pin** Constraint is a powerful tool for advanced users and is useful for combining properties and measurements of various torque-producing devices, including torsional springs, torsional dampers, torque motors, rotational friction, and torques.



Generic Coord-to-Coord Properties - **Pin**

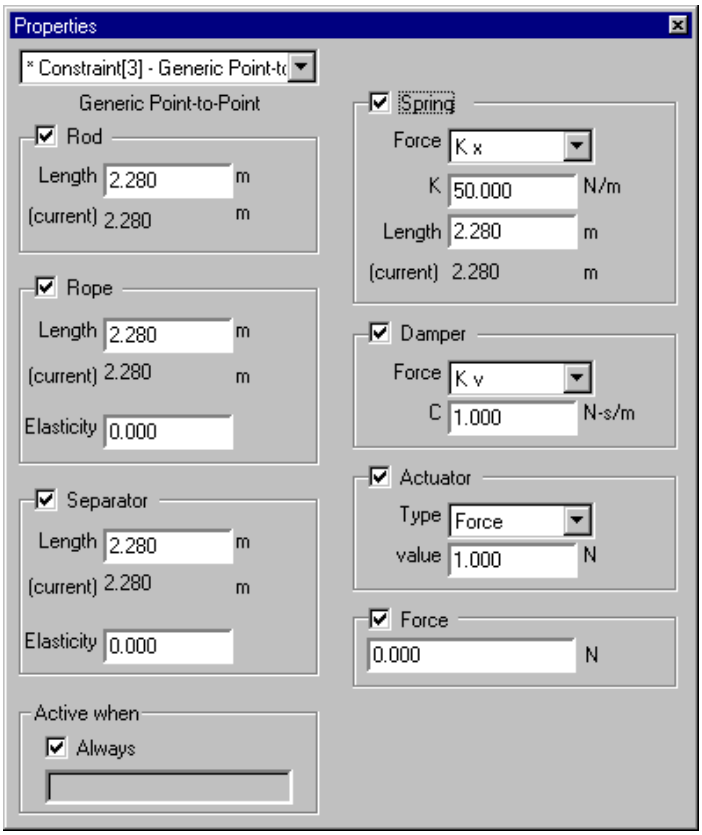
The Generic Coord-to-Coord **Slot** Constraint is a powerful tool for advanced users and is useful for combining properties and measurements of forces along slots, including dampers, actuators, friction, and forces.



Generic Coord-to-Coord Properties - **Slot**

10. Generic Point-to-Point Constraint

The Generic Point-to-Point Constraint is a powerful tool for advanced users and is useful for combining properties and measurements of rods, ropes, separators, springs, dampers, actuators, and forces.



Generic Point-to-Point Properties

11. Dynamic memory allocation for objects

With dynamic memory allocation, the number of bodies, constraints, points, inputs, and output meters used in a simulation is limited only by your computer's memory.