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Computer Simulation of University Physics

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ISBN: 9781108412636

System requirements

This product is optimized for use on the following systems:

Windows Operating System in English: Windows 7, Windows 8, Windows 8.1, and Windows 10.

Instruction to Use

Insert the USB memory stick into the USB slot of your Windows computer. Copy all of the files to your computer disk.

1. Run the computer-simulation teaching software: Open the folder copied to your disk, and double-click the csuphy.exe file to run the computer-simulation teaching software.
2. Open the computer-simulation teaching demonstration window. There are two ways to do this:
   a) Click on the wanted item in the left pane of the item list window; the content titles associated with the item will show in the right pane. Double-click the selected content title, the corresponding computer-simulation teaching demonstration window will be opened.
   b) Click on the menu item on the menu bar. The relevant sub-menu will pop up. Then click the selected sub-menu item to open the corresponding computer-simulation teaching demonstration window.
3. Presentation of the computer-simulation teaching content:
   The computer-simulation teaching demonstration window should be open on the screen, including the title bar, toolbar, demonstration window and status bar.
   The title bar at the top of the screen is used to display the title of the computer-simulation teaching demonstration. On the right-hand, side you will see three control buttons – the minimize button, the zoom button, and the close button. Their functions are:
   The minimize button is used to hide the demonstration window. If you click the minimize button, the computer-simulation teaching demonstration window will disappear from the desktop, only leaving a button at the taskbar. To re-open the minimized window, click the button at the taskbar and the demonstration window will be restored to its previous size.
   The zoom button is used to resize the demonstration window. If you want to change the size of the computer-simulation teaching demonstration window (to make it larger or smaller), we can move the mouse cursor on its corner or any border. When the cursor turns to a double arrow, drag the corner or border to reduce or enlarge the computer-simulation teaching demonstration window. If you want to move the demonstration window, just place the cursor on the title bar and drag the window to the desired position. If you want to make the demonstration window fill over the entire screen, click the zoom button or double-click on the window's title bar.
   The close button is used to close the demonstration window. Clicking on this button closes the computer-simulation teaching demonstration window and returns to the item list window.

Below the title bar is the toolbar which contains the **Start** button, **Continue** button, **Reset** button, **Pause** button, and **Return** button. The functions of these buttons are described as follows:

Start button is used to start the corresponding computer-simulation teaching demonstration. When you click the button, the computer-simulation teaching content will start to play.

Continue button is used to process the next computer-simulation teaching content. When you click the button, the current computer-simulation demonstration will go to its subsequent stage.

Reset button is used to control the demonstration process of the computer-simulation teaching content. When you click the button, the demonstration process can be set back to the initial state.

Pause button is used to temporarily suspend the computer-simulation teaching demonstration. If you click the button, the demonstration will be paused. To continue with the computer-simulation teaching demonstration, simply re-click the button.

Return button is used to stop the demonstration. If you click the button, the computer-simulation teaching demonstration will stop and return to the item list window.

The black pane under the toolbar is the demonstration area, where the computer-simulation teaching content is presented. In order to facilitate the process control of various computer-simulation teaching demonstration, there are some appropriate controls in the pane. The controls have different functions for different computer-simulation teaching demonstrations.

4. Operating system
   Windows Operating System in English: Windows 7, Windows 8, Windows 8.1, and Windows 10.

Introduction to the Software

With years of experience in software development and teaching university physics courses, Prof. Hu and his team have developed this software to facilitate teaching of undergraduate level introductory physics courses.

It is difficult to teach students to master the key knowledge points without displaying physical image. Unlike traditional figures or animations, this software calculates and displays physical images and dynamic process in a dynamic, interactive, and accurate manner. When changing the parameters, situations and viewpoints, the images, dynamic processes, and results are calculated and shown simultaneously, saving class time for setting up experiments apparatus, and helping to demonstrate the physical images and processes that cannot be directly observed. It is useful and easy for students to establish the correct physical images and to understand the physical concepts. Most physical concepts, physical images and physical dynamic processes in teaching mechanics, thermal Physics, electromagnetism, wave optics, special relativity, and quantum physics at introductory level university physics are included.

Contact

Please contact the author at information@cambridge.org, if you encounter any bugs or would like to suggest any improvements to the software.

Catalogue

Mechanics
Radius of Curvature
Projectile Motion
Measure the Length of a Moving Object
Foucault Pendulum
Collisions Between Two Balls on a Smooth Table
Elastro-plastic Collision between Two Spheres
Elastic Collision between a Small Ball and a Thin Rod
Elastic Collision Between Two Thin Rods
Conservation of Angular Momentum of a Mass Point
Motion of a Rigid Body
The Trajectory of a Point on a Rigid Body
A Boy Walks on a Disk
Conservation of Angular Momentum of a Rigid Body
Precession of a Top
Can a Wheel Roll up over a Vertical Kerb
A Simple Oscillating System
A Uniform Circular Motion of a Vector and a Simple Harmonic Motion
The Resultant Motion of Simple Harmonic Motions
Damped Harmonic Motion
Driven Harmonic Motion
Coupled Oscillations
An Ideal Pendulum
A Damped Pendulum
A Damped Driven Pendulum
Fourier Analysis of Oscillation
Water Wave
Transverse Wave
Longitudinal Wave
Huygens's Principle and Its Application
Superposition of Waves
Spatial Interference Phenomena
Standing Waves
The Doppler Effect

Thermal Physics
Brownian Motion
Probability Distribution of Small Balls in the Cordon Board
Maxwell Speed Distribution
Maxwell's Speed Distribution Curves
The Altitudinal Distribution of Particles in a Gravitational Field
Collision Frequency of Molecules
Diffusion
Disturbance
Quasi-static Process and Non-static Process
Typical Thermodynamics Processes of an Ideal Gas
Carnot Cycle
Statistical Meaning of the Second Law of Thermodynamics
The Free Expansion of an Ideal Gas is an Irreversible Process
Isotherms of Real Gas

Electromagnetism
Simulation of the Electric Field of Point Charges
Charges on a Conductor
The Polarization of Dielectrics
Magnetic Field Lines of Two Infinitely Long Parallel Wires Carrying Currents
Magnetic Field Lines of a Circular Current Loop
Magnetic Field Lines of Solenoids Carrying Currents
Magnetic Field of a Finite Wire Carrying a Current
Magnetic Field along the Axis of a Circular Loop Carrying a Current
Magnetic Field along the Axis of a Long Solenoid Carrying a Current
The Magnetic Interaction of Parallel Wires with Currents
Rotating a Stiff Rectangular Coil in a Magnetic Field
Motion ofa Charged Particle in a Uniform Magnetic Field
The Mass Spectrometer
Magnetic Focusing
Motion of a Charged Particle in an Electromagnetic Field
Hysteresis Loops
Technical Magnetization
Electromagnetic Induction Experiments
The Betatron
Transient Behavior of Electric Circuits
Radiation of Electromagnetic Waves from an Oscillating Electric Dipole

Wave Optics
Young's Double-Slit Experiment
Lloyd's Mirror Experiment
Fringes from a Wedge-Shaped Film
Newton's Rings
Effects of Finite Coherence Length
Fringes of Equal Inclination
Single-Slit Fraunhofer Diffraction
Fraunhofer Diffraction by Many Slits
Fraunhofer Diffraction by a Blazed Grating
Fraunhofer Diffraction by a Rectangular Aperture
Fraunhofer Diffraction by a Circular Aperture
Resolution of a Circular Aperture
Birefringence
The Application of Huygens's Principle to Birefringence
The Nicol Prism
The Rochon Prism
The Wollaston Prism
The Study of Polarization

Special Relativity
Observations on the Aberration of Light
The Fizeau Experiment
The Michelson-Morley Experiment
A Common Way of Synchronizing Clocks
Relativity of Simultaneity in Different Inertial Frames
The Slowing Down of a Moving Clock
Clock Puzzle
The Length Contraction of a Moving Object
The Visual Length of a Rapidly Moving Stick
The Visual Appearance of Rapidly Moving Objects
Lengths in the Train Frame and Tunnel Frame
Time Intervals in the Train Frame and Platform Frame

Quantum Physics
The Photoelectric Effect
The Compton Effect
The Two-Slit Electron Diffraction Experiment
The Infinite Square Well
The Square Barrier
The Harmonic Oscillator
Probability Distribution for a few Quantum States of the Hydrogen Atom

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Last Updated: April 2017