



Contribution ID: 247 Contribution code: S1 Physics Innovation

Type: Poster Presentation

Application of Ultrasonic Sensor and Arduino in Analyzing Motion of Damped Pendulum

An easy-to-setup experiment designed to measure period and air drag coefficients of damped pendulums is reported. The setup is made up of a solid metal ball and cylindrical shells with various sizes to create air drag. The ultrasonic position sensor (HC-SR04) and an Arduino Uno board was located at the lowest point of motion. The pendulum was released from the same height with small angles. The period of oscillations of different cylindrical shells were obtained from the time series plots of the pendulum position as its motion moving back and forth above the sensor. The periods of damped pendulum were measured with five different values of string length. The drag coefficient was proportional to the size of the cylindrical shell and in agreement with the drag equation for a small Reynolds number.

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Session Classification: Poster: S1 Physics innovation

Track Classification: Physics Innovation