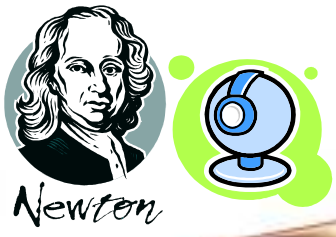
WEB CAMERA USAGE IN PHYSICS EXPERIMENTS



The innovative way of understanding & learning Physics concepts

by
Anjuli Ahooja

Focus Questions?

1. How can we make the physics experiments more precise and more accurate?
2. How can we use technology to make this happen?
3. Last, but not the least, how to make experiments more fun for students?

Traditional Method (s)

- Use
  - eye
  - stop watch
  - meter stick
  - ……

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Technology

- Sensors
- Data Acquisition Software
- Simulations
- ……

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How it all started?

- Ripple tank and still digital camera
- Digital video camera

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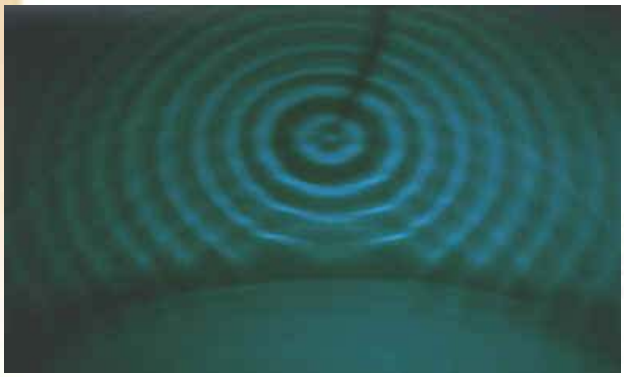
Ripple tank



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Ripple Tank

- Take videos of the ripple tank
- Observe the changes in wavelengths with change in frequency, angle, depth etc
- Observe the changes when obstacles are placed in the tanks

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Digital Video Camera

- Projectile motion
- DartFish
- http://www.dartfish.com
- Download the software free for 30 days …….

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Logger-Pro Video Analysis

- Vernier (Logger-Pro) recommended using a web camera for its video analysis software

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Advantage Web Camera

- Cheaper
- More robust
- Easy to use

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Follow up Experiments

- Projectile Motion
- Circular Motion
- Collisions
- Understanding Acceleration

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Projectile Motion

- Method
- Take videos of a projectile launcher or
- Take videos of a basketball shot
- Analyze the videos using Dartfish or Logger Pro video analysis tool
- How to plot points on the graph (Logger Pro)

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Projectile Motion

- Define the scale by keeping a meter rule in the same area
- Choose the required axes from the graph options
- plot the points by moving the video frame to frame
- Observe the graph
- Multiple graphs also possible (y - t, x - t, y – x or)

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Circular Motion

- More accurate data for time
- Response time reduced
- More precise data for number of revolutions as points are plotted on the video
- More precise time period measured

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Circular Motion

- Inertial and Non-Inertial frame

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Collisions (Elastic or Inelastic?)

- Different sized balls and marbles used (Air Hockey table or a pool table can also be used – future plan)
- Collisions video recorded
- Graph plotted for each ball
- Calculations performed to find the ratio of masses of the objects
- Check if the collision was perfectly elastic

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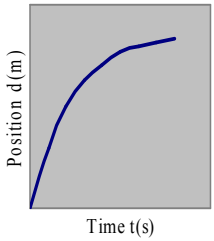
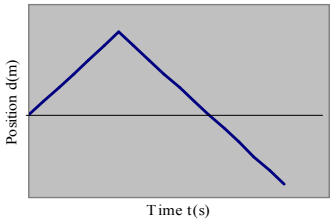
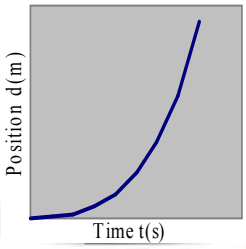
Understanding Acceleration

- Graphs given to student
- Web cam used to take the videos of the students who walked to get the same graphs
- Graphs analyzed and v-t graphs plotted with d-t graphs on Logger-Pro







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Understanding Acceleration due to Gravity

- Web cam used to take videos of a ball thrown vertically upwards
- The students could check if the throw was vertical
- The video was analyzed by Logger –Pro by plotting d-t and v-t graph for the throw
- Acceleration due to gravity found from the v-t graph

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Advantages of Using Web Cameras

The students

- perform the same hands-on experiment
- get a more interactive experience
- can review the videos or pictures at a later time
- Get more accurate results
- ….and it is more fun!!

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Thank you!

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