

TRACKER USED TO STUDY PHYSICAL PHENOMENA


General description of the activity:

To choose a physical phenomena linked with a movement and obtain data using Tracker. Obtain a mathematical-physical model and conclusions related the phenomena

STEP 1

- To record a physical phenomena and use the video to obtain data with Tracker
- To use the obtained data to obtain a mathematical model. This mathematical model is, at same time, a physical model. There are different possibilities to use the obtained data:
 - o Obtain the model directly, using a program to do it
 - Tracker
 - GeoGebra
 - Excel
 - Other programs
 - o Obtain the model using mathematical tools (calculate the model using mathematical knowledge)

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Download Tracker 4.94 installer for: [Windows](#) [Mac OS X](#) [Linux 32-bit](#) [Linux 64-bit](#)

Note: Tracker now includes its own private Xuggle video engine.
We strongly recommend uninstalling pre-4.90 versions of Tracker before installing this upgrade.
OSX users: control-click the installer and choose Open from the popup menu rather than double-clicking.

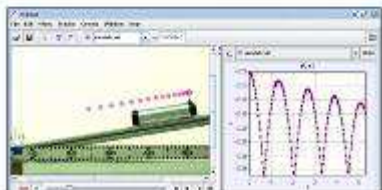
[Installer Help](#) [Change Log](#)

Physics teachers: Have you developed a good Tracker activity?
Why not share it with the comPADRE Digital Library community? [Click here to learn more.](#)

What is Tracker?

Tracker is a free video analysis and modeling tool built on the [Open Source Physics](#) (OSP) Java framework. It is designed to be used in physics education.

Tracker [video modeling](#) is a powerful way to combine videos with computer modeling. For more information see [Particle Model Help](#) or AAP1 Summer Meeting posters [Video Modeling \(2008\)](#) and [Video Modeling with Tracker \(2009\)](#).



Tracker Features

Tracking:

- Manual and automated object tracking with position, velocity and acceleration overlays and data.
- Center of mass tracks.
- Interactive graphical vectors and vector sums.
- RGR line profiles at any angle, time-dependent RGR regions.

Modeling:

- Model Builder creates kinematic and dynamic models of point mass particles and two-body systems.
- External models animate and overlay multi-point data from separate modeling programs such as spreadsheets and [EJS simulations](#).
- Model overlays are automatically synchronized and scaled to the video for direct visual comparison with the real world.

Video:

- Free Xuggle video engine plays and records most formats.

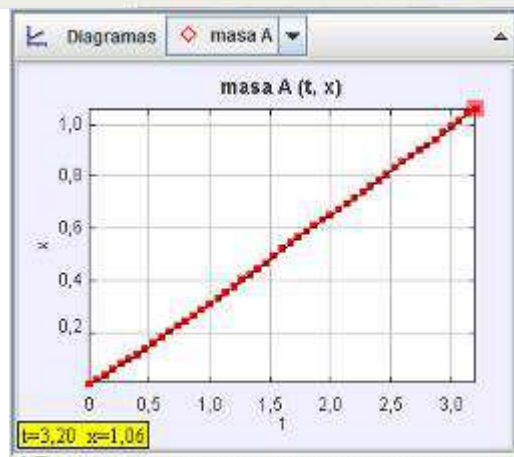
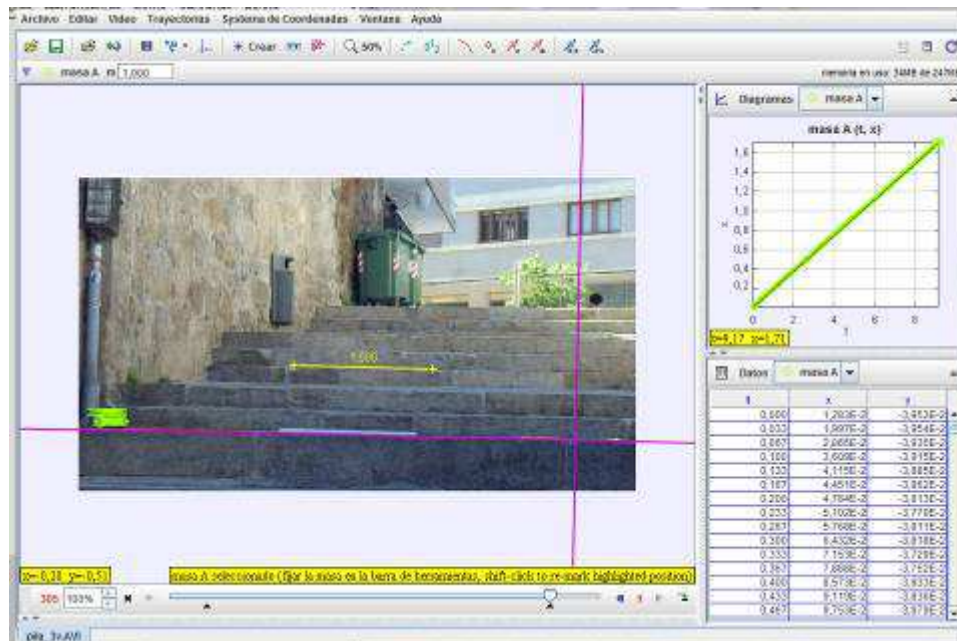
STEP 2

Implied knowledge in the obtained model:

- Mathematical variables ↔ Physical variables = Physical magnitudes
- Mathematical equation ↔ Physical expression
- Mathematical parameters ↔ Physical parameters (initial conditions of the experiment)

STEP 3

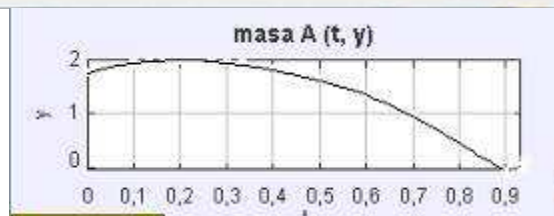
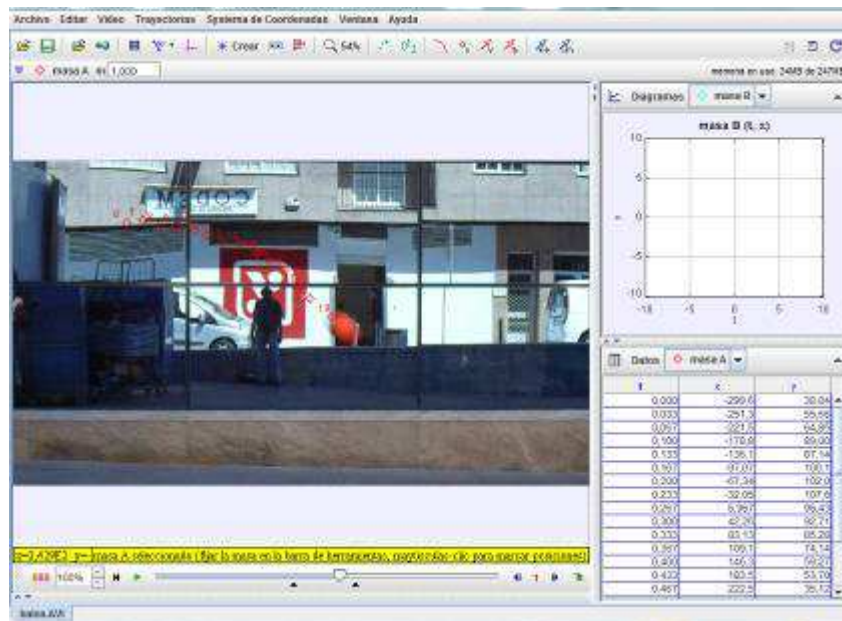
Conclusions: kind of movement, influence of the initial conditions in the mathematical-physical model, parameters and initial conditions, etc.



COLLABORATION OBJECTIVES

Teachers have a lot of possibilities to study. They have to decide what physical phenomena they want to study, what data they want obtain and what data they want to share with the other teams.

For example, they could decide to do a study of the parabolic movement. If they decide to study the parabolic movement, they can do it with a ball (typical object used like a example in this kind of movement). But they could decide use water to do something with the obtained model. That is to say, use the model to do one concrete thing. If they use water, they could decide design and build a model of a fountain with several water tap. The parabolic trajectory of the water in each water tap depends of several conditions. The influence of these conditions would be studied with the use of Tracker and the parabolic trajectory.



They could study the pendular movement. Each team of students could study the movement of a pendulum in several situations. Each team could do the study using all times the same length of the string but with different weights (the same weights for all teams). Each team will obtain different mathematical models but always of the same family function. As a result, the pendular movement depends of two initial conditions: the weight and the length of the string. Therefore, in the mathematical-physical expression will appear these two initial conditions. This option is an example of “collaborative learning” between students of different countries.

