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A PROPOSAL TO TEACH PHYSICS IN SECONDARY SCHOOL WITH VIDEOS ANALYSIS

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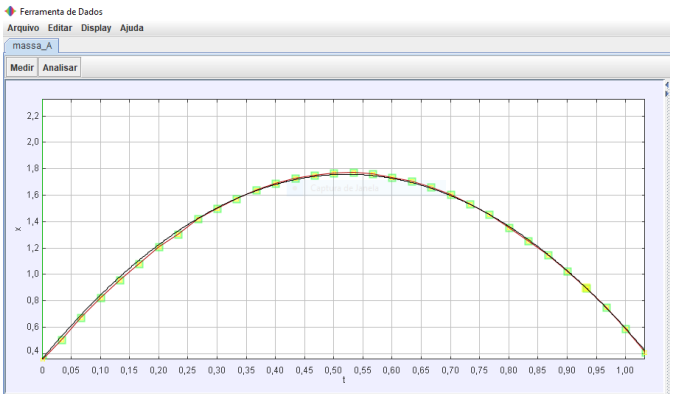
Graphical Abstract

Analisys and results of figure 3.



Function	$y = ax^2 + bx + c$
A	*-5,21*
B	*5,36*
C	$3{,}31 \times 10^{-1}$

$$Y = Y_0 + V_0 t + \frac{-g}{2} t^2$$

For g = 2A, we have gravity. Approximate -10,42

Abstract.

We present a proposal for the use of outdoor experiments that refer to everyday situations. We set up scenarios with potential to serve as experiments demonstration classical mechanics concepts, using a cell phone camera to record scenes, and using Tracker software to extract and analyze videos. We rescued Galileo's classic experiment in order to demonstrate inertia, by using a motorcycle with the vertical launch of a basketball, analyzed the oblique launch by throwing a basketball, measured the super-fast movement of a ball of tennis bouncing and we checked the less time trajectory represented by brachistochrone with the use of a mark made in the tire of a bicycle in movement. All selected scenes proved to be adequate as a didactic resource for experimental physics classes. Outdoor activities open the possibility of interlocution between high school subjects with an emphasis on Physics teaching

Introduction

In the contemporary moment the inscription of technological resources in the Secondary School is discussed. In this context, the computer as a didactic tool becomes an essential ally in learning and searching for new knowledge in Physics [1].

We create situations that refer to everyday life to study classical dynamics, according to the idea that physics is not limited to a set of codes and equations studied in the classroom, as a rule far from

reality. Thus, we wish to connect outdoor experiments with real situations that allow the appropriation between physics learned in a dynamic and interactive way, providing the understanding of the world around us.

Our objective is to find alternative ways to promote experimentation in Physics Teaching, in order to provide students with the possibility of outdoor interaction, together with the learning of Physics concepts.

Materials and Methods

To collect the data, we elaborate outdoor experiments that refer to everyday situations such as the practice of sports activities. We use the following materials: a tennis ball of 56.7g, a basketball of 600g, the tire of a motorcycle with a diameter of 46cm, a bicycle and we enact situations that involve concepts of classic mechanics like force, mass, acceleration, speed and displacements by means of oblique throwing's, gravitational potential, minimization and damped movements. The method was to record videos with the camera from a mobile phone for further analysis. We used the free software Tracker [2] in order to extract information from tables and graphs for studies and increase learning.

Results and Discussion

We measured and calculated the damped movement of a tennis ball bouncing on the ground, using the tools available in the Tracker to define the boundary conditions as reference, mass and dimensional scale obtained during the experiment. After these adjustments it was possible to mathematically model the motion as shown in Fig. 1.

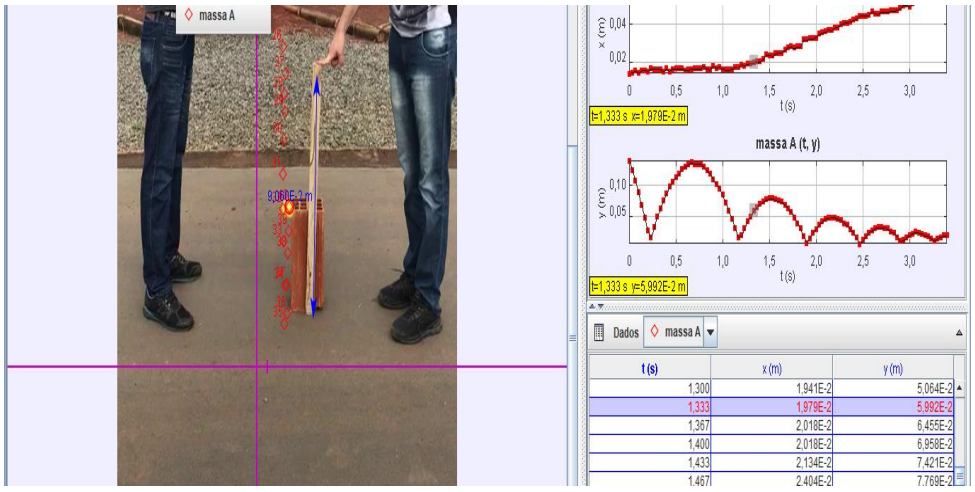


Figure 1: Scene of the video analyzed to obtain the damped motion.

Next, we check the faster path represented by the brachistochron with the use of a mark made on the tire of a moving bicycle, according to Fig. 2.

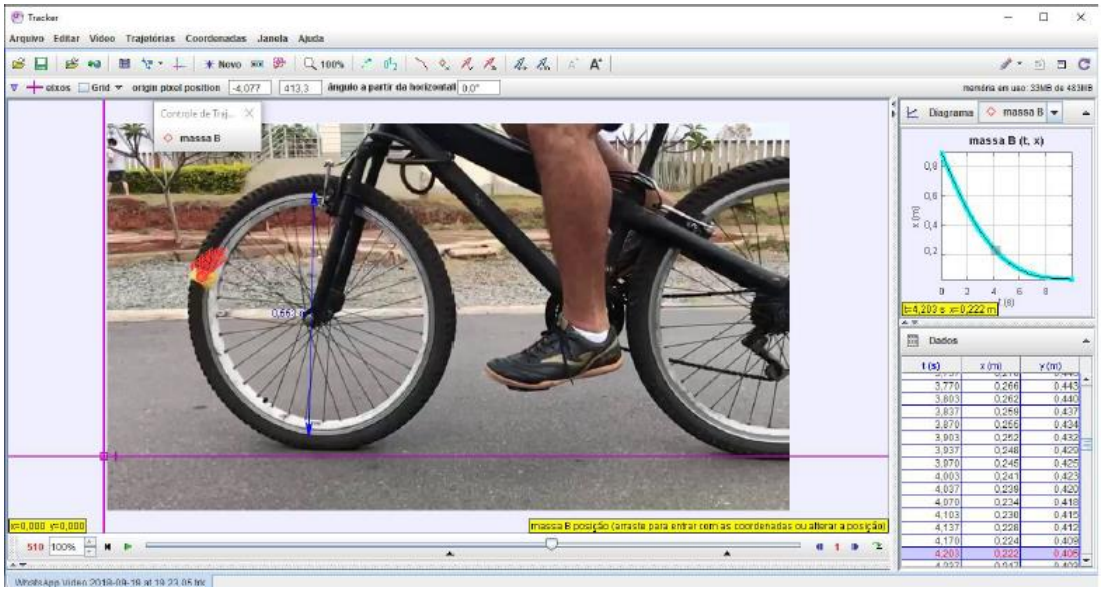


Figure 2: Video scene analyzed to obtain the trajectory in the brachistochron experiment.

We recover Galileo's classic experiment in order to demonstrate inertia by using a motorcycle with the launch of a basketball as shown in Fig. 3.

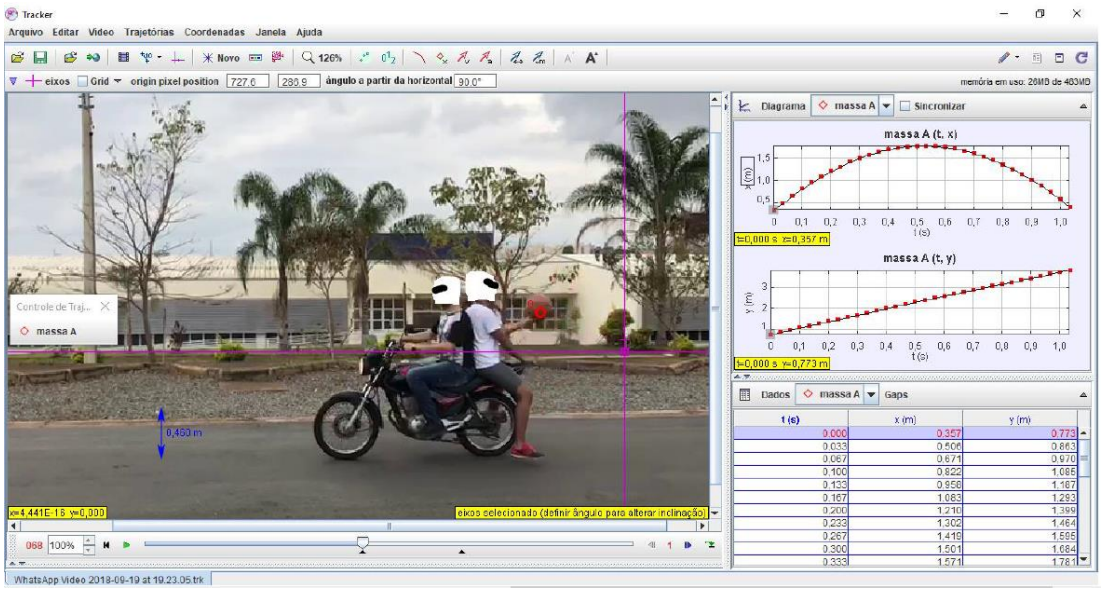


Figure 3: Video scene analyzed to obtain the oblique movement of the basketball in an accelerated frame.

We analyzed the oblique throwing of a basketball in an inertial frame as shown in Fig. 4.

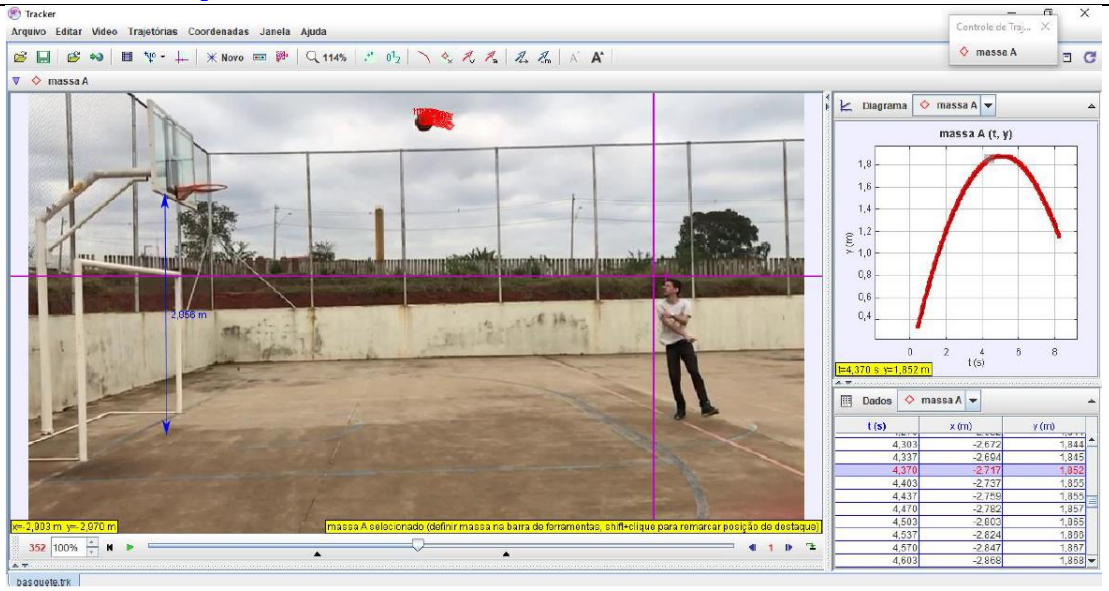


Figure 4: Video scene analyzed for oblique movement.

Conclusions

All selected scenes proved to be adequate as a didactic resource for experimental physics classes. Outdoor activities open the possibility of interlocution between high school disciplines with emphasis on Physics Education, in addition to associating Physics with daily activities.

References

[1] S. DA SILVA, Ione de Cássia Soares; PRATES, Tatiane da Silva; RIBEIRO, Lucineide Fonseca Silva. As Novas Tecnologias e aprendizagem: desafios enfrentados pelo professor na sala de aula**.** Em Debate, Florianópolis, n. 15, p. 107-123, mar. 2017.

[2] Tracker: Video Analysis and Modeling Tool. Disponível em: https://physlets.org/tracker/, Acesso em: 03-out-2018.