

# Qualitative Study Of Coupled Harmonic Oscillations On An Air-Track

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## **Abstract:**

*In this experiment we qualitatively studied the oscillations of a coupled spring mass system on a frictionless air-track. The velocities, accelerations and kinetic energies of the masses were plotted against time.*

**Keywords:** Coupled harmonic oscillator, air-track

## **Introduction:**

What are Coupled Oscillations?

Coupled Oscillations occur when two or more oscillating systems are connected in such a manner as to allow mechanical energy to be exchanged between them. The aim of the experiment was to study the motions of a spring mass system consisting of two masses coupled with a spring.

## **Experimental Setup:**

The experimental setup consisted of two masses coupled with a spring. Two carts loaded with masses were linked using a light spring. The major difficulty with experiments of this type is the elimination of dissipative forces like friction which renders the experiments very difficult. To eliminate friction a frictionless air track was used.

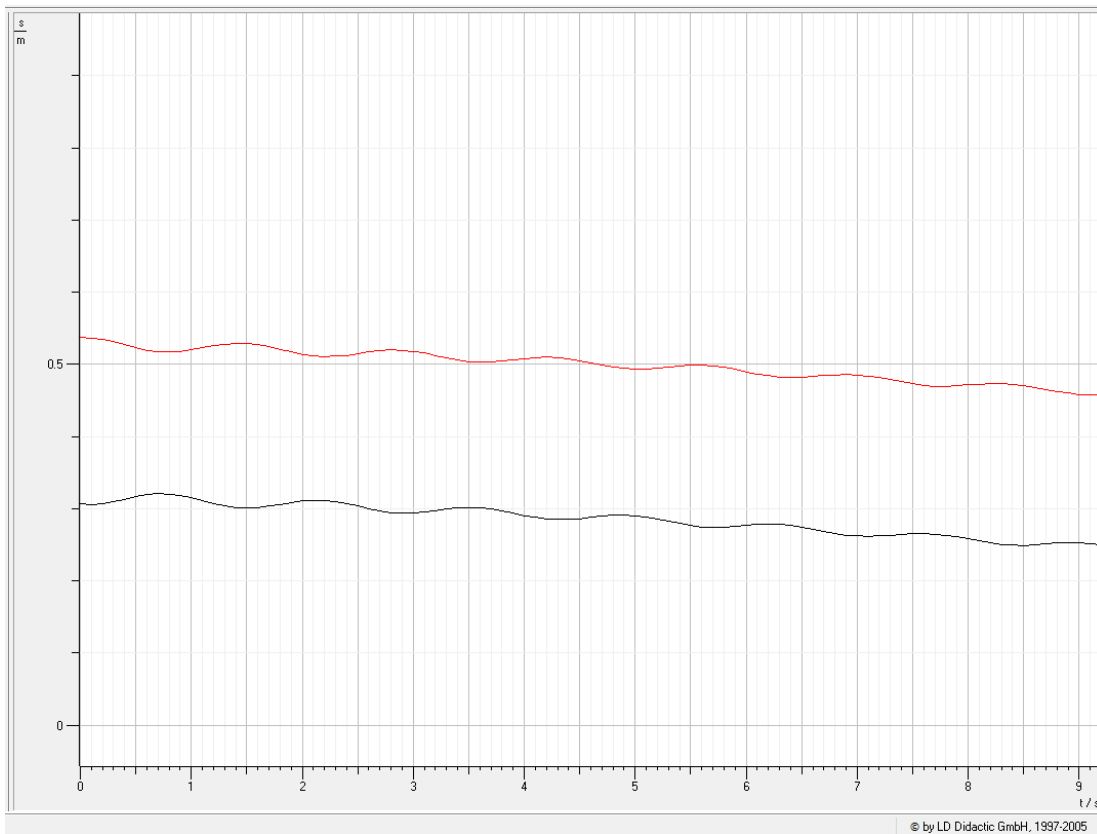
Observation of motions in mechanics experiment is another important problem. For this purpose we used a VideoCom motion sensing camera along with its associated software package.



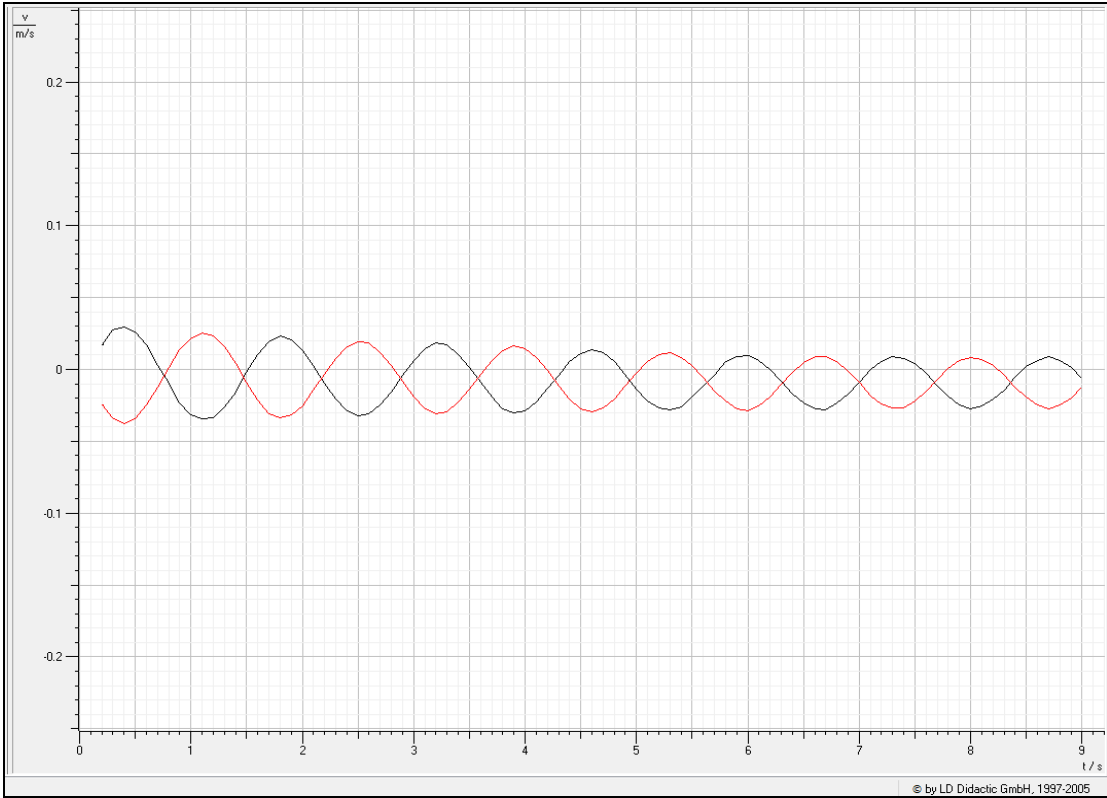
The carts were fitted with retroreflectors, which reflected the light emitted by the flashing LEDs in front of the camera, back to the camera itself.

**Results:**

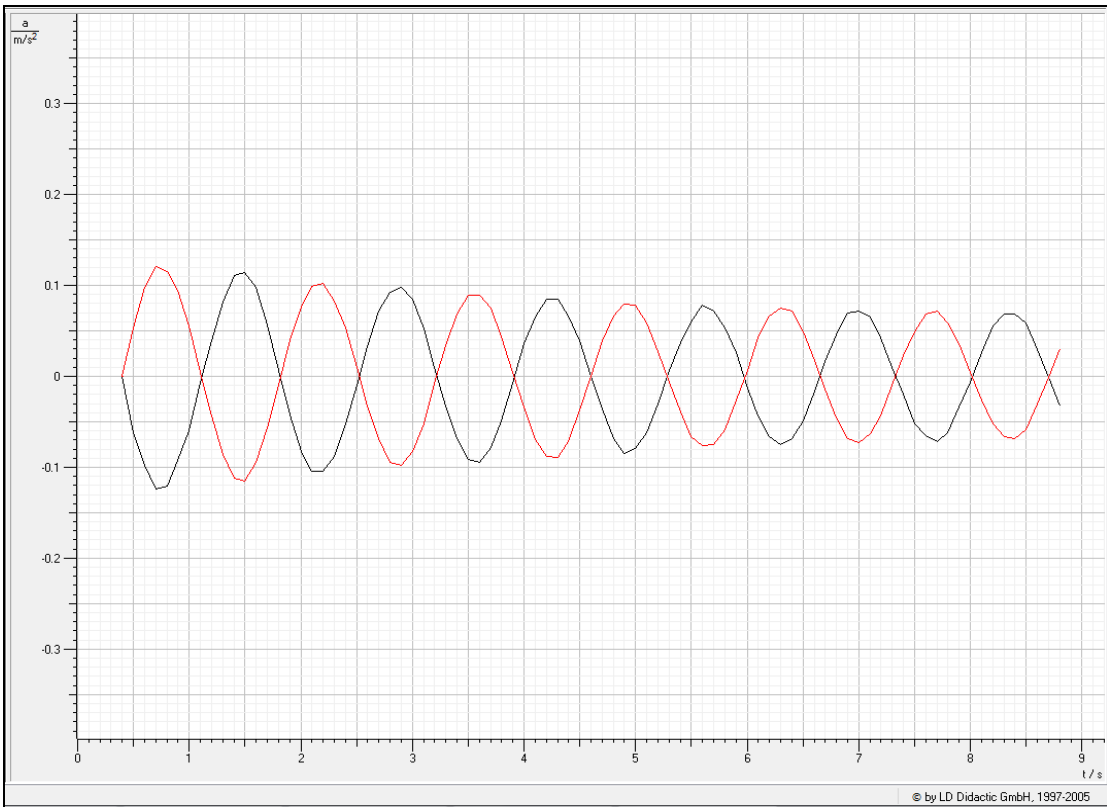
The loaded carts were put into oscillations by pulling them apart, such that the initial phase difference between their displacements was  $\pi$ . Their subsequent motions were tracked using the camera. Due to time constraint only a qualitative study was done and detailed analysis was omitted. The plot of their motions is given below:



Plot of Displacements vs time of the two masses.



Plot of velocities vs. time.



Plot of acceleration vs. time.

