The Cheerios Effect

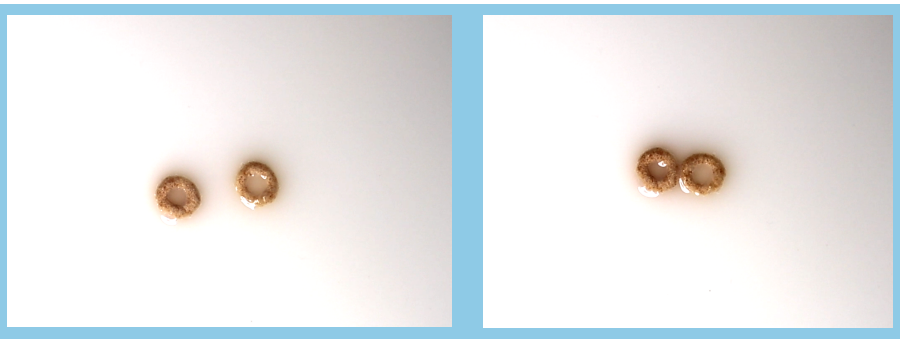
Note: This is not a full project, just the outline of an idea. Use it as a starting point, but go further, be more complete and careful.
You're expected to do your own literature search on the topic.
Ask questions, find the answers.

Description: The famous "cheerios effect" is what happens when two cheerios in your bowl of milk get close together: they attract each other and collide! In this project you will analyse this effect using video recording and tracking, with the goal of checking the published theory for the separation distance $l(t)$. Can you measure the acceleration and force between the two cheerios?

References: D. Vella and L. Mahadevan, *Am. J. Phys.*, Vol. 73, No. 9, September 2005.

Suggested Materials

Cheerios
Water or milk
Small bouyant spheres
Video camera (smart phone will do)
Tracker Video Analysis and Modelling Tool (physlets.org/tracker)



Basic Analysis: After recording the motion of two cheerios, their positions were followed with *Tracker*. The position data along the x axis (oriented so that motion was generally along this direction) is shown below in Figure 1. The total separation distance l was then calculated from the position data of each cheerio (Figure 2) and compared with the theory from Vella and Mahadevan (2005). The fit isn't great, but they assumed tiny spheres, not cheerios.

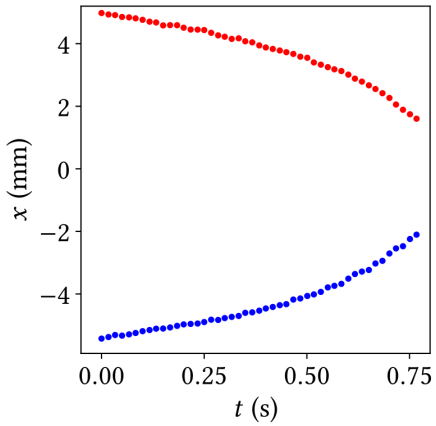


Figure 1 - Position along the x-axis for each cheerio.

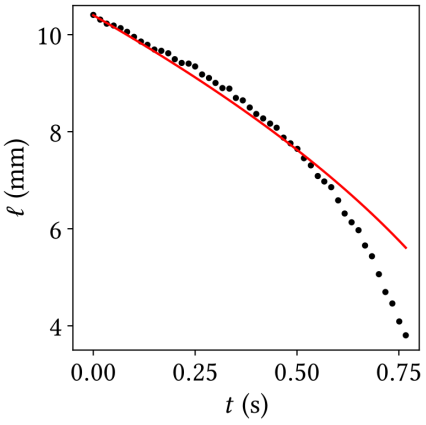


Figure 2 - Separation distance between cheerios.

Further Work

This started with actual cheerios mostly because that's the name of the effect - but cheerios make a poor object (they're all different, they get soggy after a short time, they're not spheres). So try different objects. Does their size matter? What else has an effect? Can you replicate Vella and Mahadevan's (2005) experimental work? Can you find the force between the cheerios and how it depends on distance? What else can you explore here?