**Experiment 3:** Hypothesis formulation and testing

You should be able to
- create a testable hypothesis.
- plan and execute experiments.
- collect and organize data from measurements.
- investigate what the data say about the hypothesis.
- conclude based on measurements.
- write a short lab report about the experiment.

## Part 1

An iOLab lies on its back (not on the wheels) on a horizontal surface. The iOLab is pushed in the $y$-axis direction by a hand. The iOlab slides over the surface and eventually lies still. A measurement with the 3D accelerometer, in the given situation, may look like the figure below, where three points are marked A, B, and C.
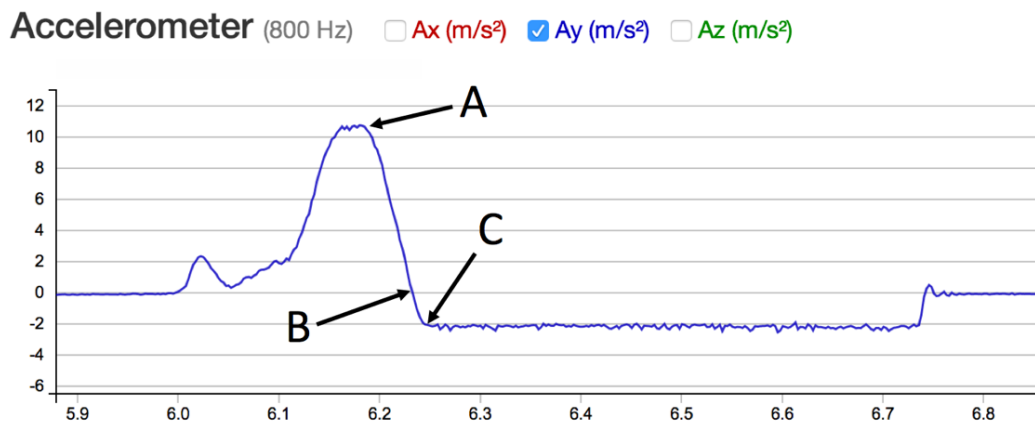


You can formulate three testable hypotheses about when the hand loses contact with iOLab.

Hypothesis A: The pushing hand loses contact with iOLab when the acceleration is peaking (point A).
Hypothesis B: The pushing hand loses contact with iOLab when the acceleration is zero (point B)
Hypothesis C: The pushing hand loses contact with iOLab when the acceleration flattens out (point C).

Choose one of the hypotheses. Design and execute an experiment that tests the chosen hypothesis. Investigate what the data say about the hypothesis. Finally, explain with theory why your hypothesis is correct (not rejected) or wrong (rejected).

## Part 2

Now you should investigate a situation in which iOLab, on the wheels, after a brief push rolls up an incline and subsequently rolls down the incline. The acceleration during the motion going up is $a_1$ and the acceleration during the motion going down is $a_2$.

Formulate a testable hypothesis that compares and refers to the accelerations $a_1$ and $a_2$ with uncertainties. Design and execute an experiment that tests the chosen hypothesis.
Investigate what the data, e.g. measured with the wheel sensor, say about the hypothesis. Finally, explain with theory why your hypothesis is correct (not rejected) or wrong (rejected).


Write a short lab report about the experiment.