Bachelor Thesis Log – LadHyX – Viscoelastic Impacts

Week 1:

* Calibration of Phyling wireless accelerometer
* Groundwork of code for data read, treatment, and analysis
* First tests in punching ball, getting acc., speed, and position on 20 impacts. Double peaks clearly visible on accelerations

Week 2:

* Analysis of 20 impacts, no correlation between sensor acceleration and video speed
* Analysis with 2 sensors, 1 on side, 1 at back. Double peaks only at back
* Leads to initial proposal and presentation of shockwave theory: Double peak is a combination of initial inertial impact + delayed propagation of shockwave through material.
* Measurements made to calculate speed of shockwave in punching ball, coherent with double-peak interval length
* Theory refined: Double peak is combination of initial rigid response of spring base and elastic response of material. Elastic response travels at speed of sound in material, therefore when sensor is sufficiently far from impact, the peaks corresponding to these two phenomena dissociate.
* Proposal of experiment to test theory: several accelerometers moulded into block of dentist paste at various distances.
* Printing of mould for block.

Week 3:

* Made gel block with inline accelerometers, first tests performed
* Visited INSEP, first tests of code with boxers, code failed to segment rounds properly
* Re-wrote code with interactive graphs, added user friendliness
* First comprehensive tests with gel cube, show constant travel time consistent with propagation speed of wave, attenuation present on travel