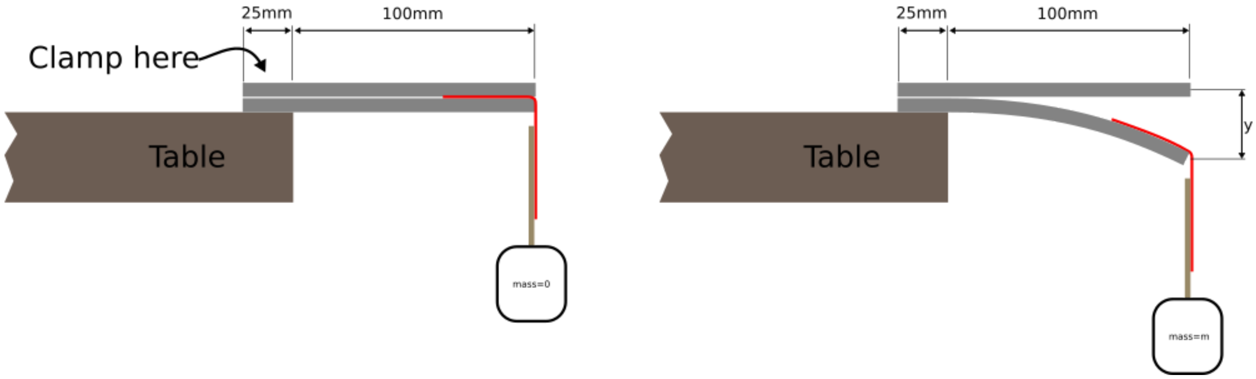
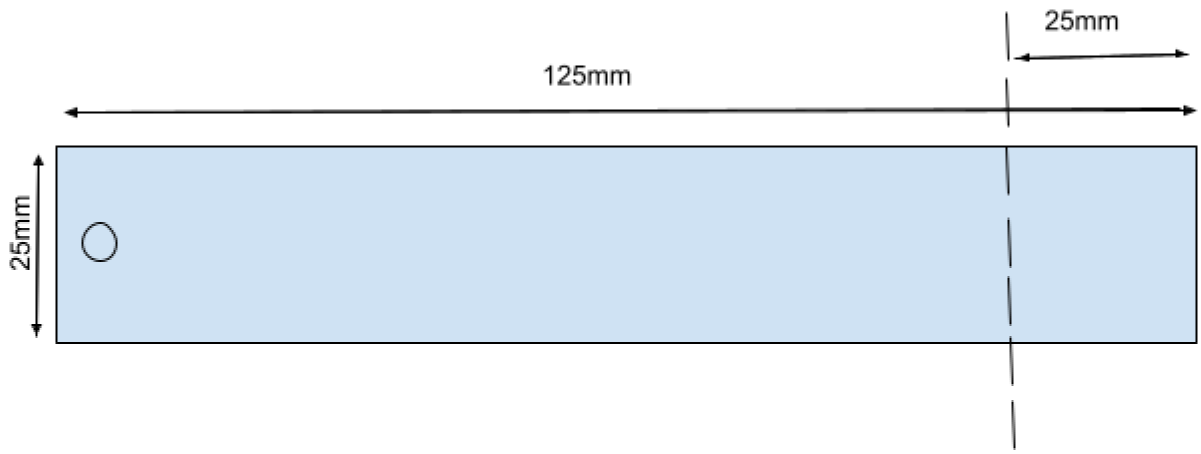
The experiment was carried out just as mentioned on the foldable robotics website



Multiple sheets of different materials were prepared in the dimensions shown below



The materials used were as follows (values in brackets are thickness of one layer of the material)

1) White mount board (1.1mm)
2) Black mount board (1.3mm)
3) Acrylic sheet (1.2mm)

A hole was drilled approximately 5 mm from the overhanging edge. But for the sake of this experiment we would be ignoring it and assuming that the force is acting at the very end.
The calibrated weights were simulated through a bottle of water which was filled with precise amounts of water and verified by weighing on a small electric scale.
The loads applied were 100, 120, 160 and 200gms.
The camera was propped up at one position and the beams were photographed in both loaded and unloaded positions. These photos were overlaid upon each and the tracker software was used to take readings. As shown in the picture below.

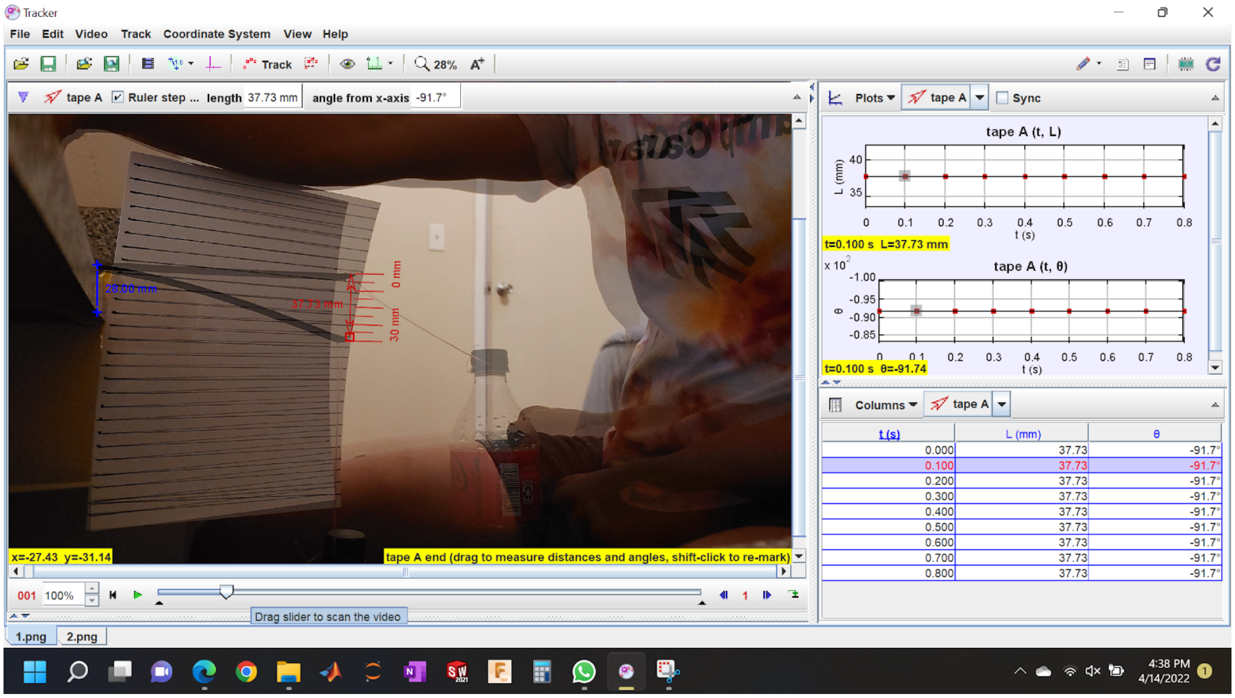
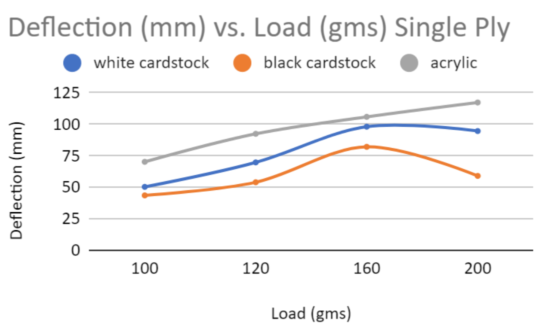


Fig- Collecting data via tracker software



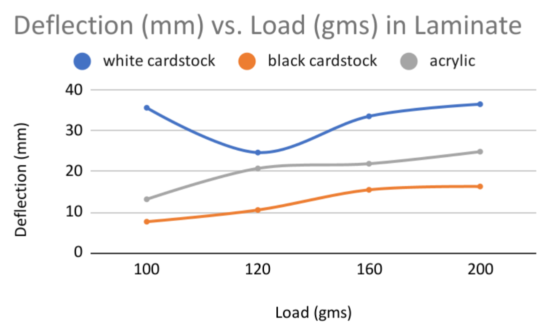


Fig- Single ply deflection *Fig- Deflection in Laminate*

Taking an average of the three separate readings taken during the experiment; this data was used to plot the graphs above.

From the above data we can make the following observations

- In the single ply data both the cardstock materials seem to have gone past the plastic deformation limit, whereas acrylic still seems to exhibit a linear stress strain behavior.
- Black cardstock is the stiffest amongst its counterparts both in single ply and laminate configurations but is prone to “failure” in its single ply configuration.
- White cardstock seems to have gone past its elastic limit in both the configurations and seems quite unsuitable for the task.
- Lamination makes the material stiffer but at the cost of its plasticity ie the material fails at lower deflections than its single ply counterpart

The next step would be to get the stiffness values from the python code.

The issue was that for large enough deflections the code would fail. As the 1/3rd assumption would fail as shown in the figure.

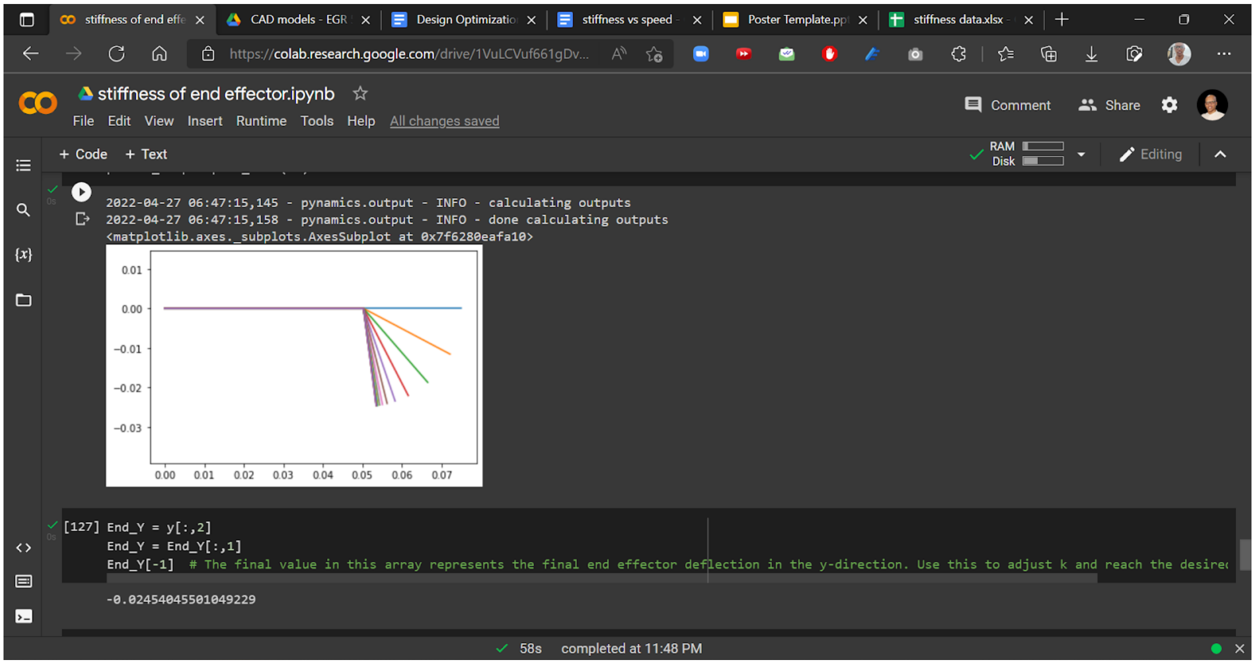


Fig- Pynamics code failing for large deflections

After combing through the data and using the small deflection values it was determined that the stiffness values for black mountboard, which was the ideal material from the above data, was 4.9 e-3 for single ply and 4.5 e-1.