

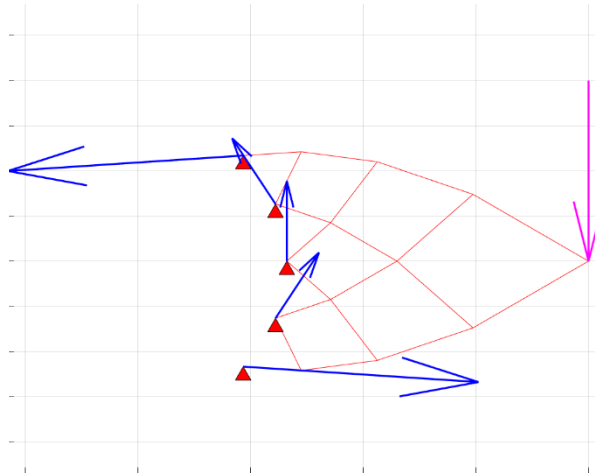
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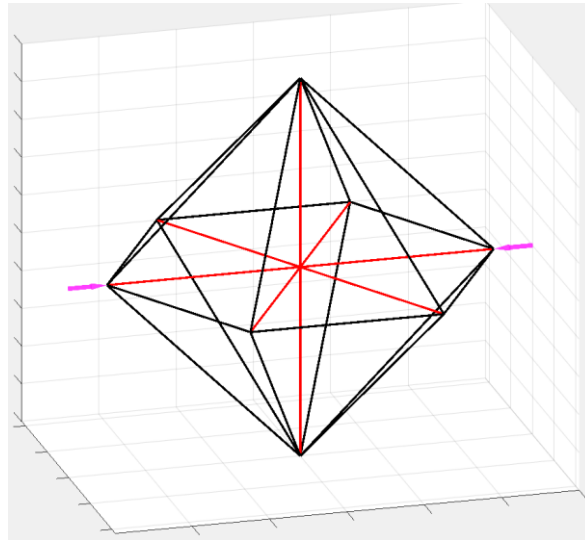
## HW1 Report

MitchelTruss4



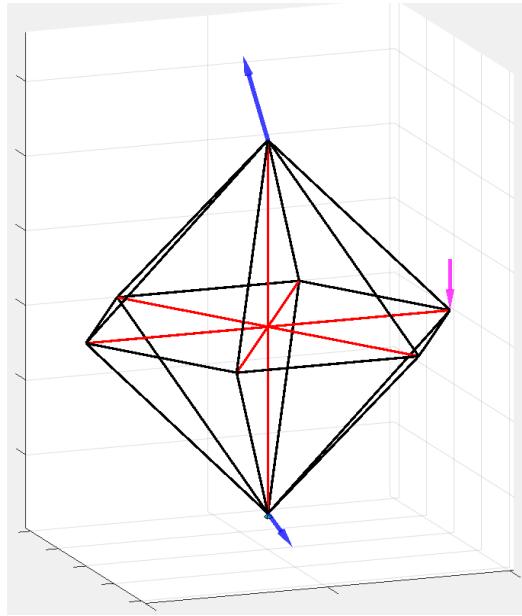
The structure is not potentially inconsistent, meaning the number of independent columns and rows of matrix  $A$  is at least the number of dimensions times the number of free nodes. In other words, there always exists at least one solution for any set of load cases. One solution is shown above. In the specific above case, not all bars are under compression and can be replaced with strings if necessary. The structure is not underdetermined, meaning there are 0 degrees of freedom in the design. In other words, there exists only one solution for the tensegrity of the design (for this case only, can possibly have 0 solutions for an inconsistent structure). Here, static determinance is achieved.

## NonminimalPrism4



The structure is potentially inconsistent, meaning there exists some rows in matrix  $A$  that are linearly dependent on other rows. In other words, there exists two possible sets of solutions for the tensegrity of the structure due to instability or soft modes existing: 0 or 1 solution: or 0 or infinite solutions. The structure is underdetermined, meaning that there exist degrees of freedom in the structure. In other words, there is the possibility of multiple solutions existing, depending on the external load case  $\mathbf{u}$ . Therefore, for this structure, the 2<sup>nd</sup> set applies, where there exists either 0 solutions or an infinite amount depending on  $\mathbf{u}$ . The structure is also pretensionable, meaning we can vary the degrees of freedom at zero nominal loading to help ensure no strings go slack under possible time-varying loads. Here, a solution is shown with a trivial load case of opposing forces on a bar. Due to the structure having no fixed nodes, any load case without opposing forces will result in instability.

### NonminimalPrism4Fixed



Using the same structure as before but fixing the top and bottom nodes, the structure stays inconsistent but has more freedom in allowing external loads. Non opposing forces can be applied and the structure will stay stable. It is still pretensionable so the degrees of freedom (5 in this case) can be adjusted to maximize tension throughout the strings.