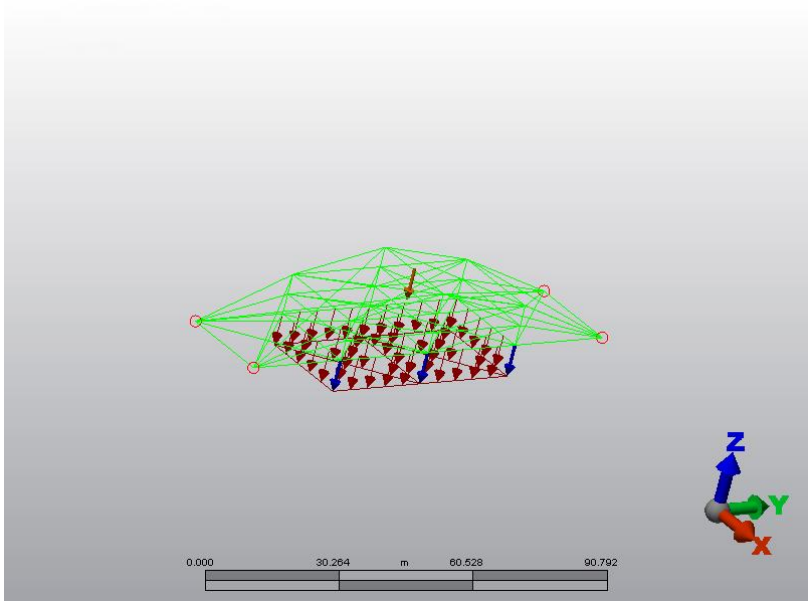
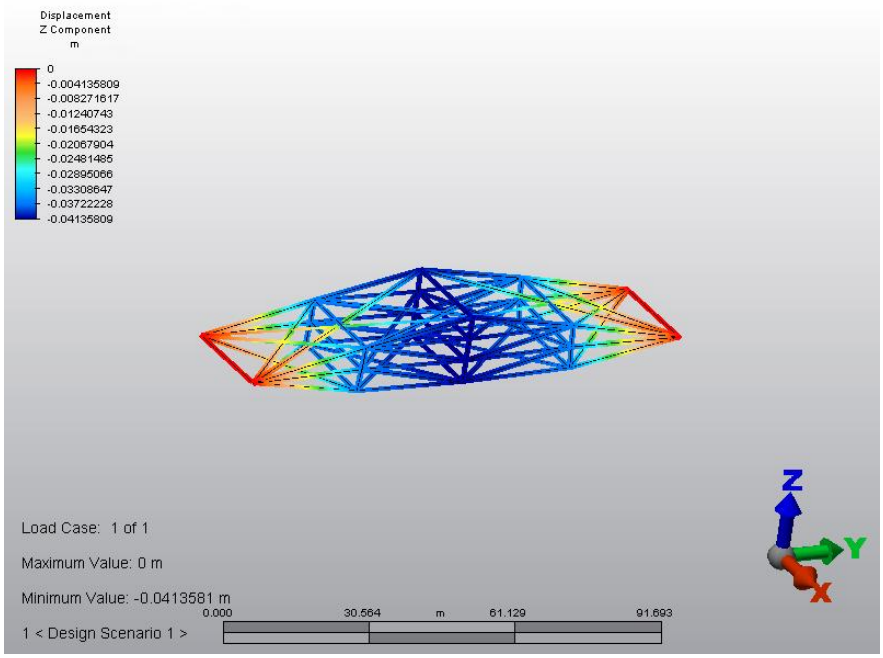
Bridge Project

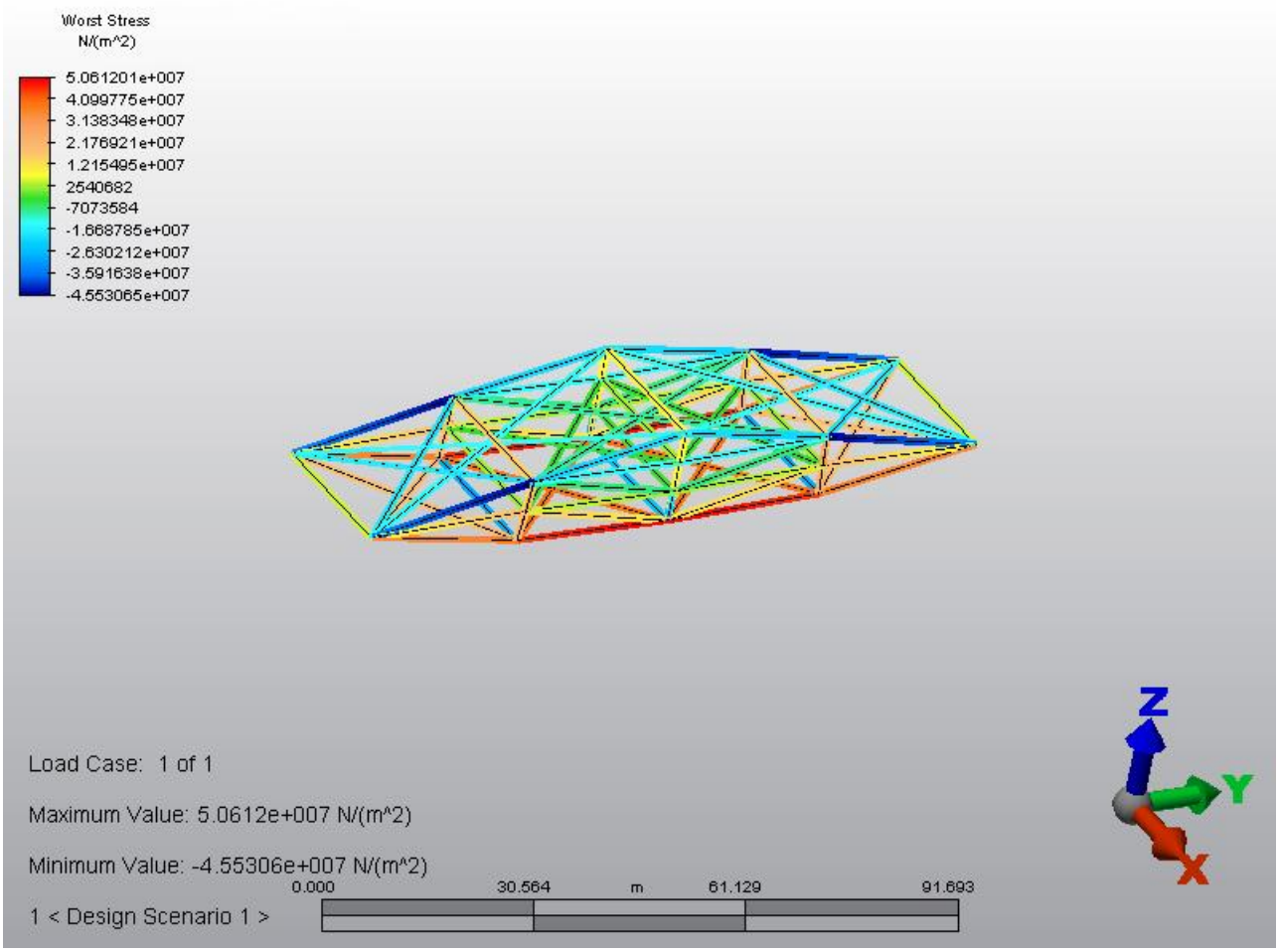
On the last day of classes, last Friday, I had a group project due for my Mechanics class. We had to design a bridge in a program called AutoDesk that could support the weight of any cars that might travel across it and the decking material along with a pedestrian walkway. The bridge had to be 100 meters long, 23 meters wide, and between 5 and 25 meters tall. Loads were applied to the structure in AutoDesk to approximate the weight of the decking, the cars, and the walkway. Our bridges had to withstand these loads with vertical deflection, or bending, below 8 cm and the stress in the structure had to stay below 120 MPa. In our groups we had to make three different bridge designs that would satisfy these requirements. We also had to conduct redundancy testing on one of the designs to ensure that it would still pass. Redundancy testing is removing each beam from the bridge and retesting the stress and displacement of make sure that the bridge still does not fail. We had to remove each beam, one by one, to make sure that if one piece of the bridge failed it wouldn't collapse. This would be very important in the real world, but took a lot of time and retuning of the design to make it work. This was our design that passed redundancy testing:



This is the map of the displacement (the image shows how the structure deforms with the applied loads), the blue regions are those that have moved the most:



And this is the image of the stress in the structure, where red is the highest tensile stress and blue is the highest compressive stress:



This project took a lot of time and we had to keep going back and making adjustments to our designs to try to improve them. All of my group members were bioengineers and it was hard for us to see how what we were doing would really relate to our field. But I think that the basics of stress and displacement and working on a design to minimize them are important any time you design any sort of physical device that experiences loading. Even though none of us will be building bridges, the design process is similar to that for engineering medical devices.

Source: http://lehighbioe.wordpress.com/2013/05/02/bridge-project/