



Timber Tectonics in the Digital Age

AARON KENT'S PORTFOLIO

PROFESSORS MARIAPAOLA RIGGIO AND NANCY YEN-WEN CHENG SPRING 2018



Date: 4/9/18

Topic: Week 1 Site Visit

Site Visit in Corvallis

When we were at the site we were able to see the different uses of mass timber in the new construction on their campus of Peavy Hall. The part that I found the most interesting were the brackets that were designed to help withstand earthquakes and seismic shock. It was also interesting to meet with the engineering students and hear their perspectives on construction as well as team building and team based projects.



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Reflection

The site visit was helpful to see what large scale mass timber construction looks like and different methods that Andersen Construction does in order to build peavy hall. It was interesting to see the measures taken to account for seismic and monitoring moisture content in the wood. Most of the time timber is used as a component in structure of buildings but not the primary building material and I liked being able to see how different measures are taken to be able to use wood where often steel or concrete would be used. I like the challenge of using the more sustainable material of wood even if it may be more difficult to deal with structurally. I think that this

Hanover Expo Roof

Another building that was mentioned in letters, this is a stunning display of what can be done with wood. I'm normally not really into the super curvilinear parametric architecture but this roof is just something else. Looking at how complex the geometry is of each roof umbrella makes me appreciate the structure so much more. The article goes into detail of the sizing of each individual piece and how much deformation occurs. These numbers helped me understand a little bit more about how this roof is constructed. Overall I think that this is a really cool project.

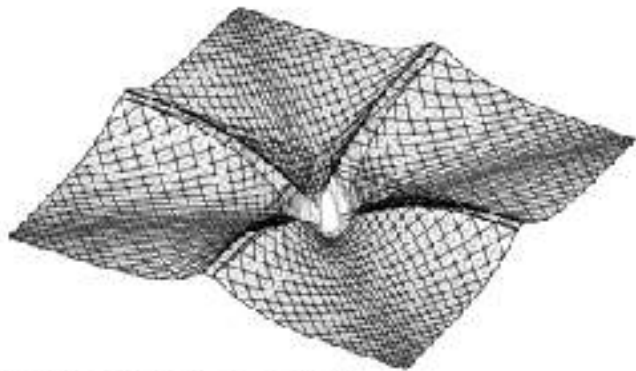


Fig. 9: Computer model of the roof area and the cantilevers.

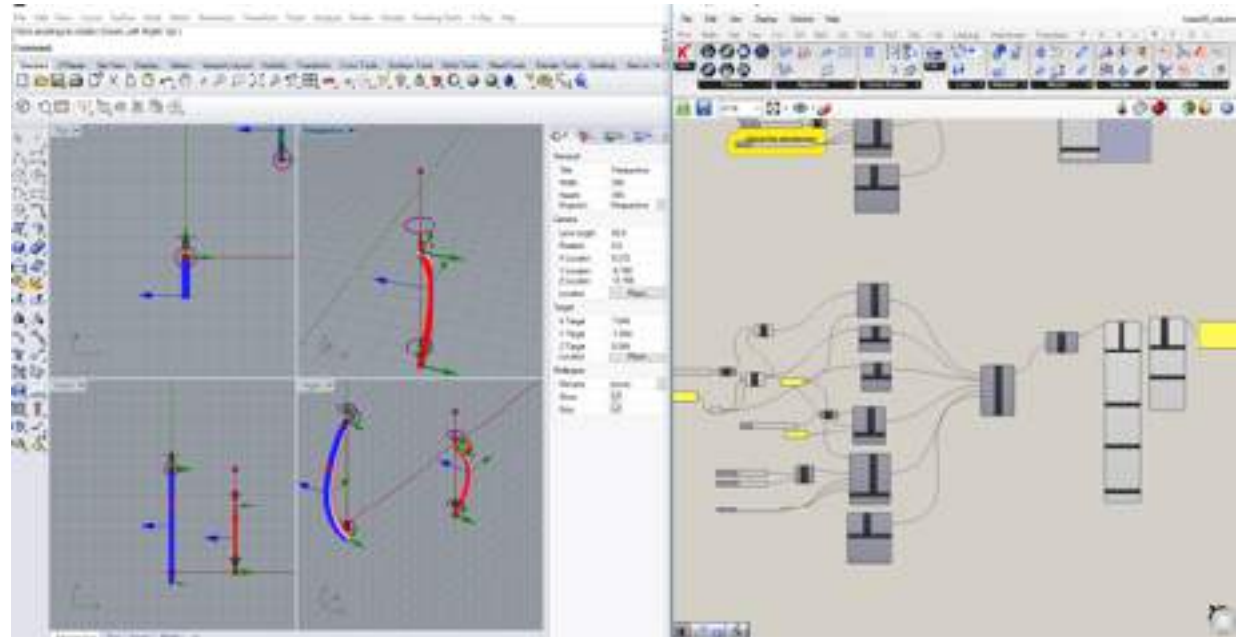


Reflection

I think this structure shows some of the best display of how a grid shell can span such a large area with minimal vertical supports. The few columns in this structure are an impressive feat of their own. With their reverse tapered shape and diamond pattern with lighting in the middle show how and expression of the structure can be made beautiful. The Hanover Roof Expo is a good lesson on how expressing the structure should be a priority because I think that it makes all for a very interesting architecture and a great way of playing with light and warmth.

Karamba Lab

This week we had a lab tutorial on using the basics of Karamba and Grasshopper. It took me a little bit of time to get back into the Grasshopper mindset and workflow but I was slowly catching on. My script worked pretty much perfectly except that I was apply a force up instead of down on the column so there wasn't any deformation. Once I was able to fix that the script worked correctly. This was one of my most successful Karamba learning exercises and was able to create the script using the template.



Trondheim HolzBau Pier

This pier case study was one that Mariapaola mentioned in lecture so it was interesting to learn more about the project. The article talked about elegance and what that means in terms of structure and architecture. I liked that the design paid homage to the wood warehouses nearby and had a strong focus on the materials and details because the design was fairly simple. This case study was also relevant to our class because they were using a 3D parametric modeling software to calculate stresses and base the design off of the analysis.

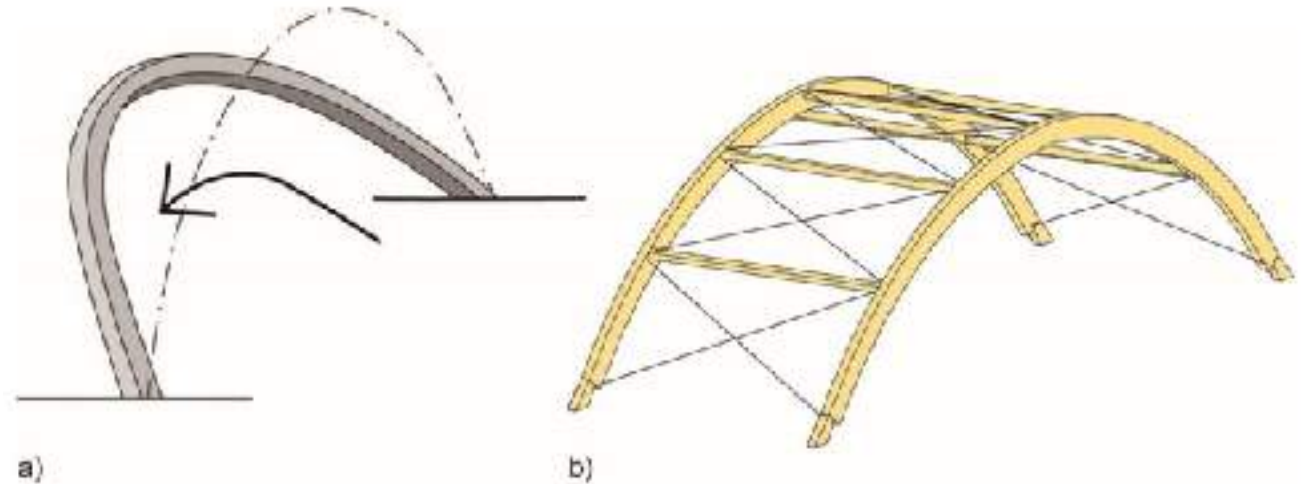


Reflection

In reading on topics we discussed in class allowed me to understand get a better understanding of the buildings and their truss systems and historical and regional contexts. I learned that truss systems aren't purely structural and are often the stars of the show for how a building looks and the aesthetic quality of the space. I also learned that trusses are a great structural solution for supporting large roof structures.

Large Span Timber Structures

This article talks about how timber can be a great material for constructing large span structures. Timber work great for creating the form of the arch because it can easily be cut into curves without sacrificing structural integrity. While arches are good for spanning large areas horizontally, they must be supported in the perpendicular axis. This is most important during construction and often two arches are constructed at the same time to prevent them from toppling over. Having these arches or trusses closer helps reduce the effects of buckling.



Reflection

In our critique of our pavilion design, we learned that although arches and trusses are good at creating large span within structures, they must be supported in a perpendicular axis. This can be achieved using more arches and trusses then with lateral supports in the opposite direction. We quickly realized our mistake and decided we needed more lateral support or a different system that matched the geometry and architecture of the rest of our pavilion.

Introducing the Segment Lath - A Simplified Modular Timber Gridshell Built in Trondheim Norway

I think that the Trondheim pavilion is really interesting because it appears to be very complex but when broken down to the simple module it makes it seem much more understandable. I also think its awesome that the transportation of the pieces is very efficient and compact, almost as if it were Ikea flat-packaged. Curving the members in the end of the assembly process is why this easy condensed transportation is possible. Also using a fairly small module reduced the amount of waste that the project created because it made it easier to find members without knots at the 500 mm size and minimal cutting was required.



Reflection

LEARNING OBJECTIVE:

In reading these articles I got an understanding how bending and prefabrication are a large part of how grid shells are constructed. From looking at the readings, and trying to understand the different systems and their applications I learned that grid shells are a great structural tool for spanning large areas without vertical supports creating a fairly uninterrupted space. For my new group we are creating a grid shell pavilion and learning the challenges of different uplift and double curvature but I think that it will pay off because we are able to span a large space with the only supports coming from the sides of the grid shell and will not need any columns.

Folding a material can often making it stronger and more rigid like when creating origami. Nw developments have shown that panels are not only to be used for cladding but because of this fairly recent development in folding technique, these panels are able to be used for structure as well. As we saw in Daniel, Eli, Ryan and Bahar's project we saw that the folds created the rigidity of the structure presenting it from simply flattening out into a flat sheet. This will allow very complex forms to be created in a fairly efficient way.



Reflection

Although we are not using panels in our current pavilion project nor our previous, it is interesting to look at the structural properties and advantages of using folded panels for structure. I think that there are some drawbacks and the technology may not be completely there yet and that's why you aren't seeing too many folded panel buildings other than pavilions but I think that if the technology could be perfected there could be some very beautiful and complex structures created using a folded panel system.

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Credits

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