Hex Decks

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Background:

Hex Decks is a python program that generates custom skateboard deck tailored to you and your riding style. Hex Decks is based off of previous research that was done at Olin college characterizing the effect that a change in core geometry has on the stiffness of a skateboard deck. Hex Decks takes data about the rider's weight and stiffness preferences through a web interface and generates a .DXF cut file that can be used to make a skateboard with the specified stiffness characteristics.

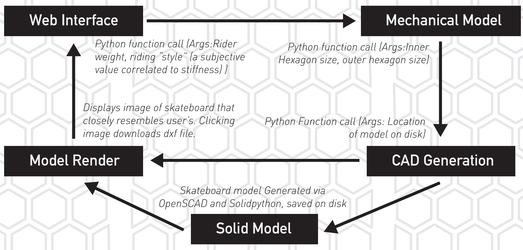
Overview:

We built this project using Python. Starting from the beginning we were unsure of the extent at which we would be able to complete in the given time frame and thus set ourselves a series of steps ranging from MVP on out. We were very clear about what was critical and what was not and we re-addressed these priorities periodically to make sure that we stayed on track.

We also broke the project into three distinct chunks and clearly defined how each chunk interacted with the other. This allowed us to be able to work independently and then integrate with very few problems.

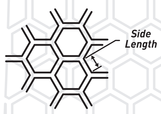
The chunks were:
- Web based user input and download
- Geometry definition
- CAD creation

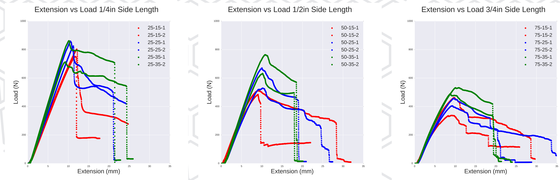
The state diagram for how these work together is below:



Math:

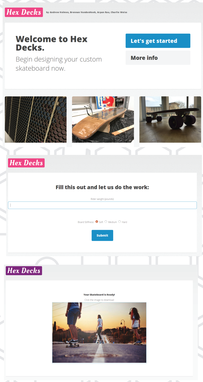
The math chunk of the code was built using the data collected from research done in the material science class at Olin. Using this data we created a model that would define the side length for geometry given a desired amount of deflection in the center of the board and the riders weight. Below are the lines of code that is core to how we are calculating the side length of a given hexagon. It relies heavily on principles of sandwich composites and the math module in python to do the number crunching.





Web:

The web application that we built was built off of an HTML5UP template website. We call a POST request in python and in the HTML template that contains our form so that user generated inputs can be used and interpreted by python. Python then calls two functions: one to derive the equations of the skateboard, and one to generate a CAD (computer aided design) drawing that can used on the laser cutter. This file is saved to a variable and displayed on a new web page that the user sees upon submitting the form.



CAD:

We are using a combination of OpenSCAD and SolidPython to generate the geometry of the decks. The code takes in the outer extents of the hexagon cut out from the board math and and the required spacing and generated a DXF with the correct shape and a series of hexagon cut outs. It does this through a series of boolean operations.

After creating a field of hexagons the right size and separation it then runs a boolean intersect and with the core shape (as shown below on the far right). After this takes place it then runs a boolean combine of the resultant and the board outline and truck pads (the middle and right images below). It then takes this final CAD geometry and exports it out as a DXF which can then be sent to the web interface for download.