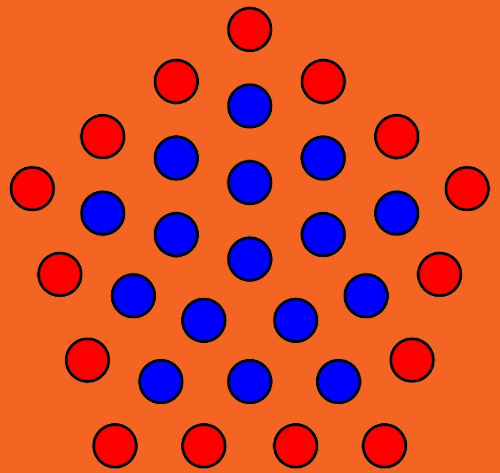
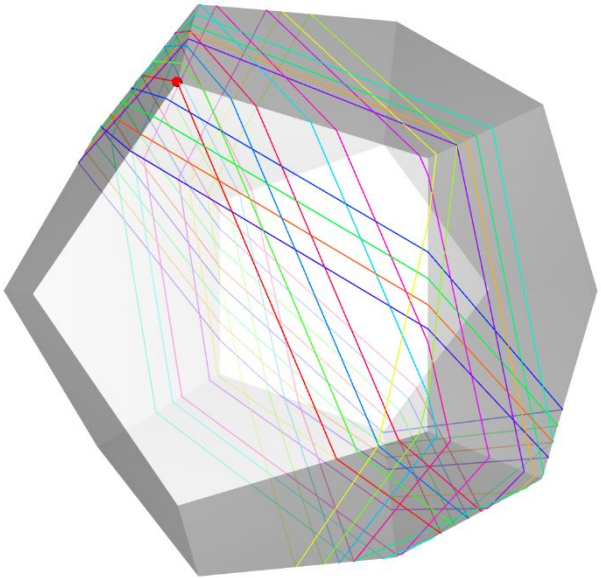
31 paths



Lasiradio

- Viljami Virolainen (contact person)
- Otso Hyvärinen
- Tom Henriksson
- Riitta Matikainen
- Lumi Alastalo

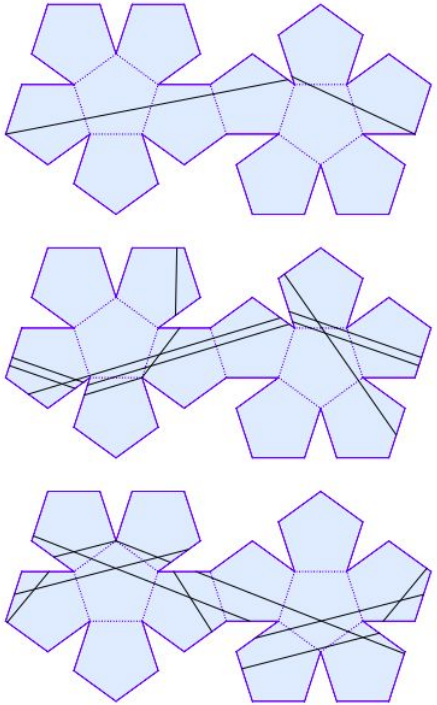
Statement



There are only 31 different classes of paths to take on a dodecahedron when moving on a straight line, starting from a vertex and without touching other vertices.

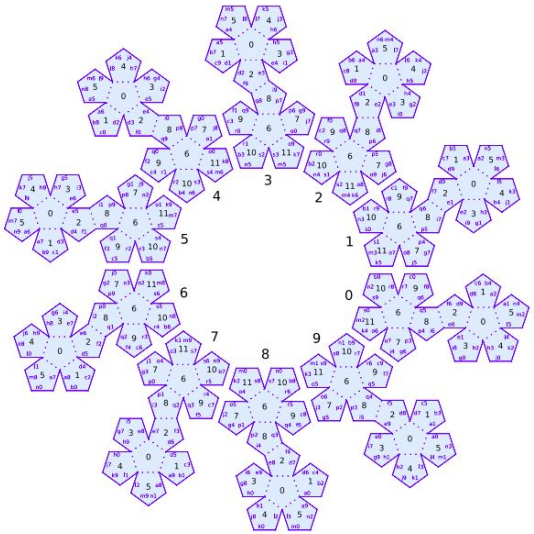
We would like to show some of the results of this new discovery* on Platonic surfaces.

* Athreya, J.S., Aulicino, D., Hooper, W.P. and with an appendix by Anja Randecker, 2020. Platonic solids and high genus covers of lattice surfaces. *Experimental Mathematics*, pp.1-31.

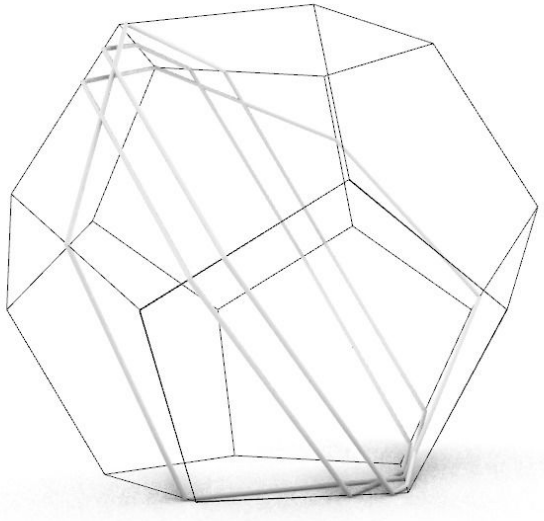


Mathematical stories we think are over keep going… it turns out there's something new about Platonic solids

- Jaydev Athreya



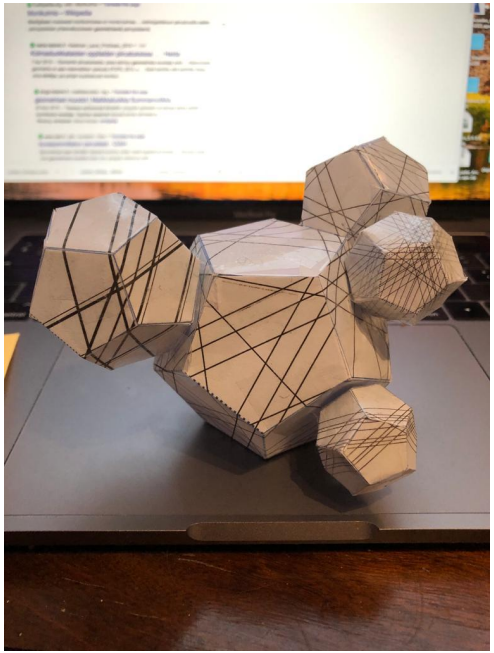
Implementation



Our main idea is to represent one or more (1-5) of these classes by using the most convenient paths in each of the chosen classes.

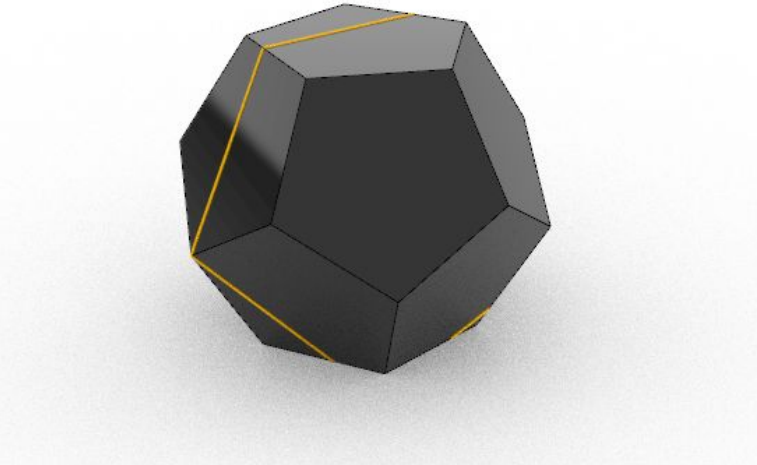
There are two possibilities: a) **solid dodecahedron** and b) **only paths**

Option a: Solid dodecahedron

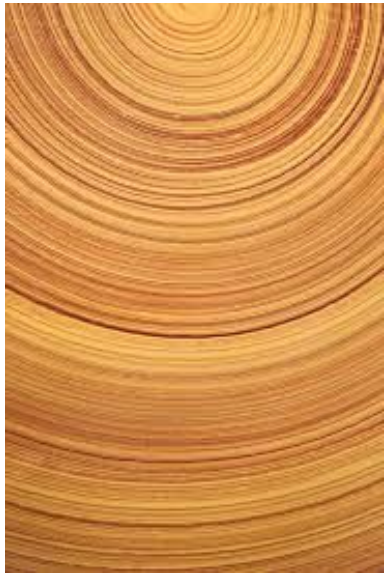


One or more solid dodecahedrons with their respective paths placed in an interesting configuration

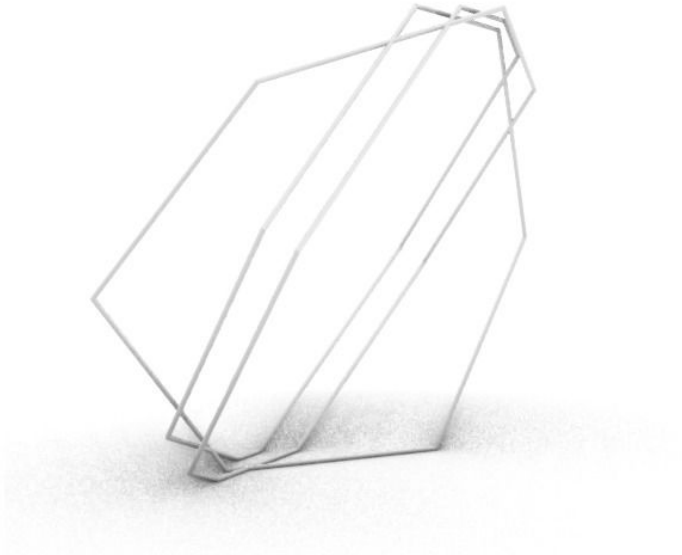
Separate dodecahedrons floating like planets or connected dodecahedrons forming a complex shape



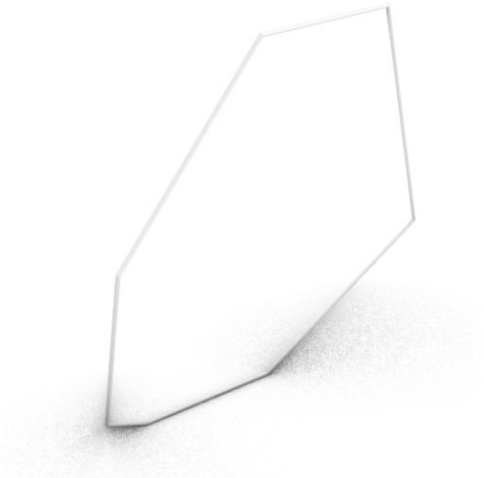
Materials, solid version

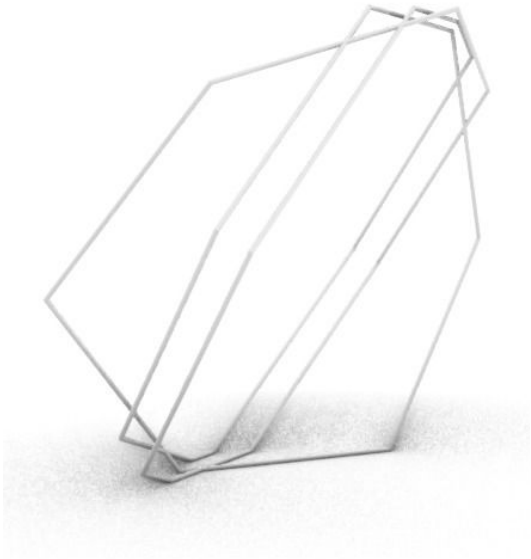


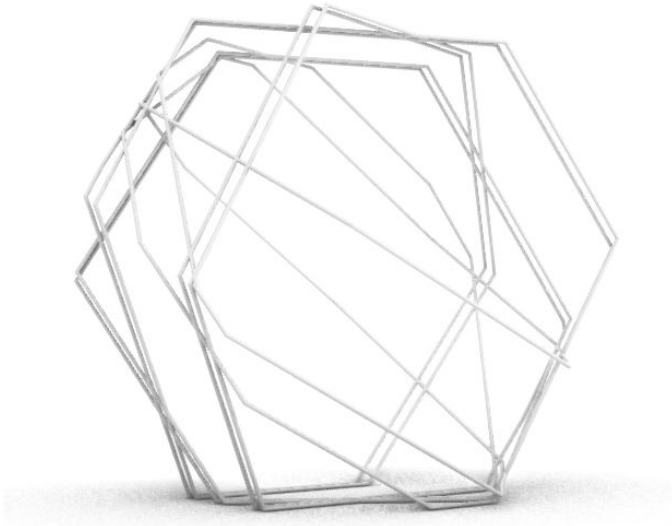
Option b: Only paths

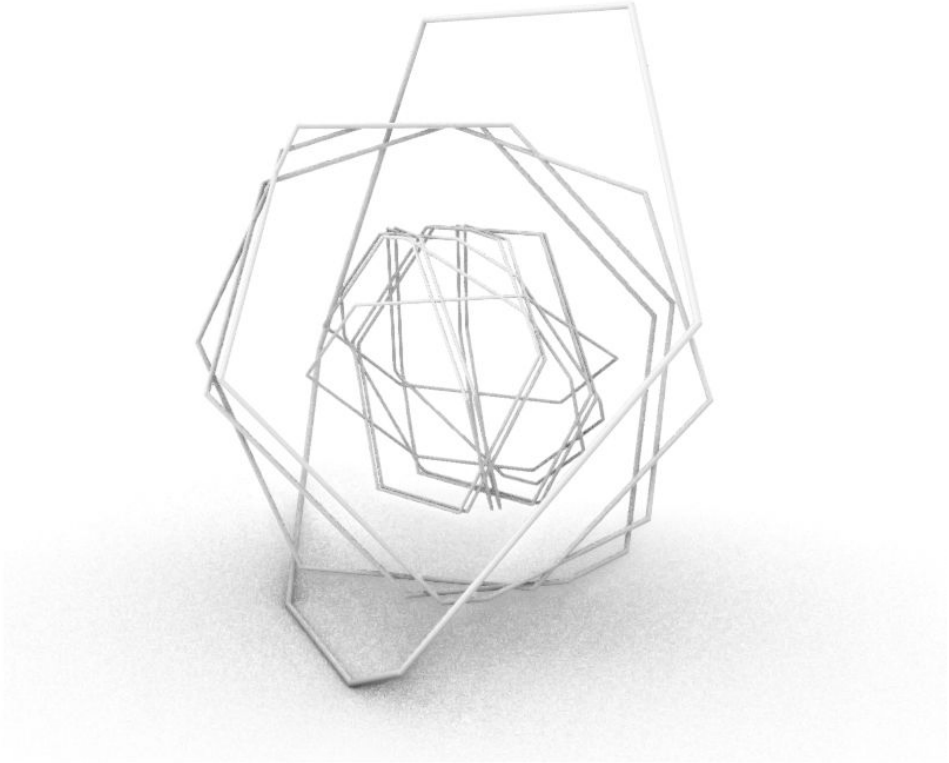


This approach has evolved into a model resembling the solar system, where a few of the paths are placed concentric to each other

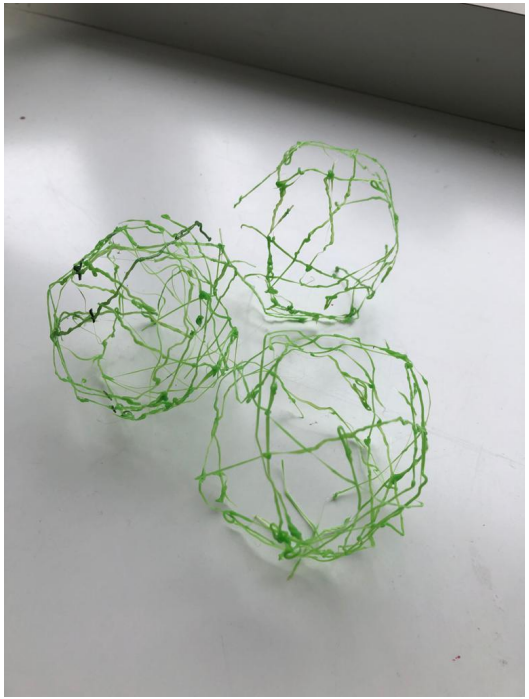






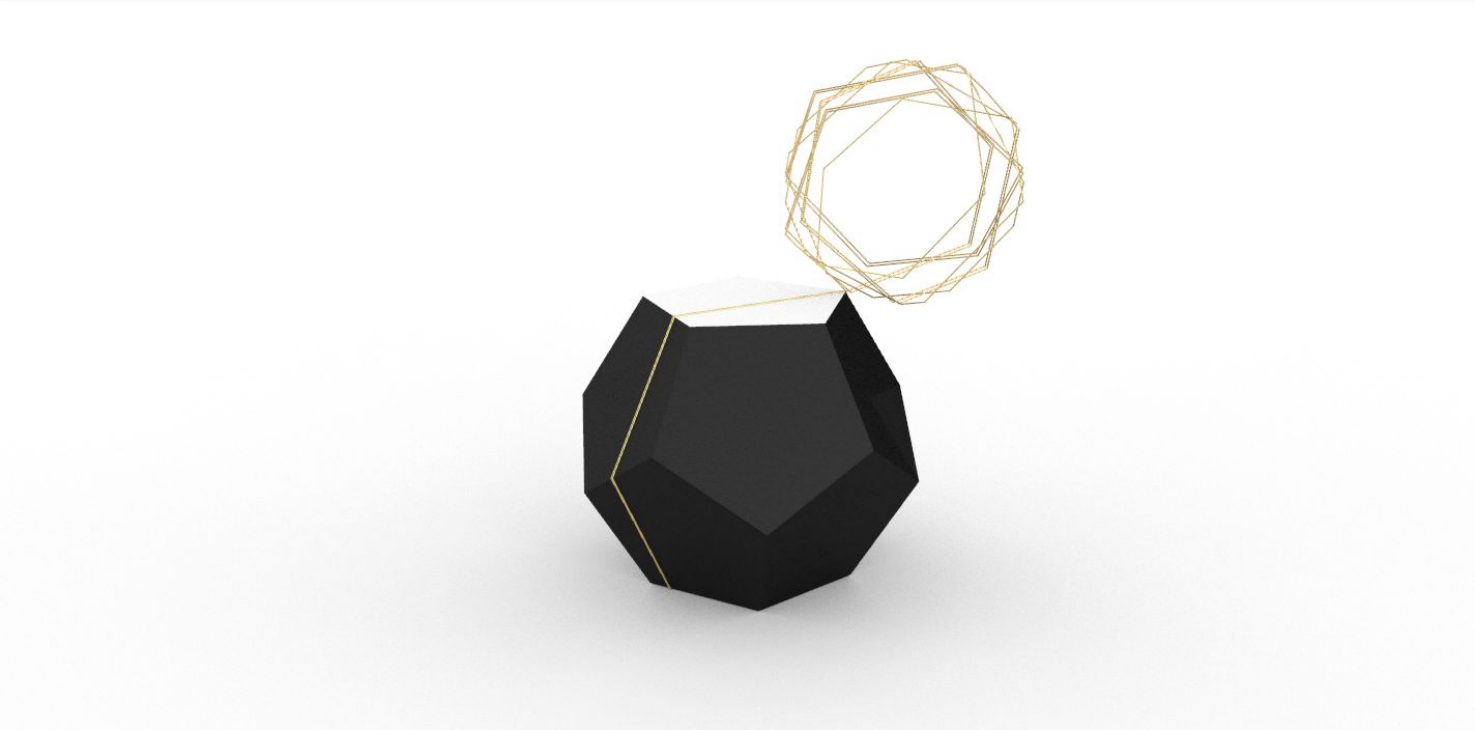


Materiality



- 3D-printing the paths (paths on each face separately) and then connecting the 12 pieces. Prototypes with plastic, final piece with metal
- The same result can be achieved in reverse with laser cutting
- The printed / cut piece can also work just as a support structure. Final material can be anything that is applied on it - we could dip the support structure in liquid gold

What if we combined the two ideas?



Bonus: We had a Zoom meeting with the author of the paper

Minilecture on Monday:

- Affine symmetry group does the heavy lifting in the proof - would be interesting to learn more about affine symmetries!
- Parallel lines are indeed parallel (every angle multiple of 2π / 5) and intersections do form pentagonal angles as we presumed
- Jaydev was happy to hear about our project and wanted to follow the creative process and see the final art piece

Challenges & conclusions

- How to find balance between artistic expression and mathematical accuracy?
- We have a plethora of ideas and thus still have couple of competing implementations - how to decide?
- Expect structural challenges when developing the prototypes further

Conclusion: a fun journey so far - still lots of work ahead before the finish line