Vectorized Capsid Generation in the Browser

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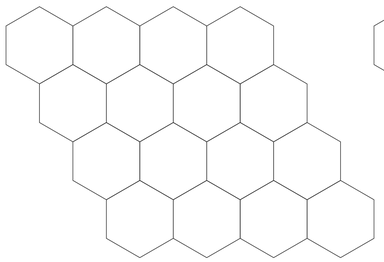
[Introduction]

This work implements Caspar-Klug Theory to generate high-quality, vectorized capsid cartoons in the browser. This is the first online tool that provides comprehensive style customization, geometry, and SVG export. The code and beta application are available under the MIT License:

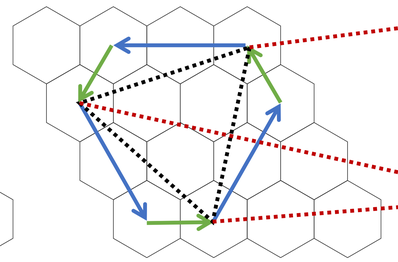
- https://github.com/dnanto/capsid
- https://dnanto.github.io/capsid/capsid.html

[Methods]

1. Tessellation
2. H/K Walk
3. Extract/Color
4. Icosahedral Projection

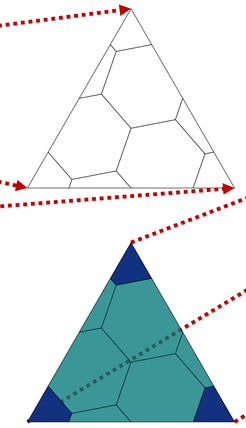


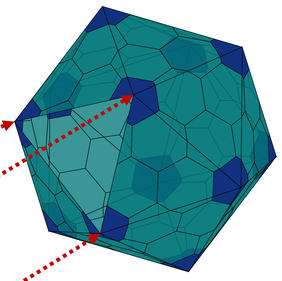
- Compute tessellation unit
- Generate grid based on the tessellation geometry



- Move h units
- Turn levo or dextro
- Move k units

$T = h^2 + hk + k^2$
$= 2^2 + (2)(1) + 1^2$
$= 7$



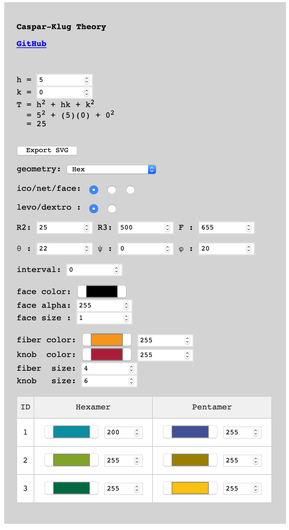


- Compute camera matrix
- Compute 3D unit icosahedron coordinates
- Sort faces by z-order
- Project each face to 2D
- Affine transform each face

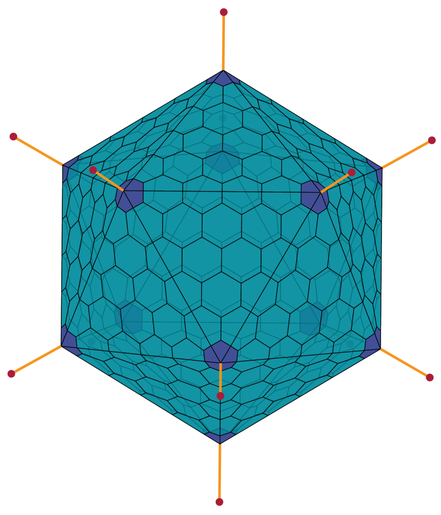
[Results]

The app renders class I icosahedra and nets. It includes geometry for viruses with exotic lattice structures. Originally, the app was adenovirus-focused, so it retains the option of rendering a fiber protein at each vertex. Next steps include improvements to rendering time, inclusion of class II and III capsids, and prolate/oblate structures.

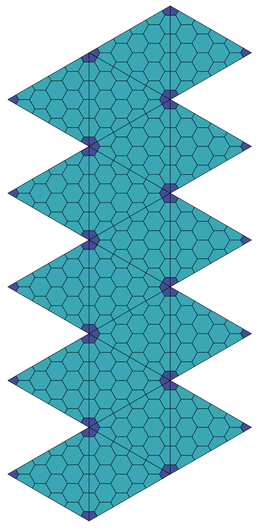
Options

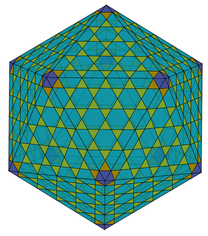
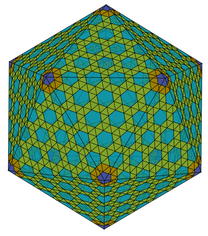
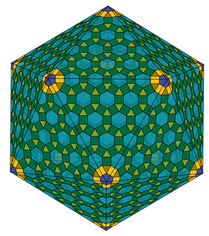
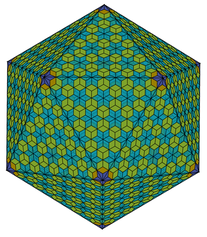
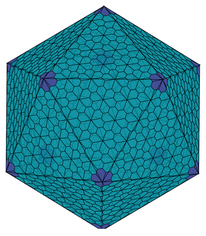
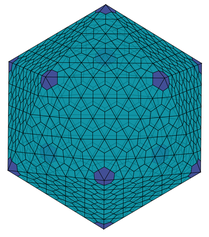


Icosahedron



Net



	Trihexagonal	Snub Trihexagonal	Rhombitrihexagonal
Non-Dual			
Dual			

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[Acknowledgements]

Dissertation committee:

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- Dr. Patrick Gillevet
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