

CS 480 - Project Proposal

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For this project I am building an interactive desktop application to represent cellular automata in hyperbolic 2-space. Essentially, rather than having a grid of square cells like most automata, I'll be tiling a Poincaré disk with a polygon of arbitrarily many sides. Ideally, a user would be able to select the type of polygon to be tiled as well as selecting from a list of pre-made rulesets for the automata to follow. Further, I'd like custom rulesets to be possible and to have the cells be capable of more than two states. The user should be able to manipulate the animation of the automata through simple procedures like start/stop/step/change speed.

The application will be written in C++ and will use Qt for the graphical interface and drawing the cells. I'll need to research the mathematical procedures for constructing tilings on the hyperbolic plane in addition to the display capabilities of Qt to be able to most efficiently draw tiles with a high resolution towards the edge of the disk. My goal is come away from this project with a much deeper understanding of hyperbolic geometry and graphical interfaces.

Some of the below features like zoom and rotating the viewport might be exceptionally difficult and are stretch goals, so I consider 100 points to be sufficient since it covers essential functionality and extended user interaction.

Feature	Point Value
Hyperbolic tilings of a single polygon	20
Support arbitrarily many polygon types	20
Color in the tilings according to an automaton	20
Animate changes in state	10
Supports multiple sets of rules	5
Supports an arbitrary amount of rulesets	10
Supports more than two states	5
Users can interactively change the state of cell by clicking	10
User selects cell dimensions	5
User inputs rulesets	5
User inputs possible states	3
User selects color of states	3
User selects speed of animation	1
Start/stop animation	1
Step one generation at a time	1
Can save/load states and rules	5
Can zoom in	5
Zoom without losing resolution	10
Can rotate view	10
Total:	149

Point Range	Grade
100+	A
85 - 99	B
70 - 84	C
50 - 69	D
Below 50	F