

Math 198 Project Pre-Proposal

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1 General Concept

My project will be to design a 3 dimensional Rubik's Cube that can be randomized by the computer and manipulated by the user. In addition, the program will be able to generate cubes of varying sizes, eg. 2x2, 3x3, 5x5, etc. Lastly, the program will have the ability to solve the Rubik's Cube by itself. I will use JavaScript to write my program in, so that users can manipulate it from any web browser without needing to download any special software. While other students in the past have attempted creating virtual Rubik's Cubes, none to my knowledge have been completed in JavaScript, nor have any been attempted in sizes other than the standard 3x3. Therefore, I can build off of the past Rubik's Cube projects while adapting them to JavaScript and adding the additional functionality of different sized cubes.

2 Cube Generation

The Rubik's Cube will be generated using three.js and WebGL. It will be comprised of a number of "cublet" objects (the number of which will be determined by the size of the cube). Each cublet will have these parameters: size, type, current location, current orientation, and color(s). Size will determine the size of each cublet; it will be inversely related to the size of the whole cube, and all cublets of a specific sized cube will have the same size eg. a 4x4 cube

will have smaller cublets than a 3x3 cube in order for the cube as a whole to be the same size. Type is whether the cublet is a middle, edge, or corner cublet. Current location determines where the cublet is currently located on the cube and current orientation is how the cublet is oriented in that location; both of these will change as the cube is being manipulated. Lastly, color(s) are the colors on all of the external faces of the cublet. Center cublets will have one color, edge cublets will have two colors, and corner cublets will have three colors. The remaining faces will be black, since they will be on the inside of the cube.

3 User Manipulation

There will be three different methods for the user to manipulate the cube. The first method will be manually rotating sections of the cube; this will be done by clicking and holding the desired section with the mouse and moving it in the desired direction. The second method will be an input terminal where the user can type in a size, and a new cube of that size will be generated. The final method will be two buttons the user can click on, labelled "Randomize" and "Auto-Solve", which will cause the program generate a new randomized cube and to solve the cube by itself, respectively.

4 Randomization and Solving

In order to randomize the cube, the program will first create a solved cube of the correct size. It will then conduct a series of random rotations to shuffle the cube. In order to "solve" the cube, the program will keep track of each rotation, done randomly or by the user. It will then conduct these same rotations in reverse order, and the result will be the correctly solved cube that it started with.