Computational Geometry
Summer Project Proposal

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1   Introduction

The art gallery problem was first posed by Victor Klee and Vasek Chvatal in 1973. It describes a situation of stationing watchmen or cameras (guards) in an art gallery while requiring the minimum number of guards that can observe the entire gallery. Chvatal's inductive proof showed that $\lfloor \frac{n}{3} \rfloor$ are always sufficient for a simple polygon. Steve Fisk later simplified Chvatal's proof to a 3-coloring triangulation.

2   Project Description

We will build an interactive application that visualizes Fisk's 3-coloring triangulation proof for the art gallery problem. Some features of the application will include at the minimum:

- Allow the user to draw line segments on a contained grid-space to create a simple polygon

- Display a possibility of sufficient guard placements ($\lfloor \frac{n}{3} \rfloor$) on the vertices of the polygon that would show coverage of the polygon

- The ability to save the image of the designed polygon and the guard placements.

3   Project Deliverables

The interactive visualization will be a web application written using HTML5, Javascript, and CSS and available online via Github web server hosting. Some JavaScript libraries may be used to help with the geometric drawings and calculations. The result will be a program that will allow the user to draw simple polygons on an HTML5 canvas element and have the system calculate sufficient guard placements on the vertices of the drawn polygon.
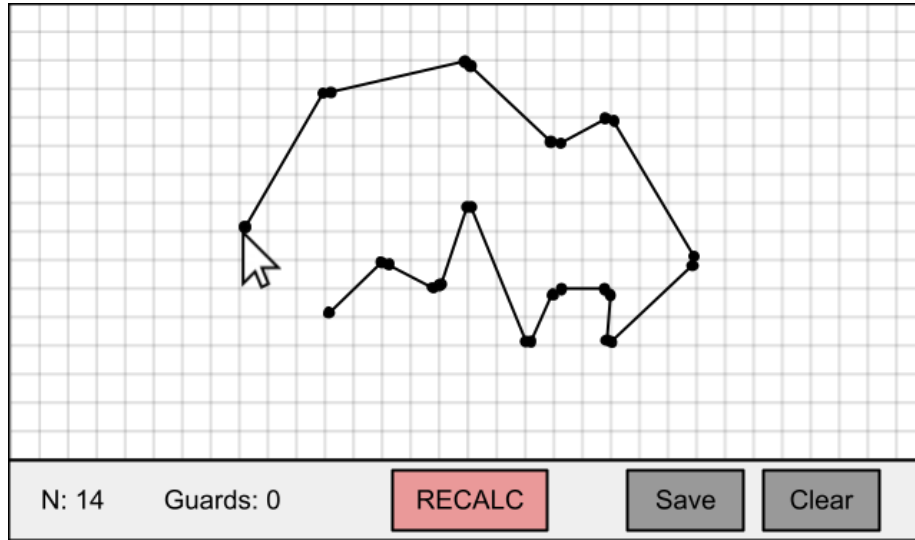
Figure 1: Mockup design of the Web Application where a user draws a polygon on the screen
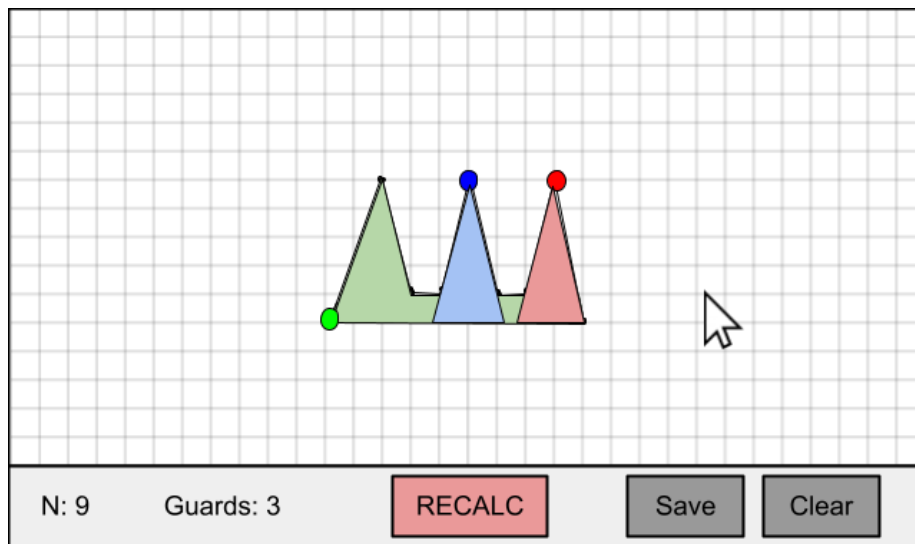

Figure 2: Mockup design of the Web Application where the system displays potential guard placements and their view range indicated by 3-coloring.