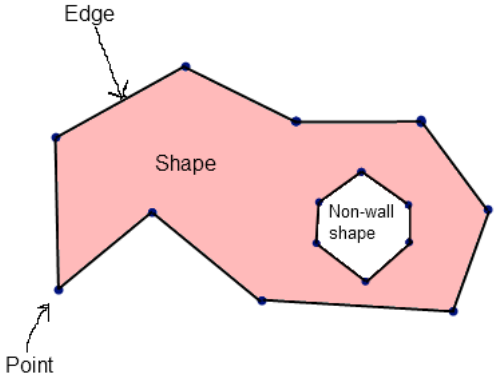
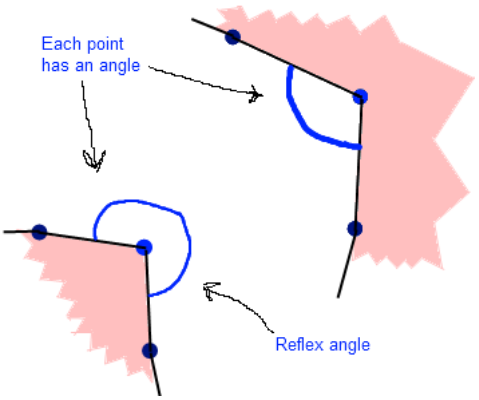
Requirements documentation

The goal is to make an optimized solution for finding the shortest path in a vector-based geometry. The program will assume that geometry is Euclidean, that way the shortest possible path between two points is assumed to be a straight line.

Instead of dividing the geometry into pixels, here points will be placed in a two-dimensional coordinate, that will then be joined to form a chain of edges. Edges are then required to form a loop - in other words - a shape. This shape can then be interpreted as a wall or a non-wall.

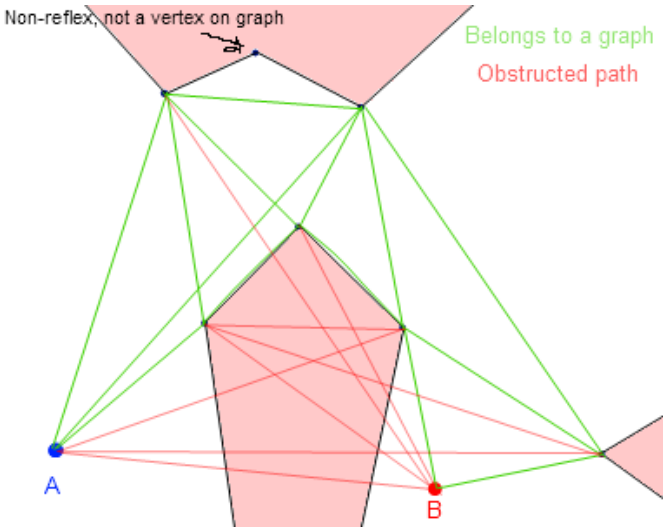


Each point in the vector field is connected to two other points. That way each point can be considered as an angle between the non-wall part.

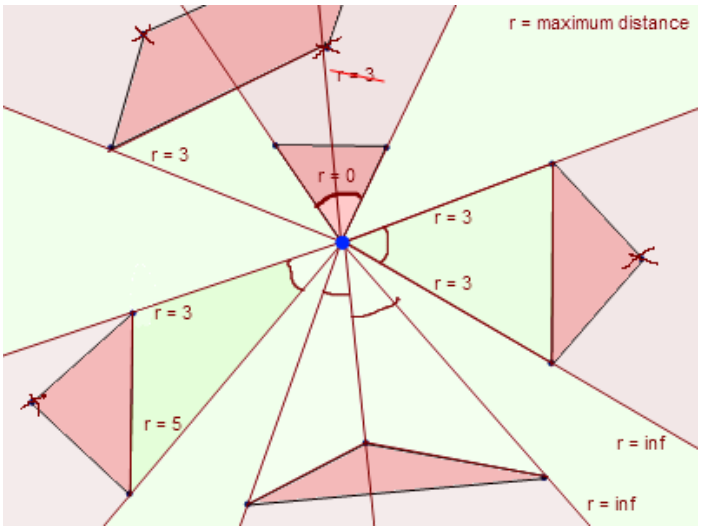


Pathfinding algorithm generates the shortest available path from point A to point B, avoiding possible walls along the way. Algorithm will construct a graph from the vector field. All points whose angles are reflex (between

180° and 360°) are vertices in the graph. Points A and B are vertices as well. Edges in the graph have a value, which is a distance between two vertices calculated by Pythagerous' theorum. That way an edge value can't be less than zero. With this graph the shortest path between points A and B can be found using the Dijkstra's algorithm.



Two points are connected in the graph if the path between these points is unobstructed. Because of this, the project will require a tracing algorithm. Current idea of the algorithm is taking each point and mapping a maximum distance for all of its directions.



The project will provide a relatively user-friendly tool for geometry manipulation. This tool will imitate a brush of a certain width, leaving a track with each stroke of a computer mouse. The stroke either creates a wall shape, or erases a piece of wall from the field. Straight-forward point manipulation via point dragging will be provided as well.

Main focus in the project is on optimization. Pathfinding algorithm should work on run-time in modern middle-end computers. Editing the vector field and repositioning the destination point should work on run-time as well. These requirements should apply with relatively complex geometry.