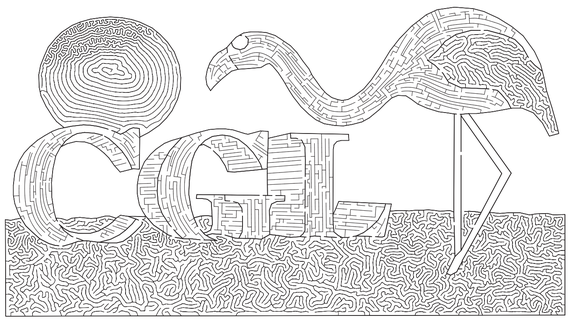

MAZE Construction

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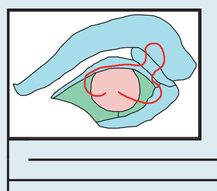
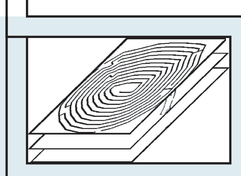
The construction of mazes and labyrinths is an ancient and enduring artform. Our research considers the problem of constructing line drawings that are simultaneously stylized depictions of real-world scenes and challenging mazes. We have created a tool in which a designer makes high-level decisions about the layout and style of a maze, and the computer constructs the final image automatically.

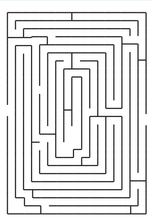
To begin, the designer selects a source image to use as a template for the maze.



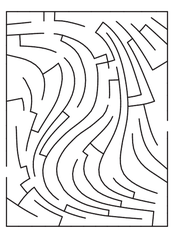
The designer can then interactively *segment* the image into regions, and assign maze style parameters to the each region. Optionally, they can also sketch a *solution path* (shown in red). At this point, our automated system takes over.



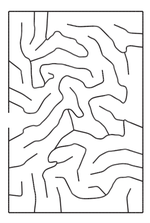
The designer assigns a *maze texture* to each region. A maze texture is a procedure that fills the region with a grid from which the maze will be extracted. We support three important maze texures.



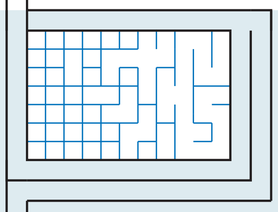
Spiral: We compute the straight skeleton of the region boundary and construct offset curves. The curves are subdivided into a grid.

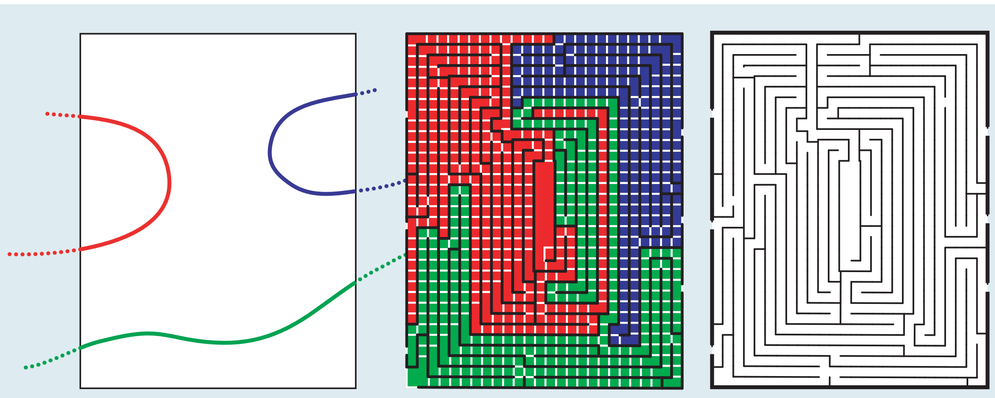


Directional: A streamline placement algorithm is used to place strokes along the direction field and perpendicular to it, forming a grid.



Random: A regular square grid is created and perturbed via a relaxation algorithm, producing a random, coral-like texture.





Our system then constructs a final maze by building smaller mazes in each region and linking them together. Given a region with a grid produced via a maze texture, we knock down walls until the desired connectivity is achieved. We use an extension of the usual *pathfinding* algorithm that takes into account multiple paths through a single region (as in the red, green, and blue paths shown here). Given a set of labeled exits on the region's boundary, our algorithm finds a maze in which two exits are connected by a path if and only if they have the same label.