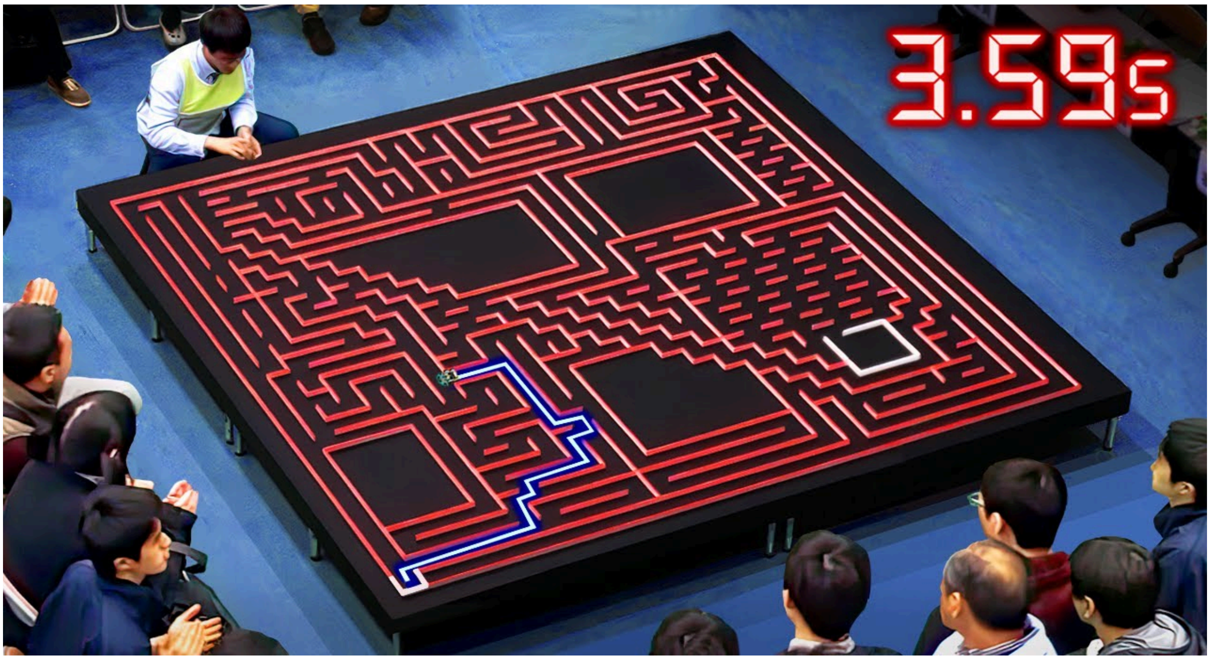
IEEE micromouse team project proposal:

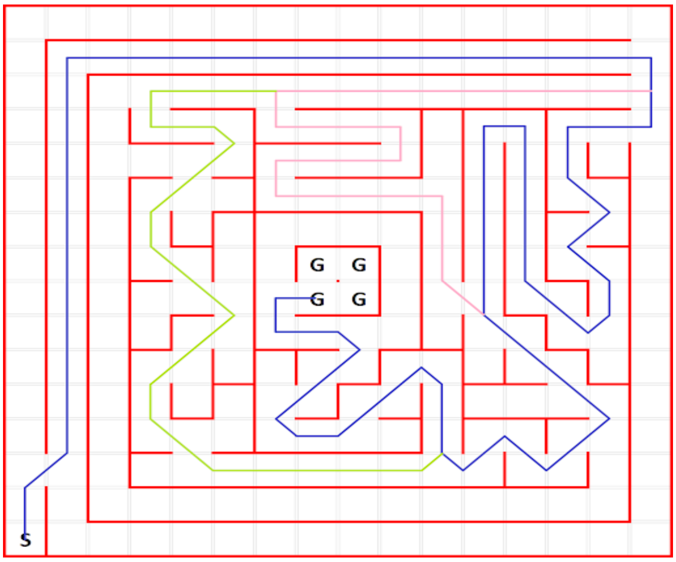
General overview:

The objective of this project is to design an autonomous vehicle (the "mouse") that first explores a labyrinth to find a solution, and then uses that solution to navigate the maze as quickly as possible without crashing. The process involves two phases: exploration and optimized maze-solving.



Hardware side:

The primary hardware challenges involve situating the mouse within the maze, given that the solution is always located at the center in competition settings. This can be achieved using infrared sensors to determine the distance of the mouse from the walls, while servo motors track the distance traveled to help situate the mouse within the maze.



Another challenge is ensuring the mouse makes precise turns. I plan to use gyroscopes to achieve the highest possible degree of turning accuracy. To optimize the mouse's path, an advanced (optional) feature could be to allow turns other than the standard 90 degrees. This would improve efficiency, especially in more complex mazes, and is one of the key technological advancements in the official IEEE Micromouse competition.

Building the mouse is another challenge, fortunately I don't think I need to design it from scratch there exists numerous designs online which I could take inspiration from. From what I see online most modern mice use brushless motors for speed.

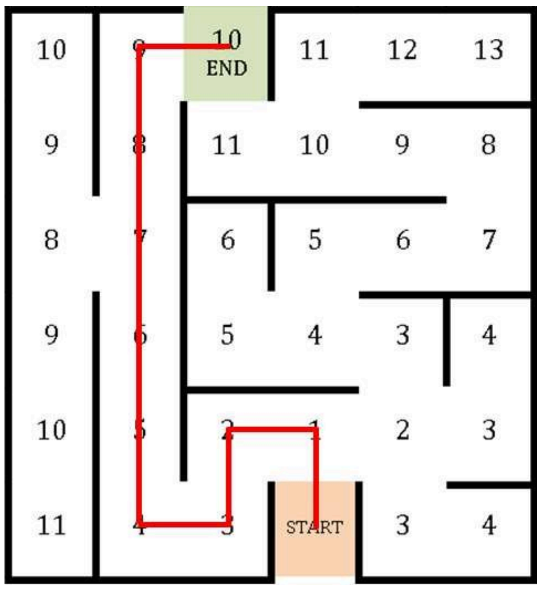
Additionally, deciding on the size of the mouse is crucial. The Micromouse competition offers several categories, two of the main ones being:

1. **Classic Micromouse (Maze-Solving):**
    - **Maze Dimensions:** 16x16 grid, each cell measuring 18 cm x 18 cm.
    - **Path Width:** 16 cm between the walls.
    - **Wall Height:** 5 cm.
2. **Half-Size Micromouse:**
    - **Maze Dimensions:** 32x32 grid, each cell measuring 9 cm x 9 cm.
    - **Path Width:** 8 cm between the walls.
    - **Wall Height:** 2.5 cm.

For easier testing, I'm considering using a smaller maze with fewer cells while maintaining the original path width.

Software side:

The primary software challenge is fitting everything into the microcontroller, as the mouse must operate autonomously. I plan to use established maze-solving algorithms, such as the Flood Fill algorithm, during the exploration phase. This algorithm allows the mouse to follow an optimistic path toward the center and updates the path as it encounters obstacles. Once the mouse reaches the center, it can refine its path and store it as the solution. Although this approach may not guarantee the shortest path, we can run the algorithm in reverse, from the center to the starting point, to increase the likelihood of finding an optimal path.



Another software challenge lies in processing data from the infrared sensors and gyroscopes to ensure accurate turns and avoid frequent collisions. This aspect is less clear at the moment and will likely be the primary focus of troubleshooting during the project.

Conclusion:

I believe this project is ambitious but feasible, given the abundance of information and resources available on previous Micromouse projects. The cost should remain manageable as the mouse should only use available sensors and microcontroller. We can laser-cut the maze to the desired dimensions and design it to be easy to disassemble and store. While the project might not have significant practical applications beyond being an engaging learning tool, I find the concept of watching a small robot race through a maze incredibly fun. My goal isn't to break speed records, but rather to build a mouse that first and foremost works and optionally be able to solve the maze quickly enough to be enjoyable to watch.