# **Auto Driving Car Simulation**

# **Approach and Technical Specification Document (TSD)**

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**Auto Driving Car Simulation**

**1. Objective**

The Auto Driving Car Simulation is designed to simulate the movement of autonomous cars within a bounded field. Users can add multiple cars with unique names, initial positions, and movement commands. The cars execute their commands sequentially while detecting and responding to collisions. The program provides real-time updates and a summary of the simulation results.

**2. Overview of the Car Simulation Logic**

This project serves as a foundational tool for testing autonomous driving logic in a controlled environment, making it useful for algorithm validation and decision-making processes in autonomous vehicle development.

* **Field Setup:** Users define the field dimensions upon starting the simulation.
* **Car Addition:** Each car is assigned unique name, an initial position, direction (N, S, E, W).
* **Command Execution:** Cars execute movement commands step-by-step.
* **Collision Detection:** Cars stops upon colliding, preventing further movement.
* **Simulation Summary:** The system provides real-time updates, collision notifications, and final positions of all cars.

**Simulation Process:**

1. **Initialize the Simulation:**

* The user enters the dimensions of the rectangular field.

1. **Add Cars to the Field:**

* The user provides car details (name, initial position, direction).
* A command sequence (L, R, F) is assigned to the car.

1. **Run the Simulation:**

* Cars move, rotate, or remain in place if movement is restricted.
* If a collision occurs, the involved cars stop moving.

1. **Display Results:**

* The system prints the final positions of all cars.
* If collisions occurred, they are reported with the exact location and step count.

Alert Generation Logic in Transaction Monitoring System

**3. Command Descriptions**

* L (Left Turn): Rotates the car 90 degrees counterclockwise.
* R (Right Turn): Rotates the car 90 degrees clockwise.
* F (Forward Move): Moves the car one unit forward in its current direction.
* N, S, E, W – North, South, East and West
  1. **Test Cases**
* **Test Case 1: Single Car Movement Without Collision**

**Input:**

Please enter the width and height of the simulation field in x y format: 10 10

Please enter the name of the car: A

Please enter initial position of car A in x y Direction format: 1 2 N

Please enter the commands for car A: FFRFFFFRRL

**Expected Output:**

Final Position: A (5,4) S

* **Test Case 2: Car Stopping at Field Boundary**

**Input:**

Please enter the width and height of the simulation field in x y format: 5 5

Please enter the name of the car: B

Please enter initial position of car B in x y Direction format: 4 4 E

Please enter the commands for car B: FFFFF

**Expected Output:**

Final Position: B (4,4) E (stopped at boundary)

* **Test Case 3: Two Cars Moving Without Collision**

**Input:**

Please enter the width and height of the simulation field in x y format: 10 10

Please enter the name of the car: C

Please enter initial position of car C in x y Direction format: 0 0 N

Please enter the commands for car C: FFRFF

Please enter the name of the car: D

Please enter initial position of car D in x y Direction format: 3 3 E

Please enter the commands for car D: FRFF

**Expected Output:**

Final Positions:

C (2,2) E

D (5,4) S

* **Test Case 4: Two Cars Colliding Midway**

**Input:**

Please enter the width and height of the simulation field in x y format: 10 10

Please enter the name of the car: E

Please enter initial position of car E in x y Direction format: 1 1 N

Please enter the commands for car E: FFRF

Please enter the name of the car: F

Please enter initial position of car F in x y Direction format: 3 3 W

Please enter the commands for car F: FFLF

**Expected Output:**

Collision Detected: E and F at (2,2) on step 3

* **Test Case 5: Three Cars with Two Collisions**

**Input:**

Please enter the width and height of the simulation field in x y format: 10 10

Please enter the name of the car: G

Please enter initial position of car G in x y Direction format: 2 2 N

Please enter the commands for car G: FFRFF

Please enter the name of the car: H

Please enter initial position of car H in x y Direction format: 3 2 W

Please enter the commands for car H: FLFF

Please enter the name of the car: I

Please enter initial position of car I in x y Direction format: 5 5 S

Please enter the commands for car I: FF

**Expected Output:**

Collision Detected:

- G and H at (3,3) on step 4

- I stops at (5,3) due to no further movement

**5. Conclusion**

The Auto Driving Car Simulation provides a structured environment for testing autonomous vehicle movement logic. It allows for scenario-based testing, helping developers refine navigation algorithms before implementing them in real-world autonomous systems.