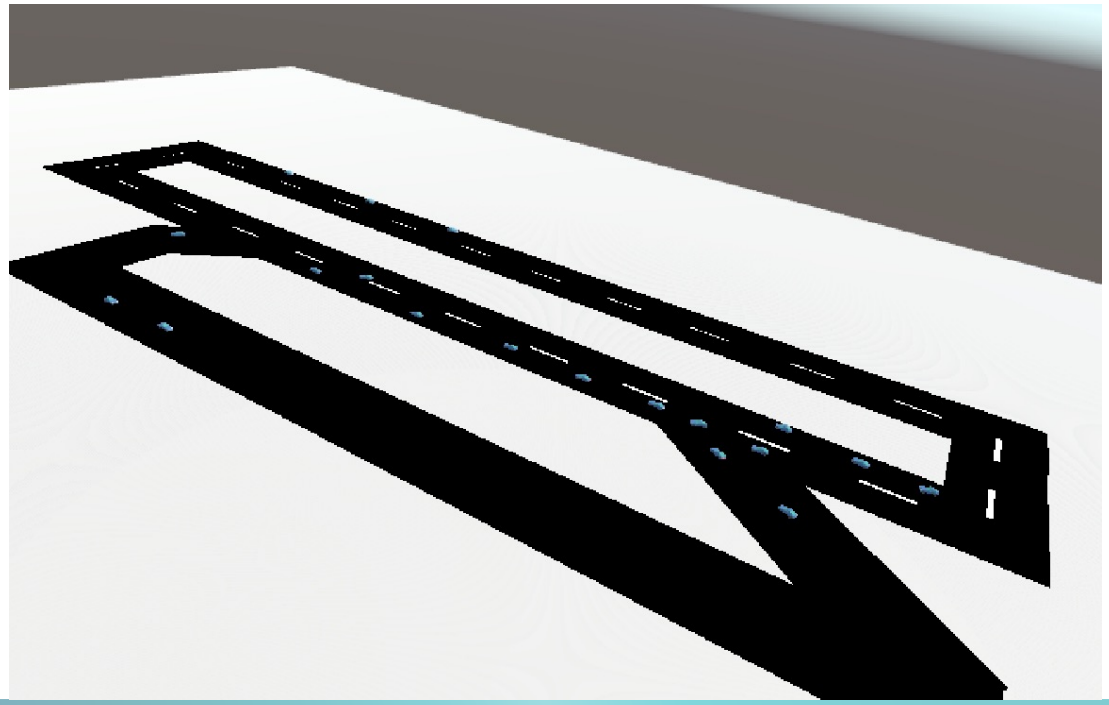
Campus Sontheim



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› Automotive Highway Traffic Simulator

Realtime 3D-Engines Project| Hiroya Taguchi | SEM | SoSe 2023

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Agenda

- Introduction
- Demonstration
- How does it work
- Modifications
- Related asset
- Improvement items

Introduction

Traffic Simulator:

- Software or systems that simulate traffic flow, vehicle behavior, traffic rules, etc.
- Commonly used for planning, designing, and operating transportation systems

the situation is only highway and the purpose is

to reproduce actual expressway conditions,

such as no traffic jams.

Demonstration

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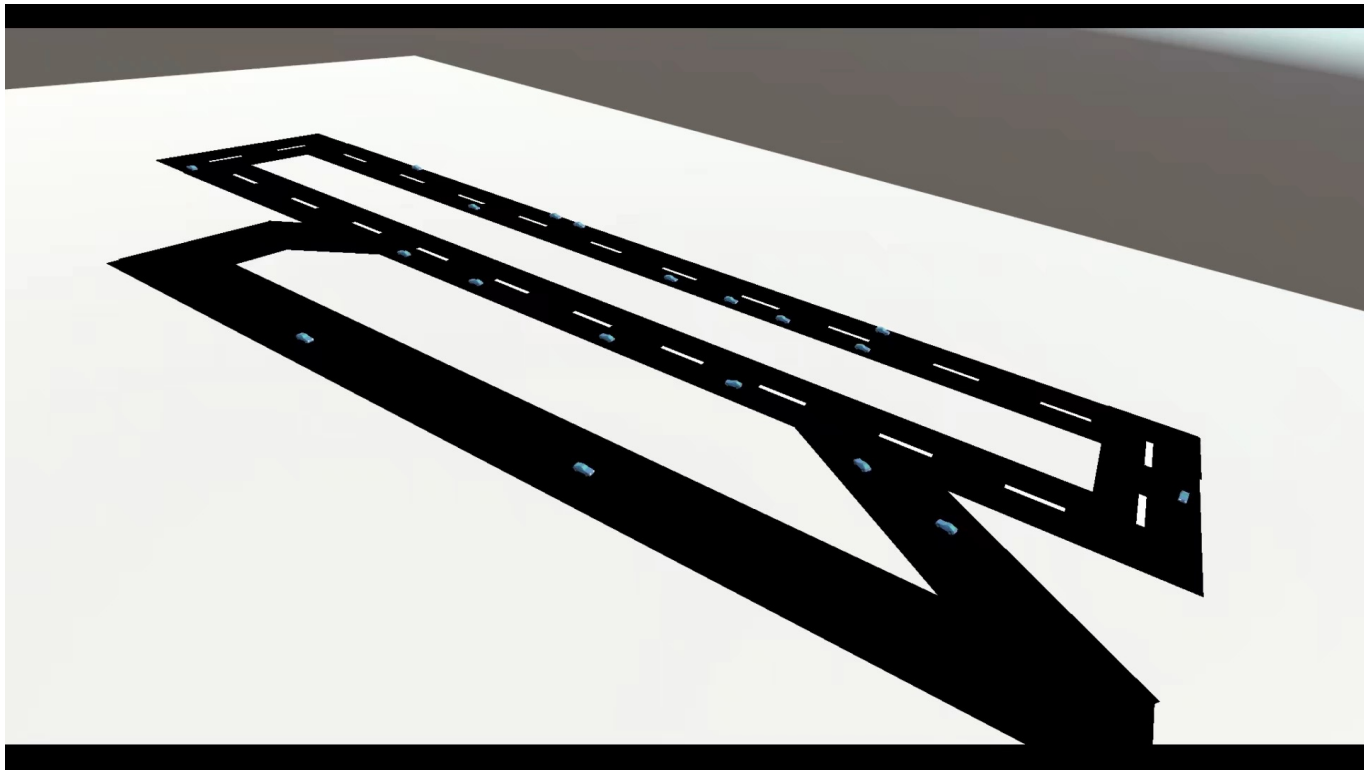

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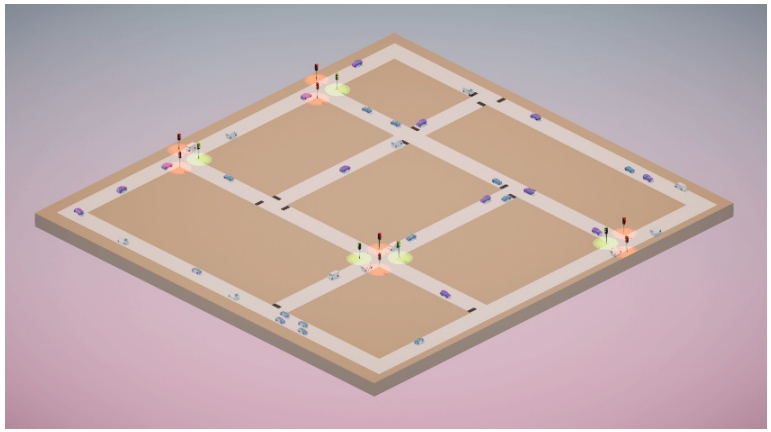
How does it work?

Asset: Unity Traffic Simulation



https://github.com/mchrbn/unity-traffic-simulation

What you can do with this asset:

- The cars move along the designated route
- Stop in front of an obstacle (including cars) etc.

➡ + Adjusted logic and parameters for unique movement on highways

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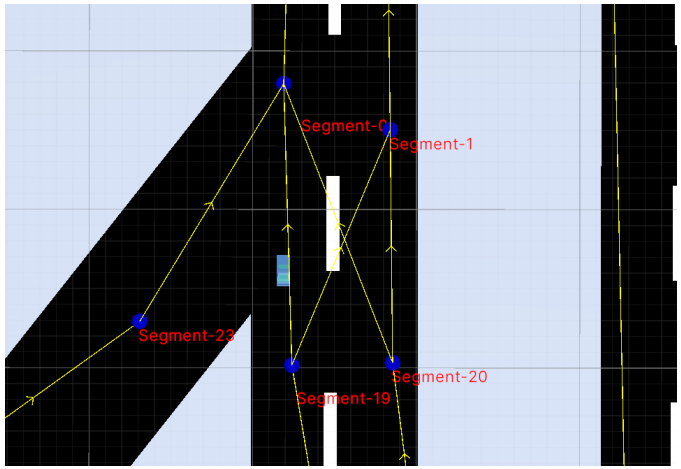
How does it work?

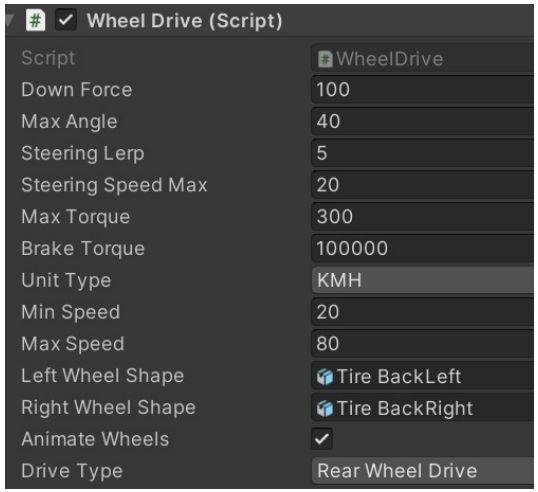
1. Set a segment and the car will move along it

,



2. Parameters can be changed

e.g. Max/min speed, Torque



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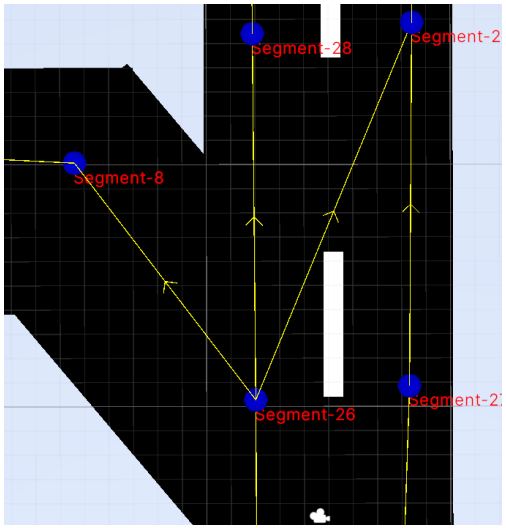
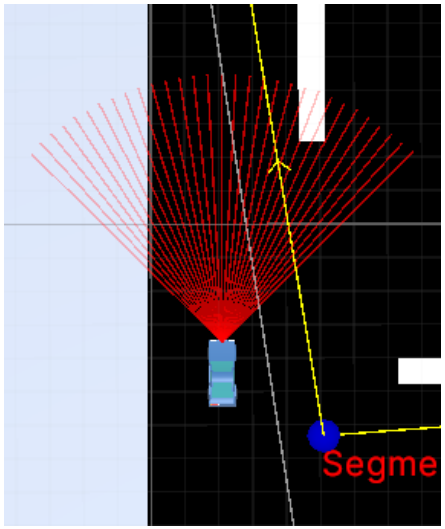
How does it work?

3. If there are multiple paths from the segment,Choose a course according to logic



4. Raycasts to prevent collisions

Takes the start position and direction of the ray as arguments and returns information about the hit object



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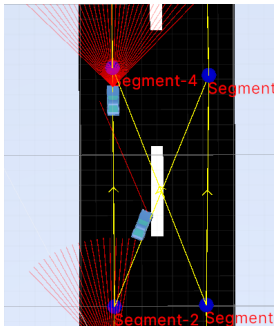
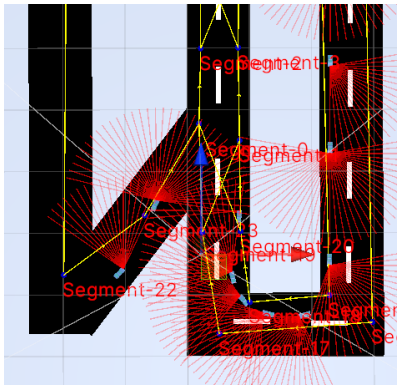
Modifications

1. Added logic to create two lanes and change lanes
   Change lanes when the vehicle in front is detected
   and how to choose the root.
2. Change the parameters to make the movement closer



Failure example



Lesson and Learnt

1. Car control
    - It is difficult to detect the target substance and control the course of the car
    - It's easy to just move it straight, but it's hard to move it to the desired position

    ➡ Use the asset
2. Difficulty to reproduce the erratic movement of the car
    - Driving a car is more complicated because of depending on the driver's personality, vehicle type, and situation.
    - 3 lanes or more, overtaking increases speed, depending on the destination because it may be crowded and not

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Relate Asset

Mobile Traffic System

https://assetstore.unity.com/packages/tools/behavior-ai/mobile-traffic-system-194888

Pros

- High level of visual and control
- More realistic car movements can be reproduced

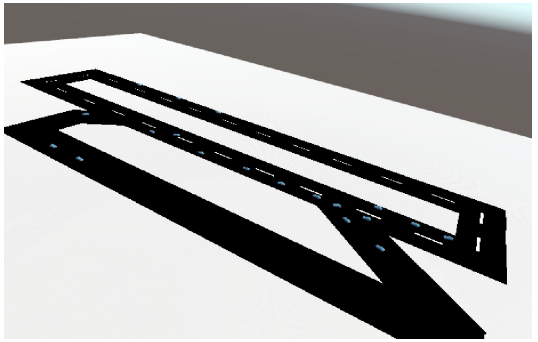
Cons

- Difficult to understand how it works
- Need to buy (60€)

Improvement items

Expectation

Reality



- 3D
- More complicated roads and more than 3 lanes
- Make it more like a real driver with AI or complex logic

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THANK YOU!

the code I changed

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> Users > freig > Documents > HHN > 3D > TrafficSystem > Assets > TrafficSimulation > Scripts > VehicleAI.cs

```
        // int GetNextSegmentId(){
        //     if(trafficSystem.segments[currentTarget.segment].nextSegments.Count == 0)
        //         return 0;
        //     int c = Random.Range(0, trafficSystem.segments[currentTarget.segment].nextSegment
        //     return trafficSystem.segments[currentTarget.segment].nextSegments[c].id;
        // }

        // This is changing point for adapting car simulation
        int GetNextSegmentId(){
            var nextSegments = trafficSystem.segments[currentTarget.segment].nextSegments;
            if(nextSegments.Count == 0)
                return 0;

            // If there are 3 segments, choose a segment randomly
            if(nextSegments.Count == 3) {
                float randomValue = Random.value; // this will return a float between 0 and 1

                if(randomValue < 0.8f)
                {
                    // 80% chance to return the smallest segment id
```

```
else
{
    // check if there is any obstacle on the way
    float hitDist;
    GameObject obstacle = GetDetectedObstacles(out hitDist);

    // If there's an obstacle, choose the right segment
    if(obstacle != null){
        // Assuming the next segment on the right is the segment with larger id
        Segment largestSegment = nextSegments[0];
        foreach (var segment in nextSegments)
        {
            if(segment.id > largestSegment.id)
            {
                largestSegment = segment;
            }
        }

        return largestSegment.id;
    } else {
```

```
int GetNextSegmentId(){
    var nextSegments = trafficSystem.segments[currentTarget.segment].nextSegments;
    if(nextSegments.Count == 0)
        return 0;

    // If there are 3 segments, choose a segment randomly
    if(nextSegments.Count == 3) {
        float randomValue = Random.value; // this will return a float between 0 and 1

        if(randomValue < 0.8f)
        {
            // 80% chance to return the smallest segment id
            return nextSegments[0].id;
        }
        else
        {
            // 20% chance to return the second smallest segment id
            return nextSegments[1].id;
        }
    }
```

```
            return largestSegment.id;
        } else {
            // If there are less than 3 segments, or there's no obstacle, choose the smallest seg
            Segment smallestSegment = nextSegments[0];
            foreach (var segment in nextSegments)
            {
                if(segment.id < smallestSegment.id)
                {
                    smallestSegment = segment;
                }
            }

            return smallestSegment.id;
        }
    }
}
////////////////////////////////////////////////////////////////////
```