

Autonomous Driving using Swarms



Project Number: p-2023-003
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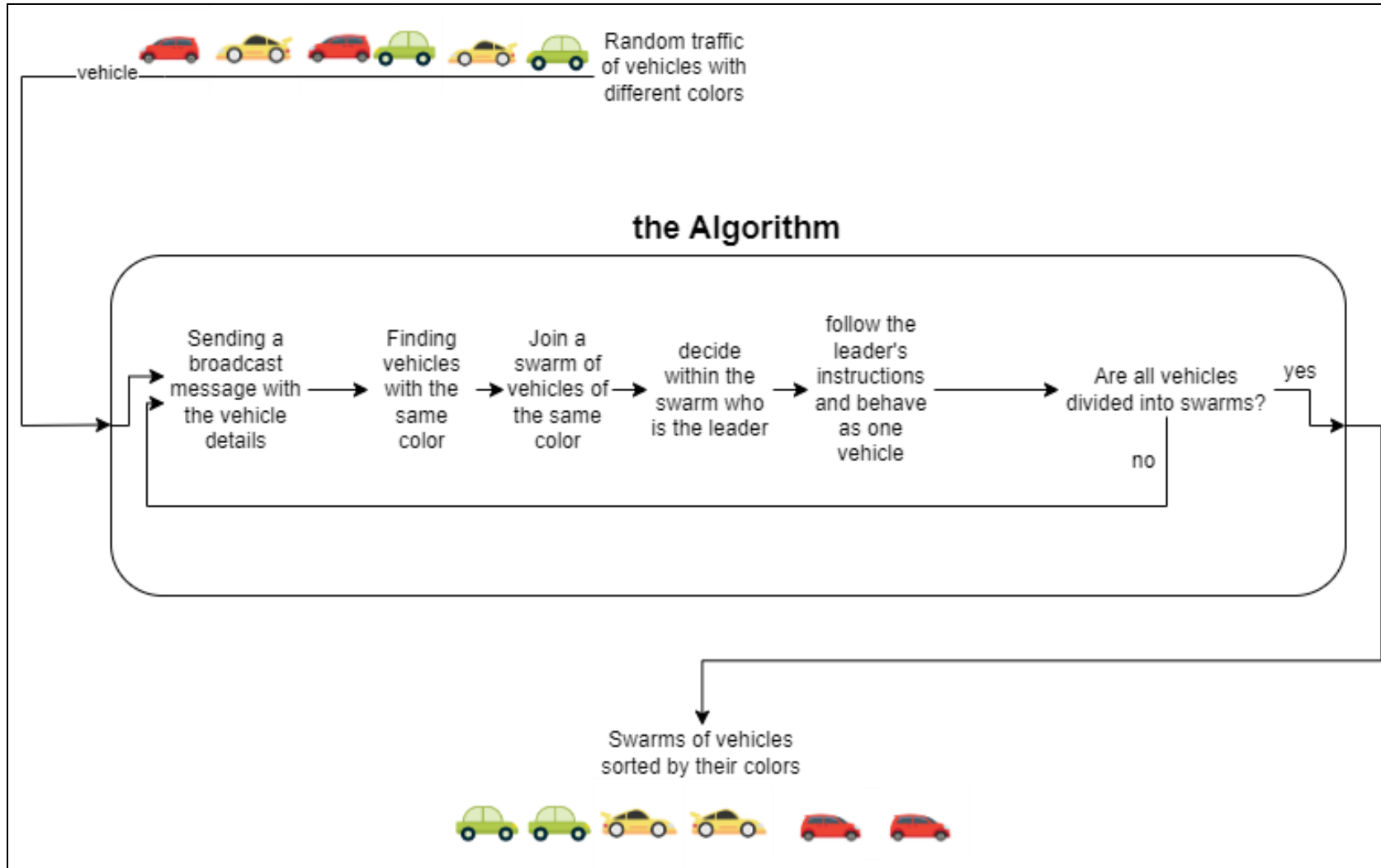
Introduction

- Our project refers to autonomous vehicles.
- Today, autonomous vehicles make decisions alone according to information from an outsourced server, our project wishes to minimize communication with distance server and prevent RT communication issues.
- swarms of vehicles is a group of vehicles that moves together and make decisions together using P2P communication.
- The purpose of the project is to develop an algorithm that divides traffic into swarms based on the vehicle's destination, in real-time.

Our Goal

- Creating an algorithm that divides in real-time a traffic stream into swarms of vehicles, based on the vehicle's destination, that will move together as one.
- Make an efficient algorithm as possible – the division will happen in a minimal time, using P2P communication.
- The vehicles should make choices as a swarm and mainly communicate un-dependently to an outsourced server.
- The algorithm not only divides into swarms but also assigns positions to specific vehicles in the swarm.

General Flow

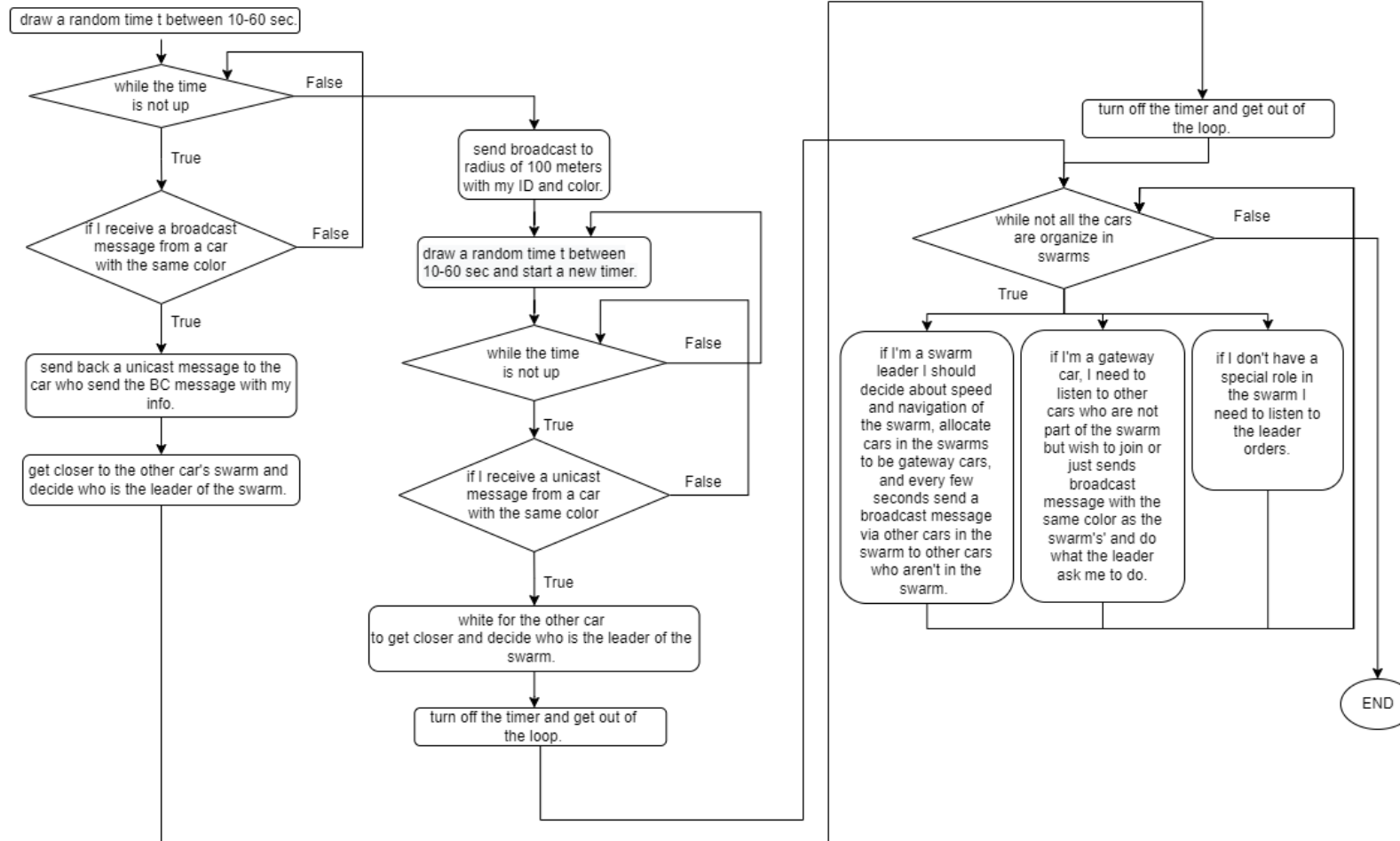


Our Progress

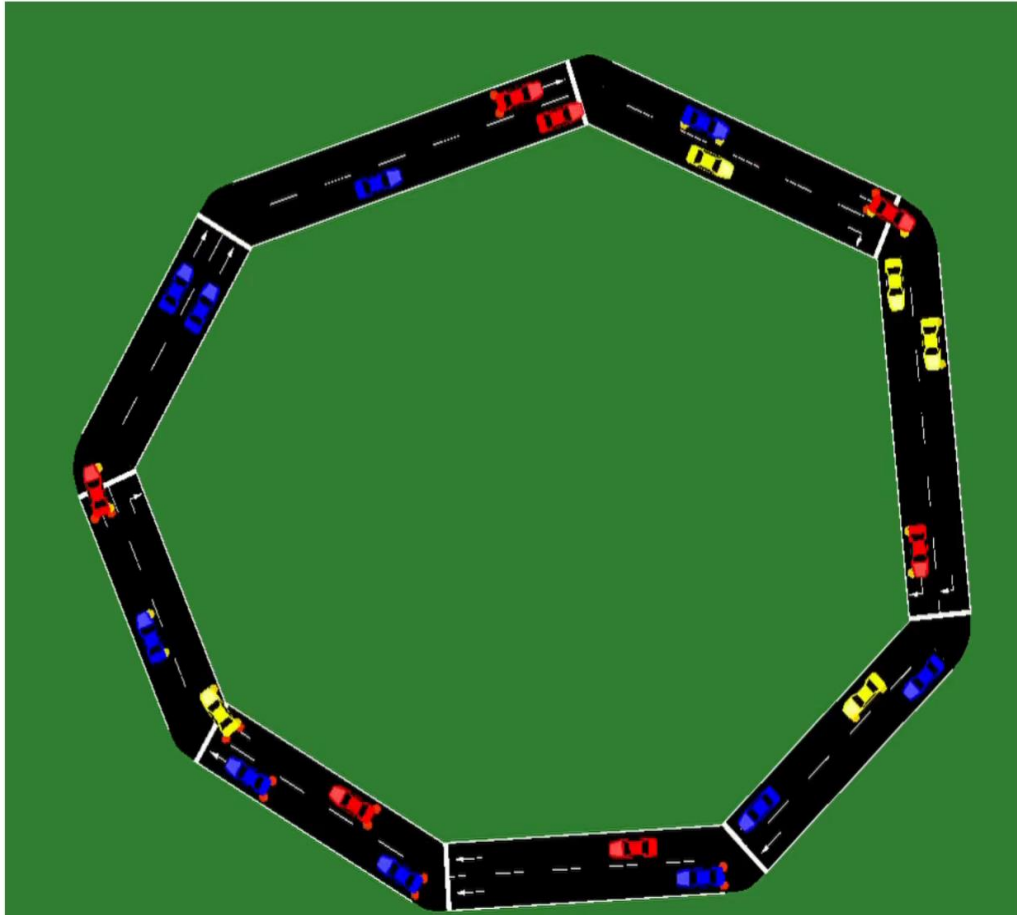
- Background research – semi-autonomous vehicles, usage of distance server for autonomous vehicles, creating vehicles swarms according to immediate location...
- Learn the SUMO simulator and create a basic workspace and conditions.
- Determine initial conditions – an endless straight road (circle road) with two lanes, and cars with different colors (destination) and initial speed.
- Creating a general algorithm that divides the vehicles into swarms and assigns positions in the swarm.

Results So Far

system initial conditions:
Fixed number of cars - n .
Fixed number of colors (=destinations) - k .
An endless straight road with 2 lanes.
Each car has a unique ID, a color and starting speed,
each car runs the next scheme.



Results So Far



Looking Forward

- Write the initial algorithm in python to implement on every vehicle.
- Test the initial algorithm using SUMO.
- Continue developing the algorithm according to the initial algorithm simulation.
- Test the formatted algorithm on more complex conditions using SUMO.
- Algorithm correction according to the results and retest.
- Results evaluation and conclusions for future research.