Prediction and control of traffic using Multi Agent Based Model

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Abstract—**Traffic simulation is one of the most complex simulation projects that can be undertaken. The main issues are: modeling of autonomous behavior of drivers, modeling of their interaction, and ability to simulate the traffic and procure reliable realistic results.In this Paper we discussed many approaches used by Previous Papers .**

Index Terms—**Multi-Agent Systems, Agent-Based Modelling, Traffic simulation,congestion, traffic**

I. Introduction

This paper presents summary of various literature we studied to start implementing our project Prediction and control of traffic using Multi agent Based Model, we have learned and explain about the Purpose of the model ,tools used ,Experiment conducted with the model and conclusion of each model.

II. Multi Agent Based Approach for Controlling Traffic

A. Multi Agent simulation of Unorganized Traffic

This paper shows the possibility of applying multi-agent simulation for unorganized traffic. A multi-agent simulator with graphics interface has been implemented to visualize and evaluate the traffic flow. In particular, we model the behavior of drivers, as being cautious, normal, and aggressive, and show results about average speed of vehicles in traffic, number of overtakes, and number of accidents occurring with different proportions of aggressive and cautious drivers.

This model involves a centralized agent plus a blackboard concept. they model the road as a collection of agents for using the blackboard concept.They used C++ with qt graphical interface developed on Linux platform.

Random number generator and normal distribution generator have been used. They also used biased random number generators to set certain percentages as Each vehicle and roads in the simulation has been modeled as an agent. For each driver to take a decision to move, she/he must communicate with all other drivers and must take her/his decisions accordingly. The aim of the simulator is to evaluate different traffic patterns that might occur under different circumstances. These general parameters like vehicle density, sector widths and lengths, vehicle length and widths, the mean speed value are changed to generate different traffic patterns. They generate their own algorithm Vehicle Agent function to simulate the traffic. This model calculates average speed as a function of percentage aggressive drivers in a scenario,Effect on average speed due to congestion on roads,Number of accidents as a function of vehicle density and number of overtakes as function of aggressiveness for different maximum number of vehicles allowed

Main objective of this work is to produce a realistic traffic situation by reproducing the behavior of drivers. These drivers interact among themselves and the produced traffic is an emergent behavior of such interactions. However the traffic is simulated with single lane for each direction and also without traffic lights at junction

B. An Agent Based Approach for Modeling Traffic Flow

In this paper they use agent based modeling (ABM) in simulating a traffic system. they modeled four different types of car drivers to investigate how drivers' behavior effect on the performance of the traffic system.

Tools they have chosen is Blender a 3D Graphics Modeling environment and Python scripts to show real movement of cars.The main concept on which they built the animation and the movement of agents is Interpolation Curves.They used the traffic flow data for the city of Giza in Egypt

The cars generation is made in different places of the map. Agents are categorized into 3 categories-Location attributes (location of a car on a road in a map),Car specific attributes (Like car quality and max speed a car can reach),Driver's specific attribute (like speed ,Perception).In this model they have defined 4 different Agent Types like private car ,Taxi car ,Mini bus, Bus Driver .Each agent types can have different attribute depending on their speed etc. speed ,braking and changing lane are the general rules of all the agents. Special rules are stopping location, stooping repetition and stopping time.Traffic lights are the points where the car should take decision to stop or to continue movement. Genetic algorithm is used to optimize traffic lights as much as possible. Than they combined all traffic lights in 1 chromosome. Techniques like fitness function, survival of the fittest ,mutation and crossover are applied to optimize the traffic lights and achieve maximum throughput. The final generation had enhanced the throughput of the network by more than 26 percent, which is a huge improvement when talking about traffic flow.

In this paper framework proposed is very customizable and can be used to model any transportation network. they presented a more realistic agent based interaction, which makes the results valid for implementation.They used genetic algorithm to schedule traffic signals and thus aiming to reach a near optimal throughput.

C. Agent-Based Modelling For Traffic Simulation

The main objectives of this paper is to research traffic theory, evaluate network architecture, and implement control improvements. Understanding traffic theory, knowing the primary aspects and challenges of traffic simulation, and assessing agent-based modelling as a way of simulating traffic.

The main entities in the traffic simulator implemented in this paper are vehicles, road segments, intersections, traffic lights which are modeled as agents and objects.They have constructed a prototype traffic simulator program to test driving agent design. The programming language we used to build the simulator is Java eclipse.The simulator program roughly consists of four elements: a user interface to provide visual feedback, a simulation controller, an environment containing simulated objects, and the driving agent model.Different environments can be loaded via Load map. These files contain a description of a road network and traffic control systems.

In this paper author describe a model of reactive agents that is used to control a simulated vehicle.The simulator consists of an urban environment with two lane roads, intersections, traffic lights, and vehicles.The main advantage of agent-based microscopic traffic simulation over the more traditional macroscopic simulation is that it is more realistic.

D. A Cooperative Multi-agent System Simulation Model for Urban Traffic Intelligent Control

The main goal of this paper to make every vehicle's travels more efficient while simultaneously reducing the number of cars on the road and this might lead to a reduction in vehicle-related pollution and traffic congestion. This paper present agent-based hybrid model for traffic information intelligent control simulation, which performs the fundamental interface, planning, and support services for controlling various DRT services.

This paper present a method that employs several agents. Multi-agent systems can display more complicated behaviours including autonomy, learning, and aggregation of agents.System agent framework consists of 3 layers. The agent platform (Jade platform) is the first layer, followed by the multi-agent architecture. The JADE platform includes an agent management system (AMS) for identifying and localising agents, a directory facilitator (DF) for identifying agents based on their services, and a message transit system for facilitating communication between agents and containers.The plan agent is in responsible of processing, allocating, and scheduling the trip requests that have been received. It is in charge of coordinating with other agents as well as the transportation service's management.The broker agent is in charge of connecting requests for transportation with automobiles that are

available. It keeps track of service descriptions from both the cars and the clients.

E. A Study on Agent Based Modelling for Traffic Simulation

The goal of this project is to create a realistic traffic condition by simulating driver behaviour. These drivers engage with one another, and the traffic that results is an emergent feature of those interactions,

The distinctions between microscopic, mesoscopic, and macroscopic, as well as between continuous and discrete time approaches, are some of the most basic classifications. Traffic safety and the implications of sophisticated traffic information and control systems are two topics of particular interest. Simulation software continues to improve in a number of ways. Simulation software programmes are getting quicker, more powerful, more detail-oriented, and more realistic as new advances in mathematics, engineering, and computers are made. Some of the simulator software packages available are NetLogo and Visual Simulator, among others. Many strategies for decreasing traffic congestion exist, including the use of high occupancy vehicles (HOV), lane switching, vehicle speed management, and traffic signal phase control in metropolitan traffic intersections. NetLogo, Visual Simulator, AgentBase, Agent Modeling Platform (AMP), AgentScript, AnyLogic, JASMINE, JASON, and others are examples of these software tools.

Main advantage of agent-based simulation is it is more flexible. Further, the simulation environment should be made more realistic by adding new objects, such as busses, trucks, emergency vehicles, pedestrian crossings, cyclists, traffic signs, trees and buildings. Once the simulator is improved with the new objects the agent's functionality must be extended to deal with these objects

CONCLUSION

In this Paper we have studied approaches used by 5 papers.Some papers developed their own Algorithm ,some used the simulators like net logo ,Repast Simphony ,TraffSIM and anylogic for traffic simulation .some of the papers used genetic algorithm to optimize traffic lights and some used Java,C++ language to code the different agents and traffic scenarios generated by different behaviors of Vehicles.

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