Traffic Dynamics in Scholastic Environments

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Abstract

A great quantity of simulations have been conducted since the beginning of computer time, studying everything from global population patterns to local climate. This simulation attempts to undertake the relatively small area of traffic simulation, more specifically within a school environment. The purpose of this project is to create a simulation of students and teachers at Jefferson moving around the building. The program will be coded in Java, using MASON, and a realistic and accurate simulation is expected at the end.

Keywords: Multiagent, dynamic simulation, probability, group mentality

1 Introduction

As far as it is known, no such simulation yet exists. A realistic representation needs to be constructed to reflect the need for a new school building and to allow users to determine paths of travel during their day at school. A graphic output shell exists through MASON, and the necessary classes will be written to detail the adventures of the students throughout their day at school. The students follow real schedules of current students at TJ, and the floorplan of the school closely resembles that of TJ.

The research being addressed is the study of how human beings move about buildings and to a certain extent how they interact with each other

and with their environment. This study will take the approach of using real, current data, to model the movement and then compare it with what is actually observed. This research will bear the most importance to those at TJ and almost none to the outside world. The scope of this project is to model observed phenomena and allow some user control of environment variables.

2 Background

This project belongs to the family of agent-based modeling projects. Agent-based simulations rely on the characteristics of the objects involved in the simulation to produce results. The objects control their own actions based on a predetermined set of rules and are not subject to the direct control of the overall governing program. The most relevant area currently being studied is traffic modeling. Such simulations endeavour to find patterns of traffic to promote better development of intersections and traffic light control. These projects provide a basis for my project because I've traded the cars for students and defined specific paths for the students to follow.

Agent-based modeling explanation - later. The central algorithm that governs the movement of the students is the breadth-first search. In each timestep, the student knows his current location, the location of his destination, and the distance to the destination. He surveys select points around himself, each equal distances away from him, and determines which would be the most desirable in getting him nearer to his goal. He only looks one time-step ahead, and takes the path that would get him closer to his goal in the next time step. For such small dimensions as those of a school building, this is sufficient and is often quite accurate.

3 Development Sections

3.1 Requirements

This project was deemed succesful by the accuracy of the portrayed motion of the students. If the students went to the correct class when expected, and exhibited normal student behavior during breaks, talking to others, getting food, using the bathroom, running around, then the simulation was succesful.

The project should also allow user manipulation of variables, allowing him to set the class and break lengths to experiment.

3.2 Overview

The project started out as a tutorial in MASON. I used the graphical output capabilities of that tutorial and created my own classes to replace the ones in that tutorial. I coded the student objects, and acquired the necessary data for creating the floorplans and schedules.

3.3 Planning

Informal tactics of assessing the components including simple observation of the studens to see if they behaved as they were programmed to behave. Formal tactics have not been employed yet. The lifecycle model used was Evolutionary Prototyping.

3.4 Visuals

3.5 Developmental Procedures

Using the GUI provided by MASON, create a SimState that contains several SparseGrids as private variables. The SimState will read in data files that include the locations of the rooms, the initial locations of the students, and the schedules. It will then enter all the data into the SparseGird and create all the Student, Room, and Wall objects. It will then start the simulation and call the step methods of each of the Students. The Students will determine their new locations and move there. See the Visual section for a diagram of relationships.

4 Quality Assessment

I have yet to do this.

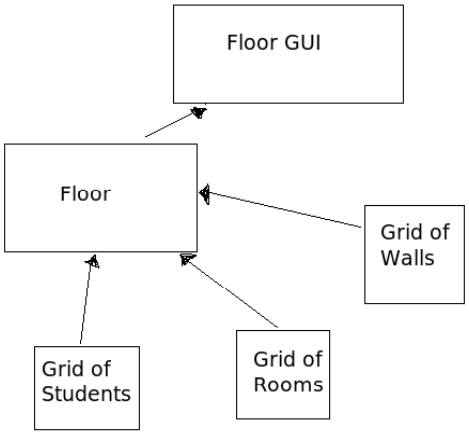

Figure 1: Diagram of class relantionships

5 Results

So far the program is behaving as expected with minor glitches. Tests need to be conducted to determine if the students are moving accurately.

6 Discussion

I don't know yet.

7 Conclusion

I don't know yet.

References

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