Thomas Jefferson Hallway Traffic Simulation

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November 2, 2009

Abstract

Agent-based models are effective methods for accurately simulating virtually any scenario. Simulations are time-, effort-, and cost-effective ways to predict how agents (in this model, students) react to other agents and whatever the current scenario is.

1 Introduction

1.1 Purpose

A hallway traffic simulation at schools could serve to design better-laid-out hallways and classrooms. By using an agent-based model with great attention paid to social factors, an architect could determine where clusters of students will cause bottlenecks in hallways and how to best circumvent them. Simulations also provide for interesting insights into pathfinding and social dynamics.

1.2 Scope

The people-traffic in the hallways at TJ is erratic. Some hallways are jam-packed between periods, during lunch, and before school. Others are deserted, save for three or four students standing in an alcove talking. My intention is to model the traffic of people, both students and faculty, during the school day. Each agent would have social factors coded into it which may change based on interactions with other agents. My program will be easily scaleable and changeable in that it will be easy to change the layout of a school and alter numbers of all types of agents. Because the decisions are generated dynamically, the agents will adapt to whatever environment they are generated in.

Keywords: agent, agent-based modeling, simulation

2 Background

I found one helpful article on portal.acm.org, which related to a study of social dynamics within a virtual ecosystem. It discussed a mathematical algorithm for assigning a numerical value to the compatability between two agents. I found this numerical assignment interesting it started me thinking about a scale-based personality method rather than a numerically-unrelated system.

There have been several tech-lab projects on the same general topic in the past. Paul Wood's simulation was also modeled after TJ's hallway traffic, but his simulation was focused on whether or not students were able to make it to their classes on time rather than how social factors afected the congregation areas.

3 Theory

Simulations are efficient ways to predict how changes would affect a system. Several projects have been done before on hallway traffic at TJ, but those projects missed out on a very important factor; they took into account the path-finding aspects, but lacked any social aspect. Adding social factors - grade, gender, shared classes, and geographic location, for example - adds a entirely new spin on the situation. While the gender, shared classes, and geographic location would affect who a given agent interacts with, the grade is what I would consider the largest variable when determining how that agent detours around the school between classes. The most obvious examples would be each grade and their respective congregatory area: seniors to senior lounge, juniors to the physics hallway, etcetera.

4 Results

So far this year, I've spent my coding time building up the framework of my program. Agents are able to perform the most basic actions in school: moving through hallways and entering/leaving classrooms. Although I do not yet use these for anything, grade levels and genders have been assigned to students. Starting second quarter, I hope to automate movement with schedules and create a more-realistic school environment for students to travel in. I still have some interface changes planned - action buttons and time controls, namely.

Having said that, I have no numeric results yet and minimal (mostly debugging) qualitative results. Movement and entering/exiting classrooms is acceptable for now, but will need improvement before my project develops too much further.

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