The Tragedy of the Commons in Traffic Routing and Congestion

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Abstract

This project uses Java to create a functional traffic simulation, focusing on routing and congestion rather than individual car physics. We can then use the simulation to make several important conclusions about human behavior. The human tendency to be self serving is considered an advantage in the economic system of today, but is this also true for other systems? This project could demonstrate the effectiveness of a traffic solution in which a central computer makes decisions rather than individual drivers. While that kind of system is not currently feasible, it may not be long before we will have the technology to implement it on highways, if not smaller roads. In most respects, it will be a simple matter of connecting the cruise control system of cars to a central highway computer bank. Of course, there would be the hurdles of justifying this much control to a computer (and of course the risks), but this project should demonstrate that turning over control to a computer can have significant benefits to society as a whole, even if it sometimes causes individuals to have a slightly longer route.
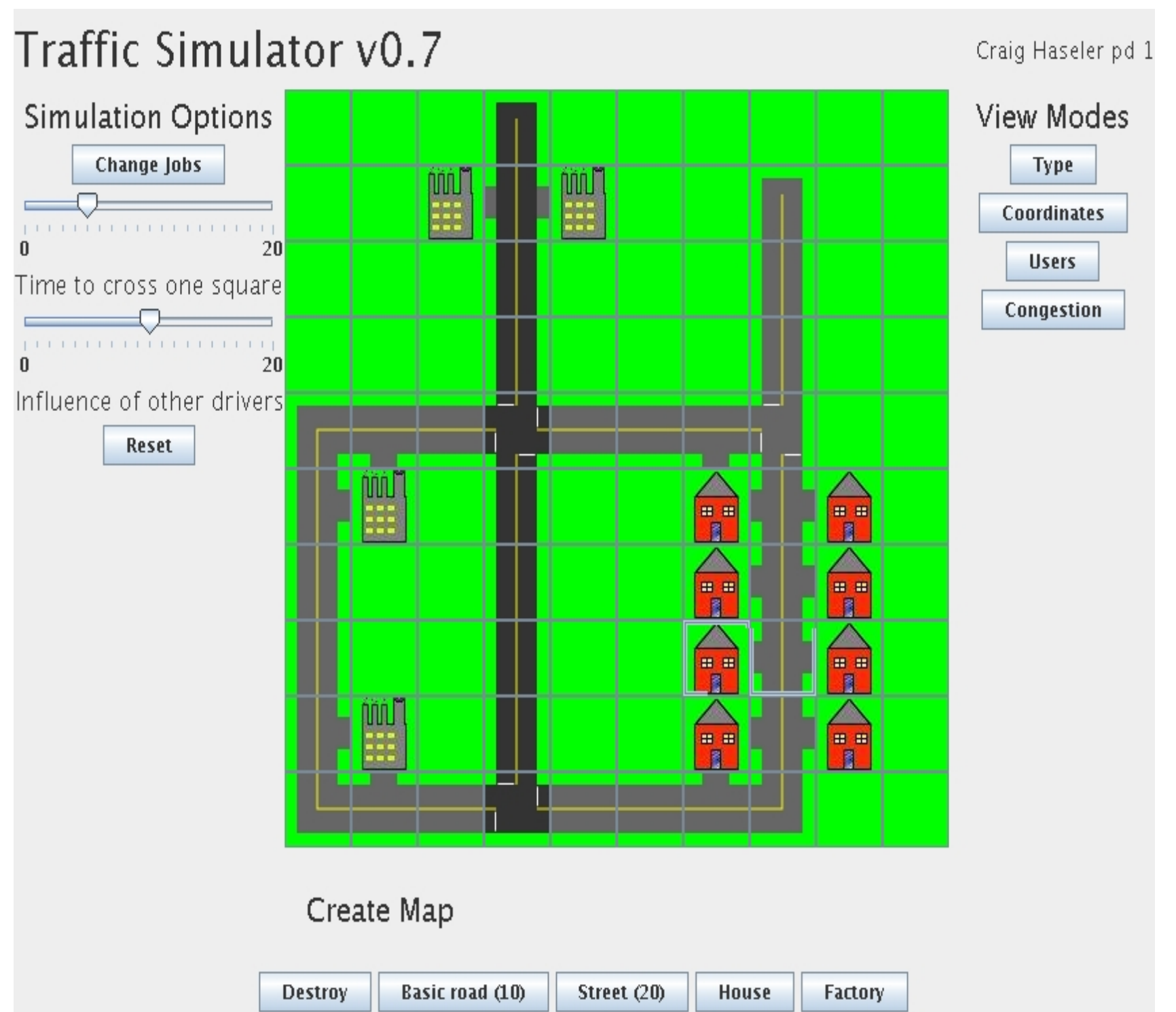

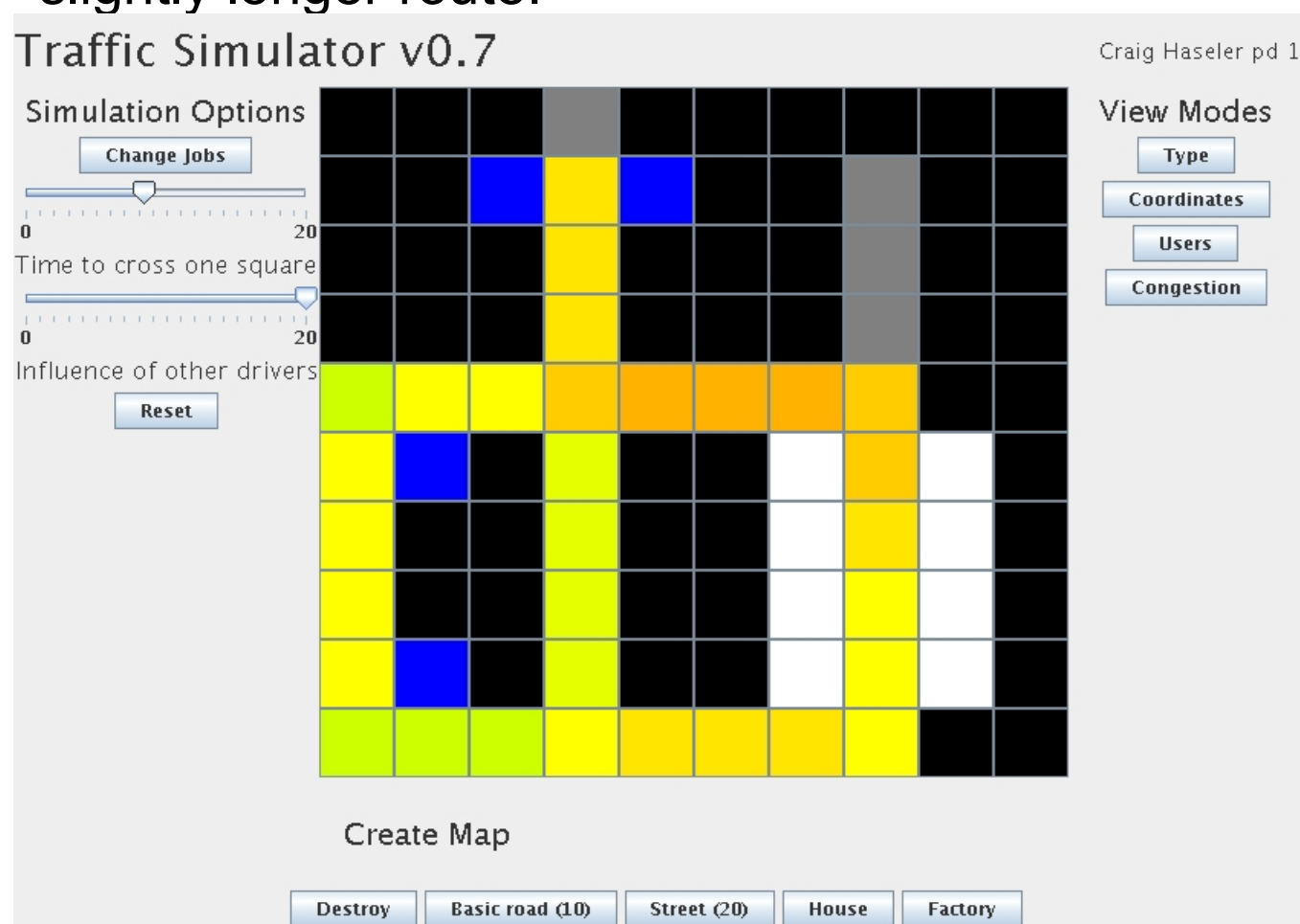Figure 1: The basic map and interface structure.
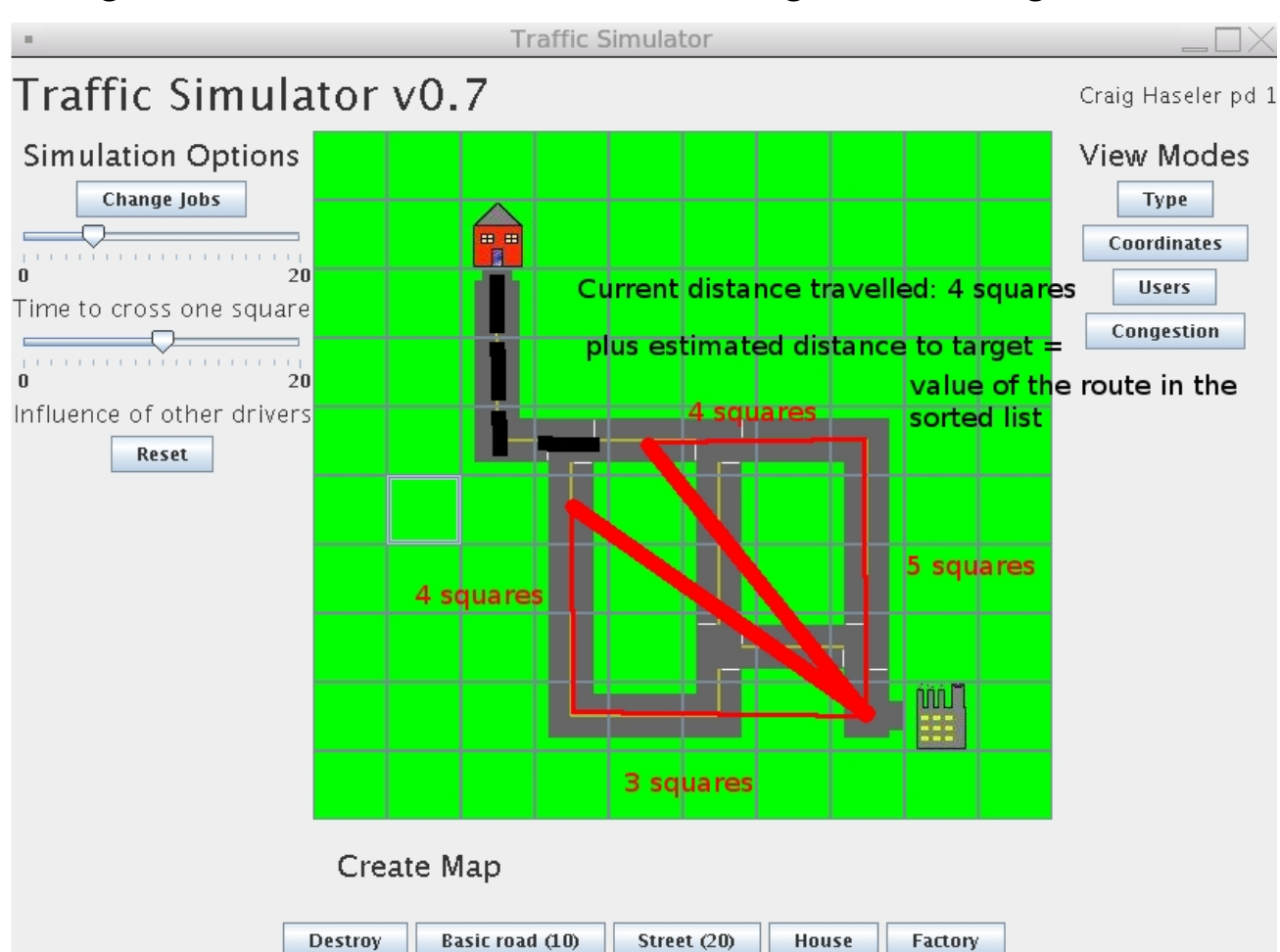

Figure 2: An alternate view, showing traffic congestion.

Figure 3: An illustration of the A* search.

Introduction

The purpose of this project is to give an example of a situation in which there is in fact a solution to the apparent paradox spelled out in theoretical situations such as the so-called Tragedy of the Commons. This paradox means that people acting purely out of self interest actually hurt the group as a whole, and so the society does not succeed. We see a similar effect in the world of traffic and congestion. People will always act in their own self interest, even if it slows down the system as a whole. My goal here is to demonstrate that the paradox can be solved by having a overall intelligence which makes these decisions for the people, acting in the interest of the system as a whole, rather than the interest of a specific individual.

Results

Results of this simulation indicate that substantially better results can be achieved by looking at the situation as a whole rather than treating each car as an individual unit. Unfortunately, this generally exceeds current computer capabilities, especially for a more complex (and realistic) system.

My only solution to this is to wait – in 10 to 20 years, the technology will be around, and people may actually be considering an automated traffic system. For the purposes of this project, we can assume future advances in technology will make it possible to expand to a large scale.