Pandemic Simulator
CS5500 Parallel Programming
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Introduction

As our final project for CS5500 Parallel Programming, we will be implementing a simple simulation program using MPI for simulating the spread of an infectious disease in a "city". The simulation will demonstrate the rate of spread for a disease among a population of people and the ratios, over time, of people susceptible to the disease, people infected with the disease, and people who have gained immunity to the disease.

Description

The simulation will simulate a "city" by dividing calculations across multiple processes. The "city" will be made up of two kinds of places, homes and non-homes. Homes will be represented by even number processes and non-homes by odd numbered processes, where each process will hold a number of buildings or houses. Each home holds 4 "people" and each day(round of the simulation) every "person" will go to 3 non-home locations which can hold 4 people and then the people will return to their homes. While a person is in a building with an infected person they will have a certain chance of becoming infected which will increase depending on how many infected people are in the building. Each person will start out in the susceptible state, when they are infected they will be in an infectious state and once they have been infected they will stay infected for three days and then "get better" or become unable to pass the disease on. The simulation will run until no more people are being infected, at which point the simulation will stop and display the results.

Tests

We will run the simulation using increasing numbers of people, buildings, and initial infected people then compare results with each simulation. The increases for the number of people, buildings, and initially infected people will change both concurrently and independently for more varied tests. During each test, the results for each "day" of the simulations will be saved in a structure in such a way that the data will all be reported, either to the screen or a text document at the end of the simulations.

Anticipated Results

We expect the number of infected to increase at at set rate per day following a function similar to $I_t = I_{t-1} * R$, where I is the number of people infected at a given instance and R is a scalar. R will be greater than one until the number of infected reaches a peak and then it will drop below one. We also expect that increasing numbers of people, buildings, and initial infected will have similar ratios of infected per day and peak infected if increased together by equivalent ratios. If those numbers of people, building and initial infected increase independently however, we expect the ratio of infected per day and the peak infected to be different. For example if we increase the number of people then we expect the number of infected per day to increase. If we increase the number of building we might expect to see fewer infected per day due to the chance that less people might be in a building at a given time. We expect that increasing just the number of infected at the start of the simulation will increase the amount of people being infected initially, but not change much in the long run.

Distribution Permission Decision

Sure, why not.