Simulation And Project 3

CSE 100

Simulation can be an effective technique for understanding the physical world. Though there is a wide range of simulation techniques, we recognize three: animation, synchronous simulation, discrete event simulation.

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CSE 100 Animation

- Animation is a form of simulation in which the emphasis is placed on making the visual display of the system "accurate"
  - For example, people and animals in film animation may have a "skeleton," but generally there is no attempt to give it correct physical properties … its mostly a reference point
- In Virtual Reality the degree of verisimilitude is usually limited by the need to run fast

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CSE 100 Simulated Time

- All simulators have a “clock” that represents global time
- In animations and in many other types of simulations, this time is advanced at regular intervals, as a physical clock would advance
- But there is no reason for the simulator to advance the clock one tick at a time if there is nothing happening over long periods

> For example, if traffic is being simulated and at a given time t, all vehicles are stopped and nothing will change (except the clock) for 10 ticks, then advancing time to t+10 will produce the same result as stepping through all of the intermediate times

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CSE 100 Synchronous Simulation

- In a synchronous simulation each of the simulated objects is updated with each clock tick even if there is no change … that is, all parts of the system are updated synchronously
- The U-District Traffic Simulator is a synchronous simulator since the state of each light and car is updated with each advancement of the clock
- Synchronous simulation is used for continuous simulations (wind over airplane wings, stars moving in a galaxy), and in other systems in which most elements change most of the time

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CSE 100 Discrete Event Simulation

- Rather than updating every part of a simulation on each clock tick, discrete event simulators keep a list of when each part of the simulation will change, and therefore needs to be updated
- This “event list” is sorted by time, earliest first
- Then, the simulator simply performs the operations...
  - Advance the clock to the time of the first element on the event list, and remove it
  - Perform that operation and update its state
  - Determine when it will next change, and if it has caused others things to change
  - Add them to the event list in their correct places

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CSE 100 Project 3

- Working with the U-District Traffic Simulator
- Guidelines in working with other people’s programs…
  - Do not expect to understand the whole program
  - Formulate a 30,000’ view of the programs structure
  - Determine what its components do
  - Try to identify where you have to make changes … what routine needs to be modified
  - Familiarize yourself with the structure of the routine … how is it organized
  - By inspecting the processing structure determine where the changes need to be made … possibly insert a breakpoint to stop the program to “look around”
  - Make tiny changes and test them incrementally

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CSE 100 Accuracy For The UDTS

- The properties of the lights in the UDTS are simply invented, but they could be determined by observation on 45th and 50th
- What facts are needed:
  - Check that type of light is correct
  - Determine the durations of each light
  - Establish the starting times relative to a base reference
- These values can then be used to initialize the simulation

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