Data Parallelism through Forest Fire Simulations

There were 13 students in our class and Aaron assigned each student a number from 1-13.
Each student did the following:

a. Use the "Interactivate: Fire!! - Shodor" from Google
b. Create a fraction by dividing our by the total number of students. This is our burn probability.
c. Use the burn probability into the box and press enter. The fraction should change to a decimal.
d. Click the "Highlight Center Tree" button.
e. For 5 times, press the center tree and watch the forest burn.
f. Record both the iterations and the percent of trees burned
g. Find the average iterations and percent burned and give those data points along with the assigned unique number to Aaron.

Aaron was setting up the graphing feature so he could graph the data points we gave him.

Necessary Steps to Play Tennis

Materials - Tennis Racket, Tennis Ball, Tennis Court, Tennis Shoes

1. Learn the terminology - Backhand, Forehand, Lobby, Overhead, Serve, Volley
2. Learn how to hold the Tennis racket - learn which grip on the neck of the racket works best for you. Your hand should be in the middle of the racket neck. Practice holding it horizontally to the right and then folding your arm over your body to the back hand form.
3. Learn the stance - learn the proper stance - feet spread apart, knees bent, racket in front of you in a "praying position".
4. Practice Hitting the Ball - Use your racket and ask a friend to throw a ball to you. Practice being able to hit it within the court.

Dependency -
Step 4 depends on steps 2 and 3
Step 3 depends on steps 2
Steps 1 and 2 are independent

Parallel-
Each person uses the materials and learns the terminology. Each person needs to learn how to hold the Tennis racket and learn the proper stance to be able to correctly hit the ball.

Conclusion-
Both of my recipes, serial and parallel, were similar because with an activity like playing tennis - if someone wants to learn, each person needs to complete all the tasks. Each person is an individual learner so another person cannot "learn the terminology" for them.

Shopping With Kids

There are totally 12 passengers in the car. Take them to the grocery store and ask each child to pick one item that they would like and Aaron and Mobeen will pay for it. Aaron takes six kids and Mobeen takes the other kids. They communicate to meet up at the register. Aaron pays for all the kids foods while Mobeen takes the kids to the car.

1. There is inherent parallelism when Aaron pays and Mobeen takes the kids to the car.
2. The kids are dependent on Aaron and Mobeen to pay for their food before they can eat lunch.
3. Aaron and Mobeen have to communicate to make sure all the kids are accounted for.

Parallelism In Nature

Function Machine

- The data that exists are a new function, the input variable x, the check formula and the option to input a formula for the function.
- The tasks - the function uses the equation to provide the appropriate output given the input created and it also allows you to check your answer.
- The data of the input variable and the check formula are parallel because they are dependent on the person putting the answer in so they are running at the same time. The input variable and the check answer cannot because the answer depends on what you input - without inputting something you cannot check your answer.

Coin Toss

- The data that exists are the number of tosses, coins, data table
- The tasks are the clear results and the toss em
- The Clear data and the data table could be in parallel because they both can occur simultaneously - you can clear your data without anything else.

Penguins of High Performance Computing

- HPC is the use of parallel processing for running advanced application programs efficiently, reliably and quickly.
- High performance computing is used for modeling different properties of products and figuring out ways to improve the product. It is used in aerospace engineering and modeling the aerodynamics of planes and making them safer in fuel-efficient.
- 3. I want to have a career in the field of statistics and computer engineering. HPC would be useful for simultaneously running and analyzing large data and to model different data in charts or graphs.
- HPC's are used for spatial statistics and data science for interpreting and statistical modeling of spatial data. Unsurprisingly it used used a lot in data modeling.

The World's Fastest SuperComputer

- The fastest supercomputer as of the most recent list is Tianhe-2 (MilkyWay-2).
- Tianhe-2 is located at the National Super Computer Center in Guangzhou (China) - has 3,120,000 cores. Peak performance is 54,902.4 TFLOP/S
- BlueWaters wants to accomplish real scientific results rather than just running benchmarks tests for recognition.

1. A processor core is a processing unit which reads in instructions to perform specific actions.
2. TFLOP/S stands for a trillion floating point operations per second
3. Linpack measures the maximum number of TFLOP/S a computer can achieve.
4. Supercomputers could also be ranked on the length of their lifetime, cost efficiency or energy efficiency.

Blue Waters Demo

- The advantages of using a remote supercomputer are that users can access powerful computers without needing to own the computer individually and that users have a bigger support community created by other people and programs working with Blue Waters.
- However, the disadvantages of using a remote supercomputer are that they will have slower feedbacks than will a local supercomputer and decreased customizability for certain tasks.

Daqri Demo

- Augmented reality can be used for visualizing models and designing.
- Augmented reality can also be used for medical imaging and geographical or geological imaging.

Flipping Coins in Parallel

1. If each worker can flip one coin per time step, it takes 2 time steps for a serial worker to flip two coins and 1 time step for two parallel workers to flip the two coins.
2. It takes the serial worker 16 time steps to flip 16 coins and 8 time steps for two parallel workers to flip 16 coins.
3. It takes 4 time steps for 4 parallel workers to flip 16 coins.
4. It takes 2 time steps for 8 parallel workers to flip 16 coins.
5. Parallel workers can do a work sooner than can serial workers.
6. In two time steps, two parallel workers can flip 4 coins and one serial worker can flip 2 coins.

7. In two time steps, four parallel workers can flip 8 coins and one serial worker can flip 2 coins.
8. In two time steps, eight parallel workers can flip 16 coins and one serial worker can flip 2 coins.
9. Parallel workers can more work than can serial workers..
10. Two parallel workers can flip a maximum of 4 coins given each worker can only hold two coins in memory. One serial worker can flip a maximum of 2 coins given each worker can only hold two coins in memory.
11. Eight parallel workers can flip a maximum of 16 coins given each worker can only hold two coins in memory. One serial worker can flip a maximum of 2 coins given each worker can only hold two coins in memory.
12. Parallel workers can do more coin flips than can serial workers.

Domain Decomposition - How Many Different Ways?

1. The domain decomposition that resulted in the least number of dependencies was a forest divided into quadrants.
2. The domain decomposition that resulted in the smallest average workload was a forest divided into quadrants.
3. Dependency refers to the researchers communicating with each other the color of their trees relative to trees of other researchers. Workload size refers to the number of trees each researcher studies/plants.
4. Dependency refers to the color of each tree relative to that of other trees of different color. Workload size refers to the amount of trees each worker does.
5. Minimizing dependencies decreases the amount of communication between workers.
6. More work should be given to one worker so that the forest will be modeled faster.