CS147 Project

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What is a Set?

A Set is collection of elements

Example: A = {2, 19, 31, 33}, B = {-77, 0, 1, 13}

Operations on Sets

A = {3, 7, 9, 14}, B = {-77, 9, 14, 28}

1. Intersection: $A \cap B = \{9, 14\}$
2. Union: $A \cup B = \{3, 7, 9, 14, 28\}$
3. Relative Complement: elements that belong to A and not to B. $A - B = \{3, 7,\}$
4. Symmetric Difference: elements that belong in A or B but not their intersection. $A \Delta B = \{-77, 3, 7, 28\}$

Libraries (CPU vs GPU)

- CPU
  - C++ STL vector
- GPU
  - CUDA runtime, and Thrust
- Both
  - C++ <ctime>, <iostream>, and <cstdlib>

Simplified Algorithm

- Two vectors are created (user chooses the size)
- If size for vector1 is 4, then vector1 will have 4 elements.
- Vector1 will have 4 numbers/elements that are randomized between -4 and +4.
    - i.e. if user entered 5000, then the vector will have 5000 elements that range between -5000 and +5000.
- Vector1/2 will NEVER have duplicate values
- Vector1/2 will be sorted in ascending order
- Vector1/2 is converted to an array
- After both Sets are created, user can perform any of the four operations shown in slide 3.

How to guarantee Sets will never have duplicate values?

Suppose initial created Set is {-9, 3, 7, 13, 0, -52, -44, 7, -2, 3}

3 and 7 are repeated. Therefore, iterate through the Set and change 3 and 7 to a different randomized number.

HOWEVER, what if 3 becomes -52??? Uh oh…there's still a repeated value in the Set.

Solution: since there are 10 values, iterate through the set 10 times. This will ensure there are never duplicate values.

Cont.....

Initial Set: {-9, 3, 7, 13, 0, -52, -44, 7, -2, 3} n = 10

After n iteration: {-9, 3, 7, 13, 0, -52, -44, 0, -2, -52}

……..

After n - 1 iteration: {-9, 3, 7, 13, 0, -52, -44, 1, -2, -5}

Note: Set is not yet sorted

Sort Algorithm

CPU uses the sort selection technique.

GPU sends the data/vector from host to device and then sorts. Then, it sends the data back to host.