Operating Systems–1

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REPORT

Program Design:

A structure (SharedData) is defined to hold the shared information, including the result array, count, and tetrahedralFlags array.

The tetrahedral function is responsible for determining whether a given number is tetrahedral.It calculates the tetrahedral number for each value up to N and stores it in the local result array.

Child processes are created using fork(), and each process is assigned a specific range of numbers to check for tetrahedrality. The child processes log their findings into individual log files (OutFilei.txt), detailing each tested number and whether it is a tetrahedral number or not.

The SharedData structure is utilised to accumulate the results from each child process in shared memory. An array (check) is used to mark numbers that have already been identified by a process, preventing redundant calculations.

After all child processes have completed, the main process generates the final output file (OutMain.txt).It organises the tetrahedral numbers identified by each process, ensuring that each number is associated with the process that identified it.

Complications and Solutions:

Inclusive Range Issue:
Initially, the program calculated the end range inclusively for each child process, leading to missing the last value. This was rectified by adjusting the end calculation for the last process to include the maximum value N.

Redundant Number Identification:
To prevent multiple processes from identifying the same number as tetrahedral, a check array was introduced. Before testing a number, the program checks whether it has already been marked by another process.

Time vs Size, N:

```
Time: 0.001355 seconds
```

```
Time: 0.001369 seconds
```

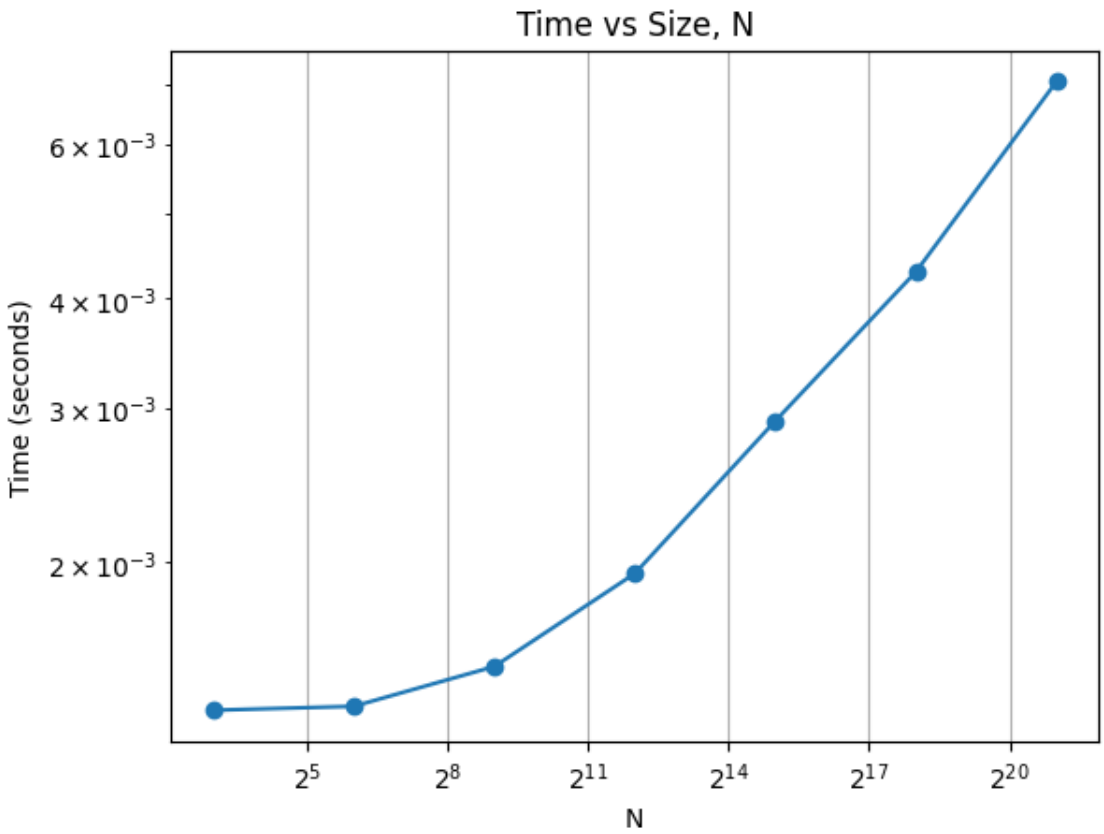
```
Time: 0.001520 seconds
```

```
Time: 0.001941 seconds
```

```
Time: 0.002899 seconds
```

```
Time: 0.004289 seconds
```

```
Time: 0.007072 seconds
```



We can see from the above graph that there is an increase in time with increase in N

Time vs Number of Processes, K

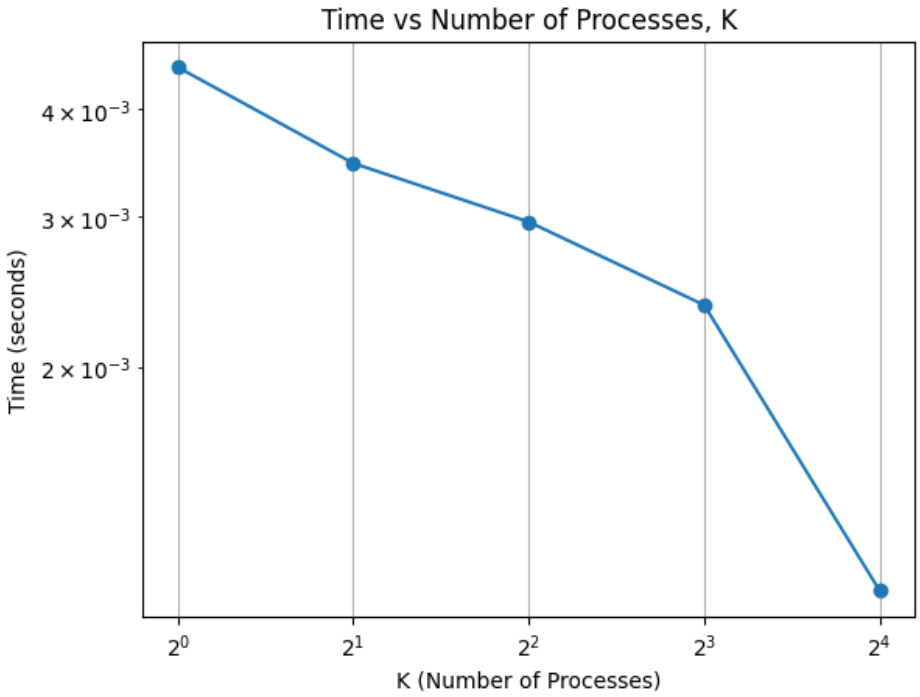
```
Time: 0.004477 seconds
```

```
Time: 0.003459 seconds
```

```
Time: 0.002955 seconds
```

```
Time: 0.002363 seconds
```

```
Time: 0.001097 seconds
```



We can see from the above graph that there is a decrease in time with increase in K.