CS3510 - Operating System

Assignment 1

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1 Coding Approach :

The program was implemented in C to find the tetrahedral numbers in the range 1 to `N`(obtained from the input file) by dividing the task among `K` children processes.

1.1 Steps :

1. First we read `N` and `K` from the input file.
2. Then we create `K` shared memories for the purpose of communication between the main process and the children processes.
3. Then the main process creates `K` children processes, each of which will execute a common routine.
4. According to the routine each process will check the numberset it has been allotted to get the tetrahedral numbers in the concerned set.
   (a) The allottment of numbers is decided using the process id which is implicitly stored in the counter variable i. Each number that is i (mod `K`) will be allotted to Process i + 1.
   (b) To check if a number is Tetrahedral or Not, tetrahedral series is generated till the new term calculated is equal to(in which case it is tetrahedral) or greater than(in which case it is not tetrahedral) the number to be checked.
5. For every number in it's allotted set a process will record its status(Tetrahedral or Not) in it's respective log file. Also on identifying a tetrahedral number the process will store the number in it's shared memory.
6. The main process waits for the completion of all the children processes.
7. Then it accesses the shared memory of every process and records the tetrahedral numbers identified by the process(if any) in the main logfile.

2 Verification :

The main log file aka OutMain.log also contains the count of tetrahedral numbers within the given range and the time required for the execution of the task for verification purposes.

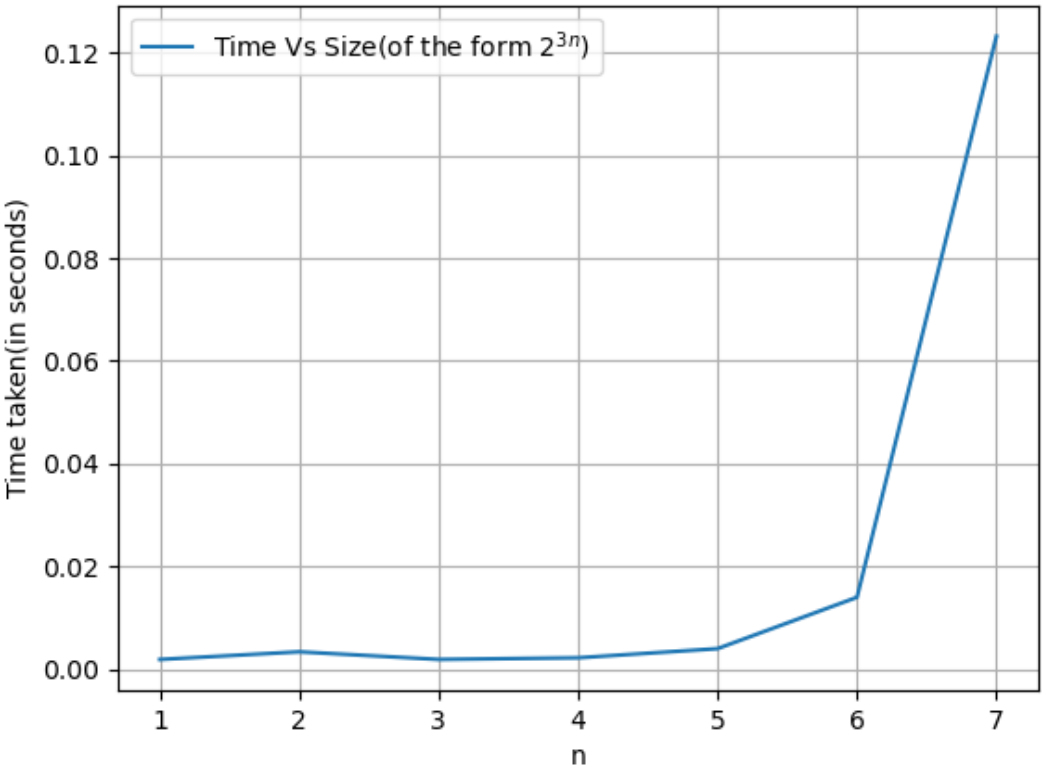
3 Conclusion :

1. Increasing the input size naturally increases the execution time.
2. Increase in the number of processes generally leads to a decrease in execution time. However, after a certain number increasing the number of processes grants diminishing returns. This could possibly be due to the distribution of tetrahedral numbers among the natural numbers.

4 Graphs :

4.1 Maintaining K at 8

Time vs Size(2^{3N}) :



4.2 Maintaining Size at 10,00,000

Time vs Number of Processes(K) :