

Distributed-Operating-System-Principles (COP5615) Project 1

Perfect squares formed by the sums of consecutive squares

#Group members:

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#Steps to run

1. Unzip the file and navigate inside the folder
2. Open Terminal
3. Run the following command:
dotnet fsi --langversion:preview proj1.fsx 1000000 24

Output:

[Prints first number of the sequence that forms a perfect square]

Real time: <real time> in ms

CPU time: <cpu time> in ms

Cores Used : <cores used in computation>

(ratio of CPU time to Real Time)

#Size of work unit for each worker actor

- The work unit considered was k where a sequence of numbers of size k was given to each actor.
- The actor then squares each of those values of size k and adds it up.
- Another approach was to simultaneously square all the values from 1 to N by assigning it to actors and then sum up each sequence of size k parallelly.
- But this would take more time and space, since the boss would need to wait till all the squares are computed by workers and also needs space to store it.
- For an input of 1000000 it was found that dividing the work to 1000 actors where each actor received 1000 work units, used the most cores delivering the best performance.
- But when the input $N < 1000$ we create only N actors and assigned 1 work unit for each actor.
- When 10,000 actors were spawned it was found to be more cumbersome to maintain this number of actors than perform the squaring.

For an input $N=1000000$ and $k=24$

No. of Actors	Work Unit Received by each actor	Cores Used
1000	1000	4.84
10000	100	4.59
100000	10	4.08

#Result of running `dotnet fsi proj1.fsx 1000000 4`

There are no sequences of length $k = 4$ for $n = 1000000$

#Running time for $n = 1000000$ and $k = 4$

Real Time: 4142 ms

CPU Time: 20130 ms

Num of Cores: 8 Cores Used: 4.859971

```
shaunak@shaunak-ZenBook-Q536FD-Q536FD:~/D0Sproj1$ dotnet fsi --langversion:preview proj.fsx 1000000 4
Real: 00:00:00.000, CPU: 00:00:00.000, GC gen0: 0, gen1: 0, gen2: 0

/home/shaunak/D0Sproj1/proj.fsx(104,38): warning FS0044: This construct is deprecated. please use List.item

Real Time: 4142 ms
CPU Time: 20130 ms
Num of Cores: 8 Cores Used: 4.859971
end
```

#Largest Problem solved

$N = 10^8$ and $k = 24$

```
shaunak@shaunak-ZenBook-Q536FD-Q536FD:~/DOSproj1$ dotnet fsi --langversion:preview proj.fsx 100000000 24
Real: 00:00:00.000, CPU: 00:00:00.000, GC gen0: 0, gen1: 0, gen2: 0

/home/shaunak/DOSproj1/proj.fsx(104,38): warning FS0044: This construct is deprecated. please use List.item

121
20

76
25

1

44
9

197

304

1301

353

540

3597

856

2053

3112

5448

8576

12981

20425

30908

35709

54032

84996
```

128601

202289

306060

353585

534964

841476

1273121

2002557

3029784

3500233

5295700

8329856

12602701

19823373

29991872

34648837

45863965

52422128

82457176

Real Time: 571544 ms

CPU Time: 2743960 ms

Num of Cores: 8 Cores Used: 4.800960