COP5615
Distributed Operating Systems Principles
Project #1

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Implementation

The implementation creates one supervisor. This supervisor spawns one SequenceResultTask worker that waits on getting results from different workers that evaluate different sequences. The number of worker units that individually evaluate different sequence is decided based on the value of N

For N <= 1000, the size of work unit is N,

For N>1000 and N<=10000, the size of work unit is N/10, and

For N>10000, the size of work unit is determined by k and is N/k. If N and k are equally large, the number of workers will be very large. We observed that large number of workers doesn't necessarily mean better performance hence, for N>10000 the code evaluates a simple max() operation

max(div(N,k), div(N,100))

which can spawn a maximum of 100 workers.

The different worker spawning conditions implemented ensures that for varied combinations of N and k, the number of workers spawned is not excessively large.

For example, for N > 10000, the first worker when created, is assigned the numbers 1 -> (N/k)+1, the next worker is assigned numbers (N/k)+2-> 2(N/k)+2, and so on.

Thus, the first worker evaluates sequences:

seq 1: $1^2 + 2^2 + \ldots\ldots + k^2$
seq 2: $2^2 + 3^2 + \ldots\ldots + (k+1)^2$
...
...
...
seq (N/k)+1: $((N/k)+1)^2 + ((N/k)+2)^2 + \ldots\ldots + ((N/k)+k+2)^2$

Furthermore, the logic of calculation uses the formula:

$$\frac{p(p+1)(2p+1)}{6} - \frac{(q-1)(q)(2q-1)}{6}$$

{ where calculation is for sequence q, q+1,........,p-1,p in the sequence 1,2,3,.......q-1,q,q+1,......,p-1,p }

to evaluate the sum of squares. Thus, the calculation requires constant time to evaluate.

How to run

The application can be run by executing the following command:

```
mix compile
mix run -e Starter <N> <k>
```

example:

```
mix run -e Starter 100000000 4
```

Testing

time mix run -e Starter 1000000 4 gives output as **nil**

with the execution times as

```
real    0m19.714s
user    1m6.760s
sys     0m0.395s
```

ratio = (66.76 + 0.395) / 19.714 = 3.406