Programming Assignment 2

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1 Preamble

For question 3, I discussed with Dongmin Han and Yuanlai Zhou and we worked together to figure out the parallel solution.

2 Algorithm

1. **seq_solve**r

   (a) $op(a, b) = 2a + b$
   since

   $$op(op(a, b), c) = 2(2a + b) + c = 4a + 2b + c$$
   $$op(a, op(b, c)) = 2a + (2b + c) = 2a + 2b + c$$
   $$\Rightarrow op(op(a, b), c) \neq op(a, op(b, c))$$

   Thus $op(a, b) = 2a + b$ is not associative operation.Therefore, parallel prefix algorithm cannot be used in this binary operation.

   (b) $op(a, b) = \sqrt{a^2 + b^2}$
   Since

   $$op(op(a, b), c) = \sqrt{(\sqrt{a^2 + b^2})^2 + c^2} = \sqrt{a^2 + b^2 + c^2}$$
   $$op(a, op(b, c)) = \sqrt{a^2 + (\sqrt{b^2 + c^2})^2} = \sqrt{a^2 + b^2 + c^2}$$
   $$\Rightarrow op(op(a, b), c) = op(a, op(b, c))$$

   Thus $op(a, b) = \sqrt{a^2 + b^2}$ is associative operation.Therefore, parallel prefix algorithm can be used in this binary operation.

2. **nqueen_master**

3. **nqueen_worker**

3 optimization

4 Implementation and Analysis

1. vary n choose k ≥ 8
2. vary p n not too low or too high
3. vary k $n > 10$

5 Results and Conclustion