Square Chicken Dance
Illustrating Principles of Parallelism Using People
(I POP UP)
Faculty Version
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This classroom exercise is intended to illustrate the idea of the single-instruction, multiple data style of parallelism using message-passing. It is one of several exercises that illustrates parallel programming principles using students – but faculty work equally well under sufficient guidance.

Requirements:
- 9 participants minimally. 16 ideally. More will add a bit of chaos (which isn't necessarily bad). Less than 9 won't sufficiently illustrate the depth of the algorithm.
- Index cards with random numbers printed on them. You'll need one for each participant. Start with a unique list of numbers and use the case where you have redundant numbers in the list as a classroom conversation topic.

▶ Setup:

- This description assumes that we have 16 participants. If you have more or less, adjust accordingly. With 16 participants, you start with $\sqrt{16} = 4$ volunteers from the classroom. Line them up facing alternating directions so that the pairs on the ends are to the right of each other:


Facing Forward
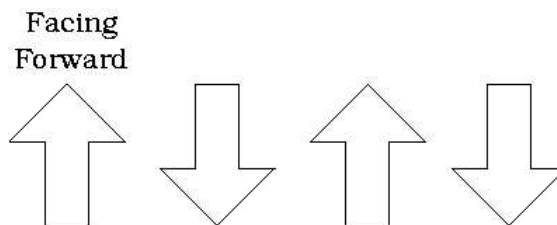
These initial four individuals will illustrate the idea that will be expanded to include the rest of the participants.

- Hand out four numbers that (out of order works best), and declare one end of the room as the "High" end, the other as

the "Low" end:
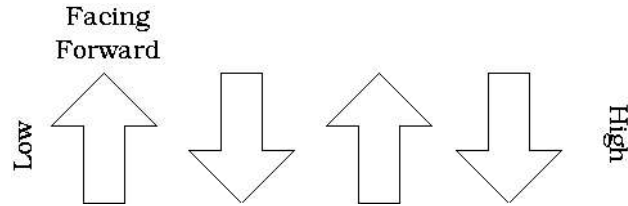
- Each person shows their number to their partner on their right, and if the person toward the high side of the room does not have the higher of the two numbers, the pair exchange numbers. That is to say, if the number were distributed above in the order (from left to right) "55 – 21 – 22 – 12," the groupings would be "(55 – 21)   (22 – 12)." After examining the numbers of the partners, the new order would be "(21 – 55) (12 – 22)."
- After the first exchange, everyone turns 180 degress.
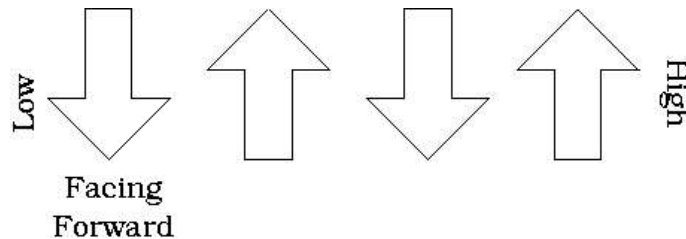
- Adhere to the rule that the person to your right is your partner (which leaves the ends without a partner for this portion of the exercise. We repeat the process of showing your number, exchanging if necessary (note that the high and low end assignments remains the same), and turn.
- Adhering to the original example distribution, we would now have the pairing: "21 (55 – 12) 22," so that after the exchange we are left with: "21 (12 – 55) 22."
- Everyone turns once again and the process continues until the numbers are completely sorted.

The Square Chicken Extension:

- Now that everyone has the idea, bring in 12 more participants, but line them up in the following manner:
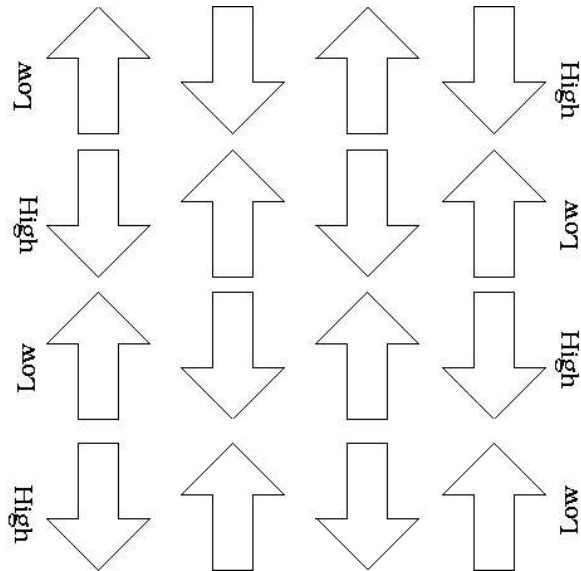
- Mix up the numbers again, and distribute them one per person.
- Repeat the algorithm along the rows, but this time, note that the rows alternate their High/Low end designation.
- Complete the sorting process along each row.

- When all rows are sorted, turn everyone 90 degrees such that everyone is now facing a new partner:
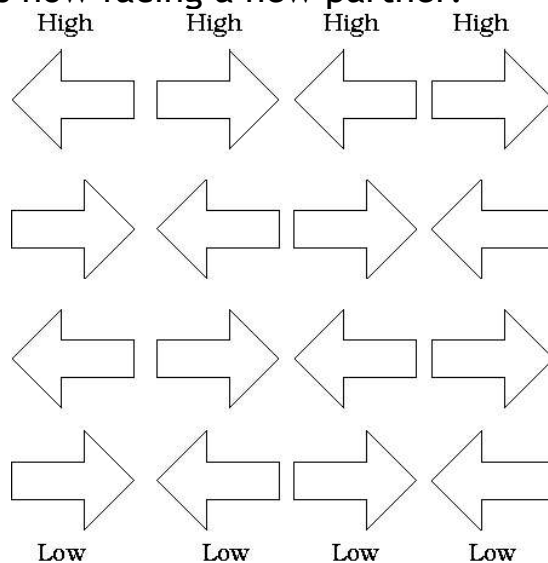
- Note that the High/Low designation DOES NOT ALTERNATE.
- Sort now along the columns.

▶ Lyrics:

- Try these lyrics to help things move along (sung to the tune of chicken-dance):

  Look on over to your right
  Place your number in their sight
  and trade your cards (if it seems right)

  Turn around yet stay in place
  See to the right a smiling face
  Unless your on the end (a boundary case)

  And then we turn to face a new friend
  We realign based on our new end
  My face lights up into a big grin
  Because we're going to start again (We start again!)

Have fun...enjoy.