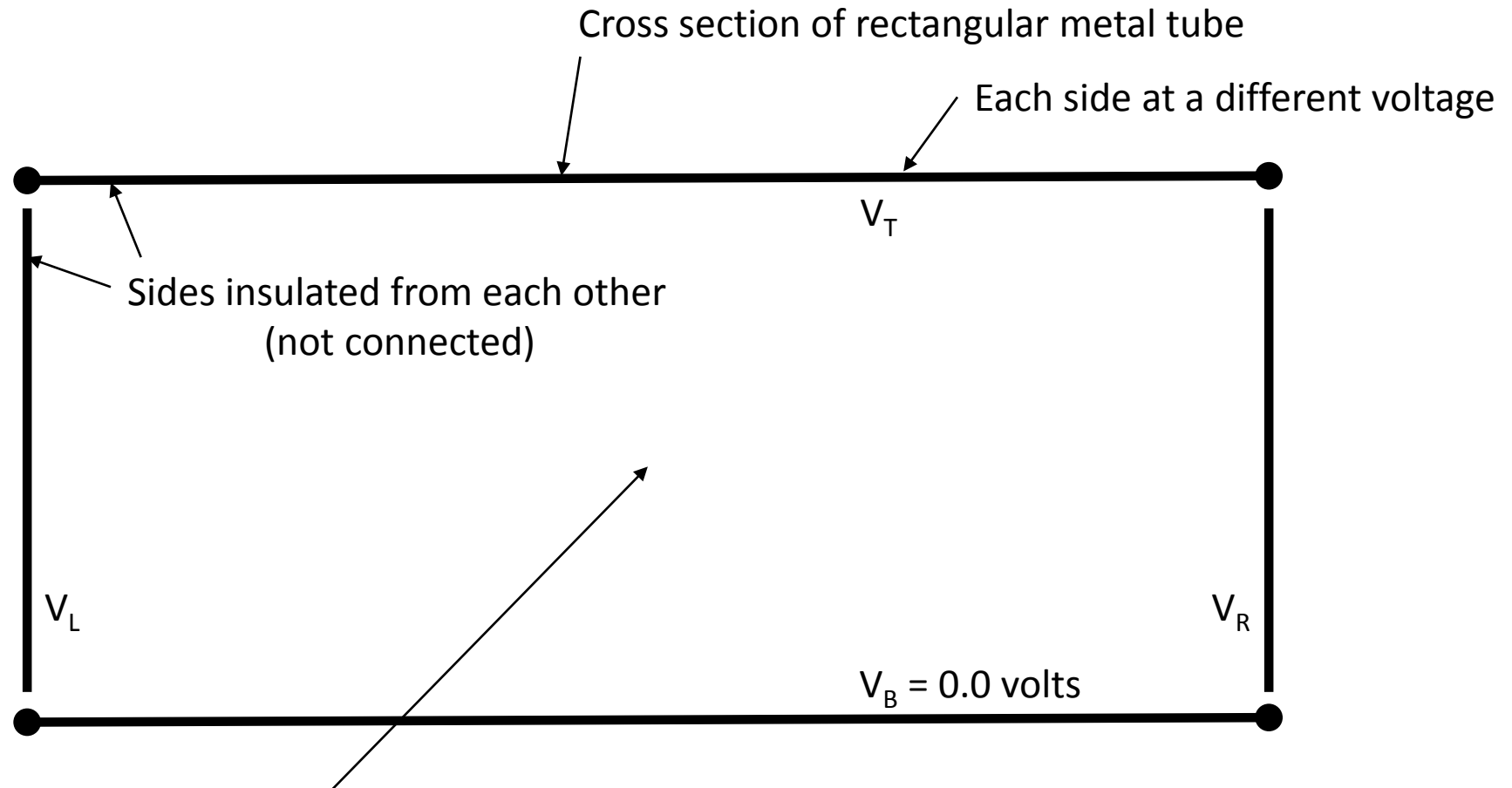


Voltage Fields

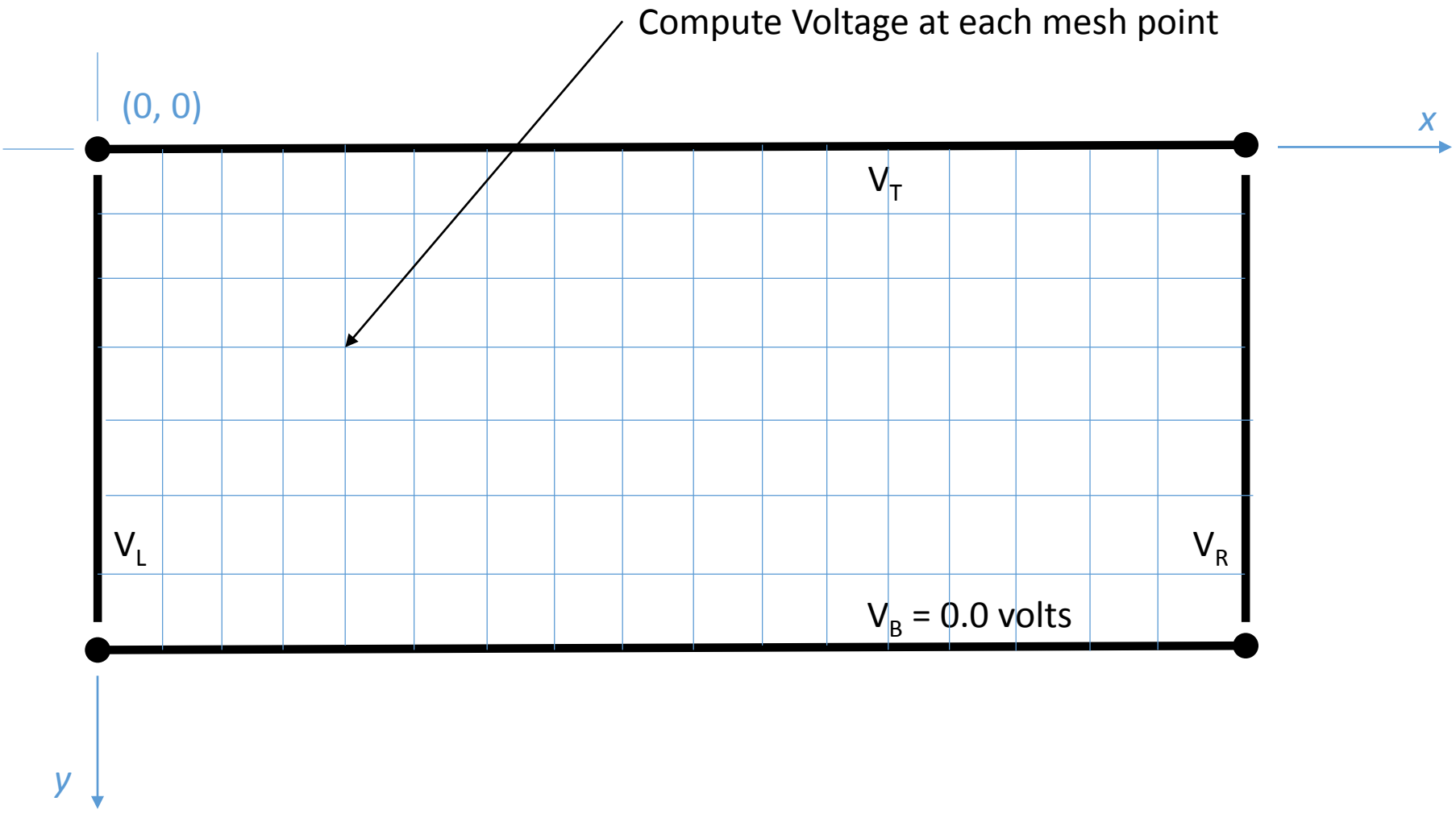
A Simple Parallel Programming Exercise

Problem Statement



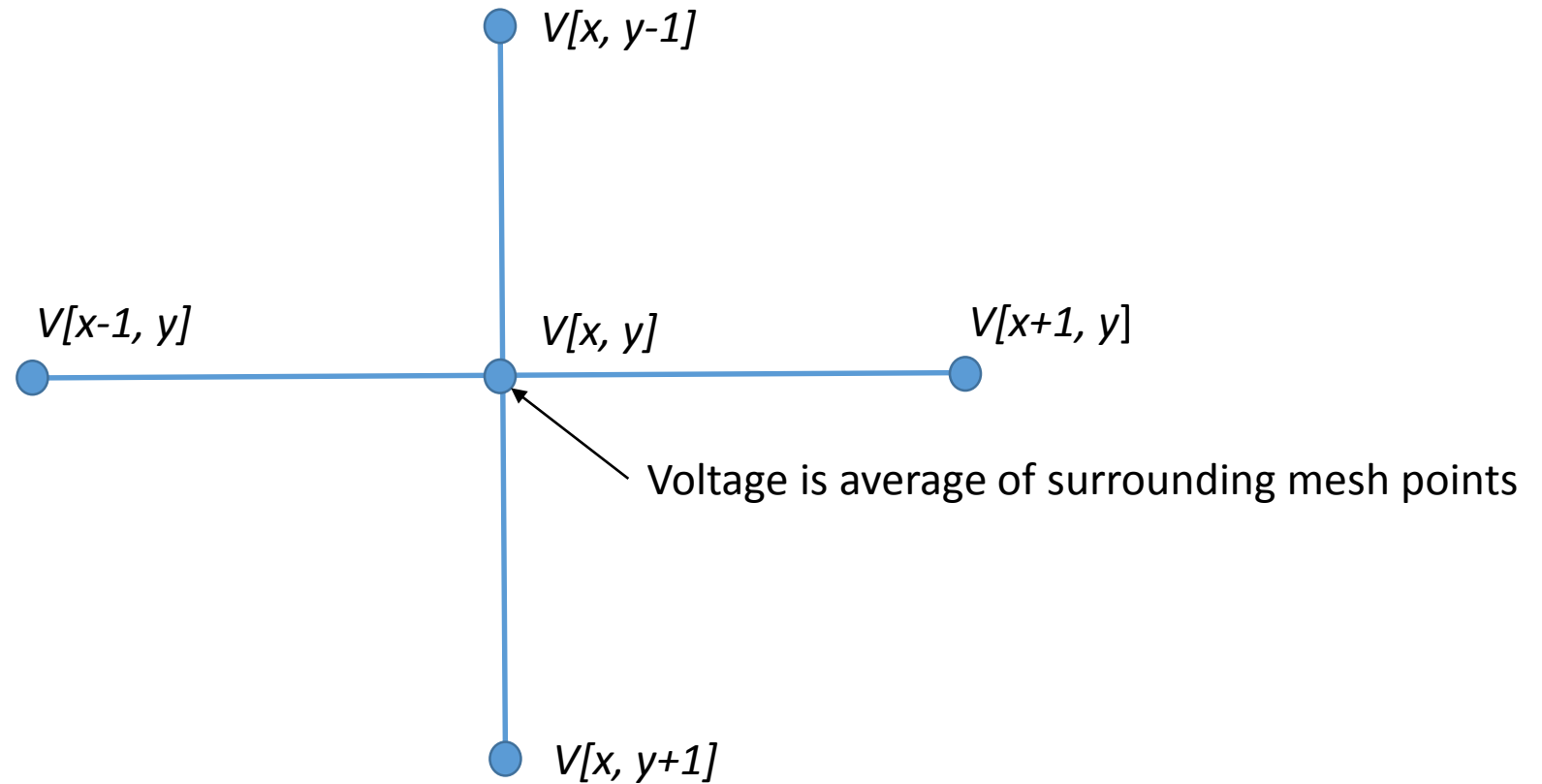
Problem: Compute voltage at interior points

Approach



Details at Each Point

$$V[x, y] = (V[x+1, y] + V[x, y+1] + V[x-1, y] + V[x, y-1]) / 4.0$$



Method

- Use a two dimensional array of `double`
 - Initialize the “edges” to the side voltages
 - Initialize the interior to 0.0
- Sweep over *interior only* and update each point to be average of adjacent points
- Repeat until results converge on a solution

Notes

- Results more accurate with a fine mesh
 - ... but larger number of points increases computation time
 - An example of time/accuracy trade-off!
- How many iterations over the interior are necessary?
 - Until no point changes more than δ percent? (for some small δ)
 - It's not obvious that is correct. Consider the harmonic series
 - $1 + 1/2 + 1/3 + 1/4 + \dots$ diverges even though the terms approach zero
 - Nevertheless we'll use this approach for now!