KAZAKH BRITISH TECHNICAL UNIVERSITY

# REPORT

# Heat distribution problem

Basics of Computer Simulation

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This program follows the static heat equation to determine heat dissipation within a defined area, room.

How it works:

1. The program will prompt the user for the size of the room N x N
2. The program will then prompt the user for the number of iterations to be taken into account, as the program calculates heat dissipation within the room
3. The program will then calculate the temperatures
4. The program will then output the initial and then the final temperatures within the room

Code review:

```
//define fireplace area
double fire_start, fire_end;
fire_start = 0.4 * N;
fire_end = 0.6 * N;


//declare temperature of fireplace
for (i = fire_start; i < fire_end; i++) {
        h[0][0][i] = 100.0;
}
```

```
//initialize all walls to temperature of 20C
for (i = 0; i < N; i++) {
        for (j = 0; j < N; j++) {
                h[0][0][i] = 20.0;
                h[0][i][0] = 20.0;
                h[0][N - 1][i] = 20.0;
                h[0][i][N - 1] = 20.0;
                h[0][i][j] = 20.0;
        }
}
```

Divide area into fine mesh of points, $h_{i,j}$.
Temperature at an inside point taken to be average of temperatures of four neighboring points. Convenient to describe edges by points.

Temperature of each point by iterating the equation:

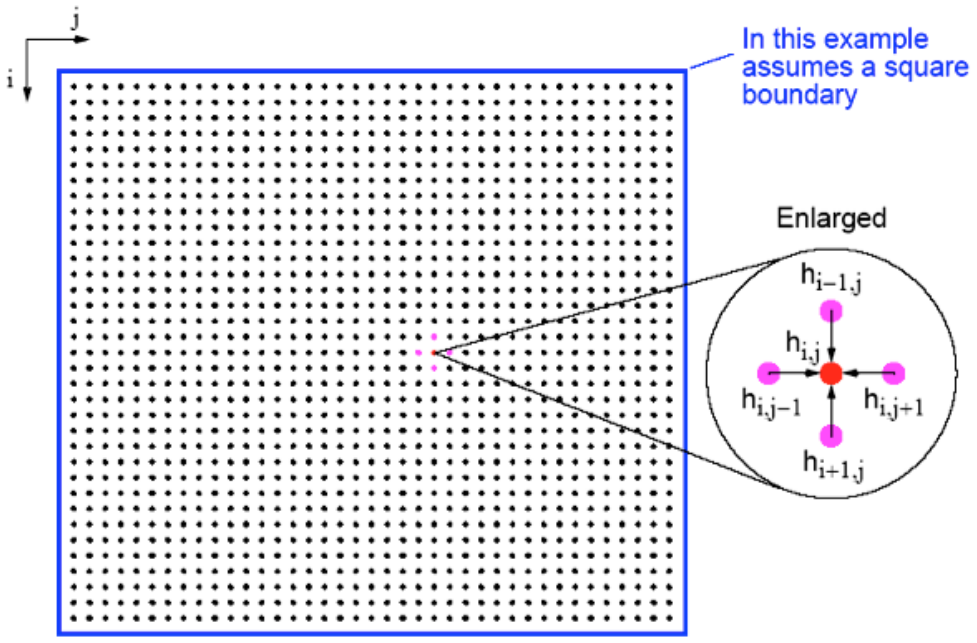
$$h_{i,j} = \frac{h_{i-1,j} + h_{i+1,j} + h_{i,j-1} + h_{i,j+1}}{4}$$

```
//iterate through iterations put in by user then calculate new temperatures using the heat equation
for (iterations = 0; iterations < T; iterations++) {
        for (i = 1; i < N - 1; i++) {
                for (j = 1; j < N - 1; j++) {

                        h[nextCurrent][i][j] = 0.25 * (h[current][i - 1][j] + h[current][i + 1][j] + h[current][i][j - 1] + h[current][i][j + 1])

                }
        }

        current = nextCurrent;
        nextCurrent = 1 - current;
}
```




Result: (visualized by HTML and css gradient):