Problem Set 3 Exercise #22: Matrix Normalization

Reference: Lecture 9 notes

Learning objective: Two-dimensional array

Estimated completion time: 40 minutes

Problem statement:

Write a program **normalization.c** that normalize the values in a given 2D array. Your program should contain at least the following two functions:

```
void read_matrix(double mtx[NROWS][NCOLS], int *rows_p,
                 int *cols_p)
```

Above function reads values into array **mtx** and returns the number of rows and columns through two pointer parameters.

```
void normalize_mtx(double mtx[NROWS][NCOLS], int num_rows,
                   int num_cols)
```

Above function normalizes the values in array **mtx** using the following equation:

$$\overline{mtx}_{i,j} = \frac{mtx_{i,j} - min_{mtx}}{max_{mtx} - min_{mtx}}$$

In the formula above, $\overline{mtx}_{i,j}$ is the normalized value in slot $mtx[i][j]$, min_{mtx} and max_{mtx} are the minimum and maximum values in **mtx** respectively.

You may assume that not all the elements in **mtx** have the same value, both **NROWS** and **NCOLS** have the value 10. Correct your output of real numbers to two decimal places.

Sample run #1:

```
Enter the size of the matrix: 4 5
Enter elements row by row:
1 0 1 0 1
0 1 0 1 0
1 0 1 0 1
0 1 0 1 0
Normalized matrix:
1.00 0.00 1.00 0.00 1.00
0.00 1.00 0.00 1.00 0.00
1.00 0.00 1.00 0.00 1.00
0.00 1.00 0.00 1.00 0.00
```

Sample run #2:

```
Enter the size of the matrix: 4 5
Enter elements row by row:
67 50 26 3 35
50 26 3 35 67
26 3 35 50 67
3 26 35 50 67
Normalized matrix:
1.00 0.73 0.36 0.00 0.50
0.73 0.36 0.00 0.50 1.00
0.36 0.00 0.50 0.73 1.00
0.00 0.36 0.50 0.73 1.00
```

Useful tip:

You need to find out the maximum and minimum values in a matrix, which has been done in the previous exercise.