Following is the python program to perform the data encoding and decoding of the 2D matrix.

1. For this program, the 2D matrix is predefined in 9 rows and 9 columns as follows:

Calendar

Description automatically generated with medium confidence

1. For each element, the program will get its 3 columns and 3 rows of its neighbors. Then subtract that element of middle index from its 8 neighbors.

A picture containing calendar

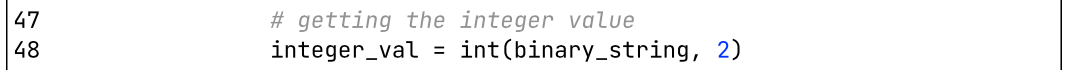
Description automatically generated

1. From the results it will then sign “1” to the values that are greater than or equal “0” and “0” for the values that are less than “0”.Text

   Description automatically generated
2. Concatenate the 8-bit binary code as counterclockwise starting from the middle element which will be at the first bit from the right to bottom right element.

Table

Description automatically generated with medium confidence

1. Convert the binary code to decimal and substitute that decimal code instead of the element in the middle. 

Text

Description automatically generated

1. The program will repeat for all the elements and display the encoded and decoded matrices.

A picture containing text

Description automatically generated

1. Output of the program:

A screenshot of a computer

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