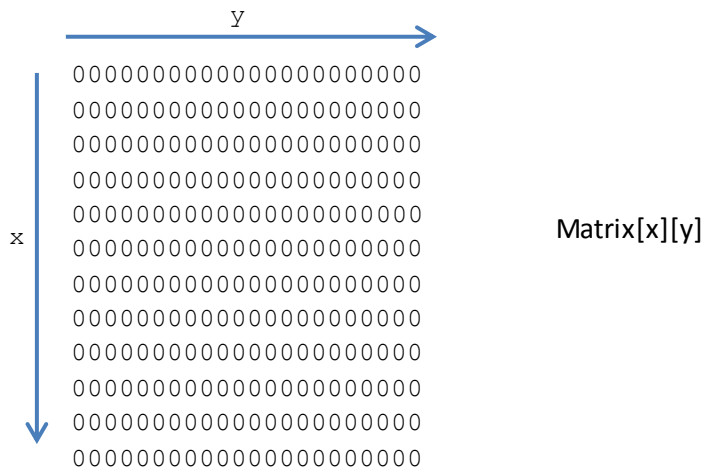# 1- Introduction

In this project, corner nodes from composition of some rectangles, which are taken from a file, are determined. A matrix is initialized with zeros firstly and necessary points are changed as one, with the information from the file. The array has a fixed size and the zeroth column and row are left as blank, in order to determine corner nodes at limits $((0,0)$ or $(x_{max}, y_{max}))$ if any exists.

Corner node determination depends on the selected point and the other eight points, surrounding the selected point. If the total number of ones is 4 or 8 in the nine-sized block, and the selected point is one, that node is a corner node. Program starts to scan from the first node of the composite shape.
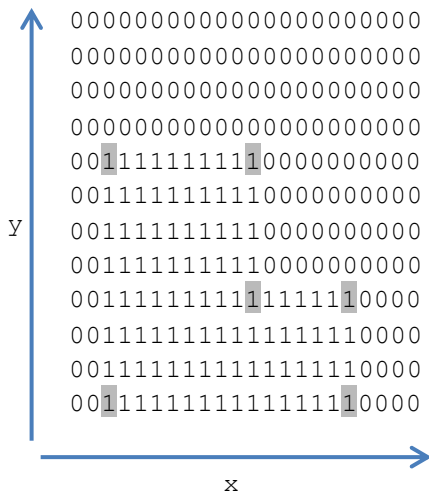
Determined corner nodes are written to file "outline.txt" one by one inside the a function. Also, an arbitrary drawing function is used to print the shape to "hw3_draw.txt" and to screen.

y

```
000000000000000000000000
000000000000000000000000
000000000000000000000000
000000000000000000000000
000000000000000000000000
000000000000000000000000
000000000000000000000000
000000000000000000000000
000000000000000000000000
000000000000000000000000
000000000000000000000000
000000000000000000000000
```
x

Matrix[x][y]

| 0 | 0 | 0 |
|---|---|---|
| 0 | 1 | 1 |
| 0 | 1 | 1 |

| 1 | 1 | 0 |
|---|---|---|
| 1 | 1 | 1 |
| 1 | 1 | 1 |

Corner node examples

```
000000000000000000000000
000000000000000000000000
000000000000000000000000
000000000000000000000000
00111111111 10000000000
001111111111 0000000000
001111111111 0000000000
001111111111 0000000000
00111111111 111111 10000
0011111111111111110000
0011111111111111110000
00 111111111111111 10000
```
y

Drawed shape from a sample

x

## 2- Development and Operating Environments

### *Ubuntu 12.04*

Codeblocks IDE has been used to write the source code, compile and run the program. The source code has been tested with the GNU C Compiler. The following is the commands used:

To compile : **gcc –o hw3 hw3.c**

To run : **./hw3**

**MS Windows**

To compile : **gcc –o hw3.exe hw3.c**

To run : **./hw3.exe**

## 3- Data Structures and Variables

No data structures were used in this program. The followings are the variables and their initial values:

```
#define X_LIM 60                          // Max x value of matrix
#define Y_LIM 30                          // Max y value of matrix

int matrix[X_LIM+1][Y_LIM+1]={0};        // Matrix initialized with 0

unsigned int xMax=0,yMax=0,xMin=X_LIM;   // For drawing limits (yMin is always 0)

FILE *ptr, *f;                           // Read from/write to file

int start,h,w;                           // Integers from "buildings.txt"

size_t i,j,t,z;                          // For loops
int i,j;                                 // For loops with negative numbers

int count_1=0;                           // Counter for cells with value 1

int x,y;                                 // Functions input parameters
```

## 4- Program Flow