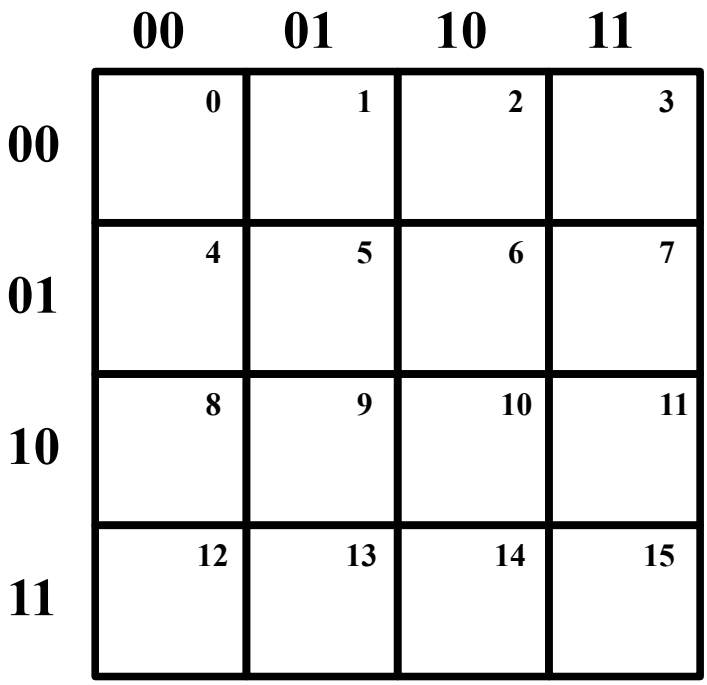

Bidirectional GPIO Port

Foto Frame:
Step 1:
Write 1111 in pins 3210.
Read result in pins 7654. (LLLL)
The Register Have:
LLLL1111

Step 2:
Write 1111 in pins 7654.
Read result in pins 3210. (CCCC)
The Register Have:
1111CCCC
Step 3:
Apply XOR logic of both results
LLLL1111 ^ 1111CCCC
Step 4:
Counter to find 1 of both nibbles and apply shift left (2 bits) of Lines Counter and logic OR with Columns Counter.

Advantages:
We make only two reads and two writes in GPIO port, making key acknowlage faster.

Example:

We press key 9. Binary Code = 1001 (linecol)

Applying the algorithm:

S1:
Write 1111 in pins 3210 of the GPIO
Read 1011 (third line (top-> down) = third bit)
In one register (or byte of one register) we have 1011 1111.

S2:
Write 1111 in pins 7654 of the GPIO
Read 1101 (second column (left->right)= second bit)
In one register (or bytes of one register) we have 1111 1101.

S3:
Applying the XOR between the two bytes
1011 1111 ^ 1111 1101 = 0100 0010

S4:
Apply Conter in nibble high = Lines
0100 = 3rd bit = 2 = 10 (conter start at zero for first bit)
Apply Conter in nibble low = Columns
0010 = 2rd bit = 1 = 01 (conter start at zero for first bit)
Apply Shift Left (2 bits) in Line Conter:
1000
Applying the OR between the two result
1000 | 0001 = 1001 = 9

We press key E. Binary Code = 1110 (linecol)

Applying the algorithm:

S1:
Write 1111 in pins 3210 of the GPIO
Read 0111 (fouth line (top-> down) = fourth bit)
In one register (or byte of one register) we have 0111 1111.

S2:
Write 1111 in pins 7654 of the GPIO
Read 1011 (third column (left->right)= third bit)
In one register (or bytes of one register) we have 1111 1011.

S3:
Applying the XOR between the two bytes
0111 1111 ^ 1111 1011 = 1000 0100

S4:
Apply Conter in nibble high = Lines
1000 = 4rd bit = 3 = 11 (conter start at zero for first bit)
Apply Conter in nibble low = Columns
0100 = 3rd bit = 2 = 10 (conter start at zero for first bit)
Apply Shift Left (2 bits) in Line Conter:
1100
Applying the OR between the two result
1100 | 0010 = 1110 = 14 = E