XNOR Gate in Arduino

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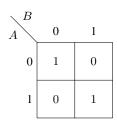
Abstract—We implement XNOR logic in Arduino by getting the boolean expression from it's K-map for it's truth table by writing our sketch in avr assembly language.

I. THEORY

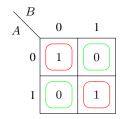
Let A and B be the inputs to the gate, Y be the output. The truth table for XNOR gate is given below.

A	В	Y
0	0	1
0	1	0
1	0	0
1	1	1

K-map for the above mentioned truth table:



Simplified K-map:



Collecting minterms from the kmap, i.e., where Y=1, we get the boolean expression in sum of products form for XNOR gate as following.

$$Y = A'B' + AB \tag{1}$$

And for product of sums form, we get maxterms, where Y=0, we get the boolean expression as following.

$$Y = (A' + B)(A + B')$$
 (2)

II. IMPLEMENTATION

Components Required:

Components	Qty.
Arduino UNO	1
Breadboard	1
Jumper wires	4

Connections:

Arduino	2	3
Inputs	Α	В

In addition to the above table, we connect 5V and GND pins of Arduino to different bus strips of breadboard to input binary values back to the input pins of Arduino.

A. Sketch

We set the digital pins D2, D3 as inputs and feed A, B into those. We utilise the builtin LED at D13, by setting D13 as output. So, when Y = 1, LED glows and when Y = 0 LED doesn't glow. This sketch in assembly code is given in the below link.

https://github.com/ahilan22/fwc-1/tree/main/assembly/assignment/code/asm.asm

B. Software

We use avra assembler to convert the code to machine language. Uploading the code to Arduino depends on the host system, if it's a computer or a phone, refer the following steps:

- 1) Download the source code in the desired location from the link given above.
- 2) Convert the assembly code into machine code.
- 3) Upload the generated eep.hex file to Arduino using Arduino Droid if the host is a android phone, or use avrdude if the host is a linux computer.

We've successfully implemented XNOR logic in Arduino.