5-Bit Gray to Binary Code Converter using Finite State Machine

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***Abstract*—This paper presents the design of a Finite State Machine(FSM) that converts a 5-bit Gray code to its equivalent binary code. The design takes 5-bit input and produces 5-bit output after 5 clock cycles that is required for processing the data. The circuit can continuously take input and produce the output 5-bit data with previous 5-bit input data.**

***Keywords*—Gray to Binary, Code Converter, FSM**

I. Description

The design presented works on a FSM that takes 1-bit input at a time. The gray to binary code conversion logic is taken care by FSM. The input to the block is a 5 bit input which is serialized using a Parallel In Serial Out shift register. The output from the FSM is accumulated in registers using the Serial In Parallel Out shift register. After 5 clock cycles, we can get the output for previous 5-bit input for the first time after which, for each input bit and previously available input are taken and output is produced. The MSB of the input is first fed to the design and the output is received accordingly.

II. State Diagram

The state diagram for the FSM of the design described uses different states to keep track of previous output and count of number of bits received. The MSB is produced as such as output, following which the input bit is XORed with the past output. The state transition depicted in figure 1 shows the appropriate code conversion.

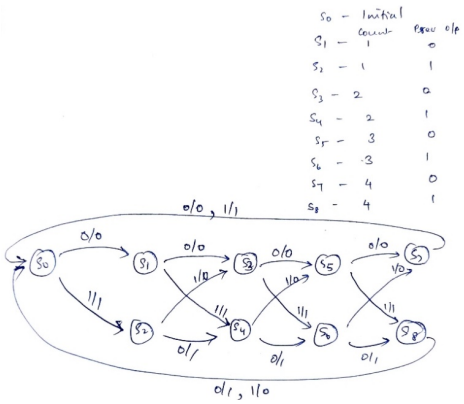

Fig. 1. State diagram for Gray to Binary Conversion Logic

III. Block Diagram

The block diagram of the design is designed using eSim circuit simulator, and is given in figure 2.

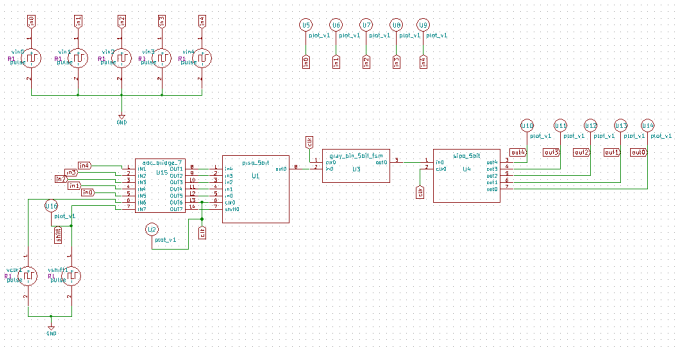

Fig. 2. Block diagram of 5-bit Gray to Binary Code Converter

IV. Waveform

The figure 3 shows the conversion of Gray to binary code with all inputs 1. The properly of XOR of complementing the value if one input is 1 is shown in figure 2 which also depicts the functioning of Gray to binary code converter. After 5 bits again the input is copied to output as per the design requirement. Only the MSB is shown other bits are just the time shifted version of the MSB bit.

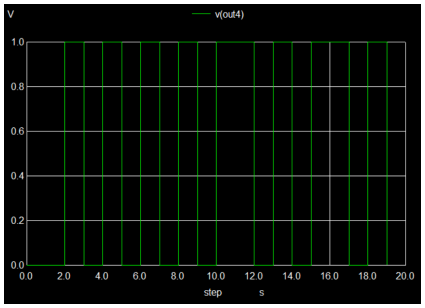

Fig. 3. Coffee Vending in action

References