

4 BIT ALU

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Introduction

- ▶ An arithmetic logic unit (ALU) is a major component of the central processing unit of a computer system. It does all processes related to arithmetic and logic operations that need to be done on instruction words. In some microprocessor architectures, the ALU is divided into the arithmetic unit (AU) and the logic unit (LU).

Our Project

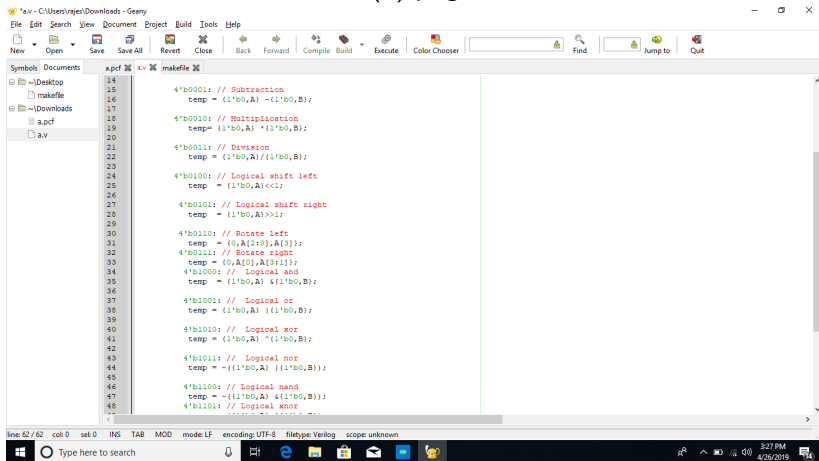
We are doing 4 bit ALU

Components

- ▶ ICO Board
- ▶ Two Arduinos
- ▶ Raspberry Pie
- ▶ LCD display
- ▶ SD card with raspberry OS

Verilog code

(1).png



The screenshot shows a Verilog code editor window titled "a.v" with a menu bar (File, Edit, Search, View, Document, Project, Build, Tools, Help) and a toolbar. The left sidebar shows a file tree with "a.pcf" and "a.v" selected. The main editor area displays Verilog code for various operations, each preceded by a 4-bit hexadecimal comment. The code is as follows:

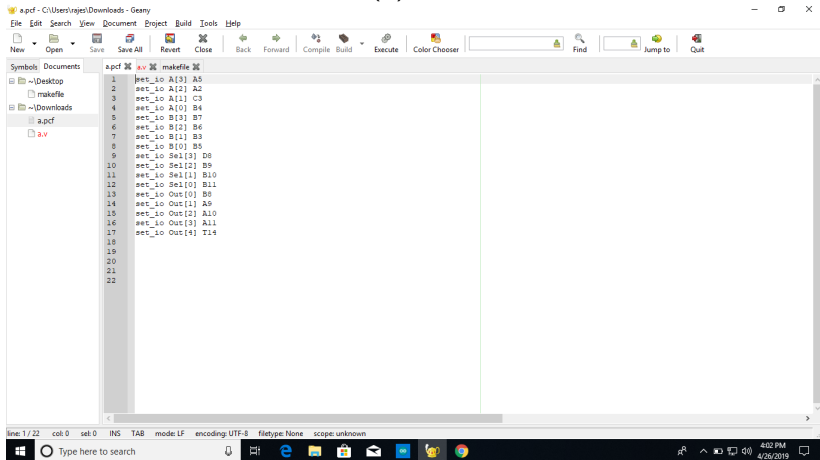
```
14
15 4'b0001: // Subtraction
16     temp = (1'b0,A) -(1'b0,B);
17
18 4'b0010: // Multiplication
19     temp= (1'b0,A) *(1'b0,B);
20
21 4'b0011: // Division
22     temp = (1'b0,A)/(1'b0,B);
23
24 4'b0100: // Logical shift left
25     temp = (1'b0,A)<<1;
26
27 4'b0101: // Logical shift right
28     temp = (1'b0,A)>>1;
29
30 4'b0110: // Rotate left
31     temp = {0,A[2:0],A[3]};
32 4'b0111: // Rotate right
33     temp = {0,A[0],A[3:1]};
34 4'b1000: // Logical and
35     temp = (1'b0,A) & (1'b0,B);
36
37 4'b1001: // Logical or
38     temp = (1'b0,A) |(1'b0,B);
39
40 4'b1010: // Logical xor
41     temp = (1'b0,A) ^(1'b0,B);
42
43 4'b1011: // Logical nor
44     temp = ~(1'b0,A) |(1'b0,B));
45
46 4'b1100: // Logical nand
47     temp = ~((1'b0,A) & (1'b0,B));
48 4'b1101: // Logical xnor
49     temp = ~((1'b0,A) ^ (1'b0,B));
```

The status bar at the bottom indicates "line: 62 / 62", "col: 0", "set: 0", "INS", "TAB", "MOD", "mode: LF", "encoding: UTF-8", "filetype: Verilog", and "scope: unknown". The Windows taskbar at the very bottom shows the search bar, task view, and several application icons, with the system clock displaying "3:27 PM 4/26/2019".

Figure 1: These are how logics and arithmetic operations are written

PCF file

(2).png



```
a.pcf
1  set_io A[3] A5
2  set_io A[2] A2
3  set_io A[1] C3
4  set_io A[0] B4
5  set_io B[3] B7
6  set_io B[2] B6
7  set_io B[1] B3
8  set_io B[0] B5
9  set_io Sel[3] D8
10 set_io Sel[2] B9
11 set_io Sel[1] B10
12 set_io Sel[0] B11
13 set_io Out[0] B8
14 set_io Out[1] A9
15 set_io Out[2] A10
16 set_io Out[3] A11
17 set_io Out[4] T14
18
19
20
21
22
```

Figure 2: This is the pcf code

Arduino for interfacing

- ▶ We used one arduino for giving input to the icoboard (i.e inputs are two numbers followed by selecting operation) via serial monitor
- ▶ Other arduino is used for taking output from the icoboard and producing the output on the LCD display
- ▶ We take inputs in decimal and show output in lcd as also decimal
- ▶ But all the operations in the ICOWBOARD are handled in binary

(3).png

