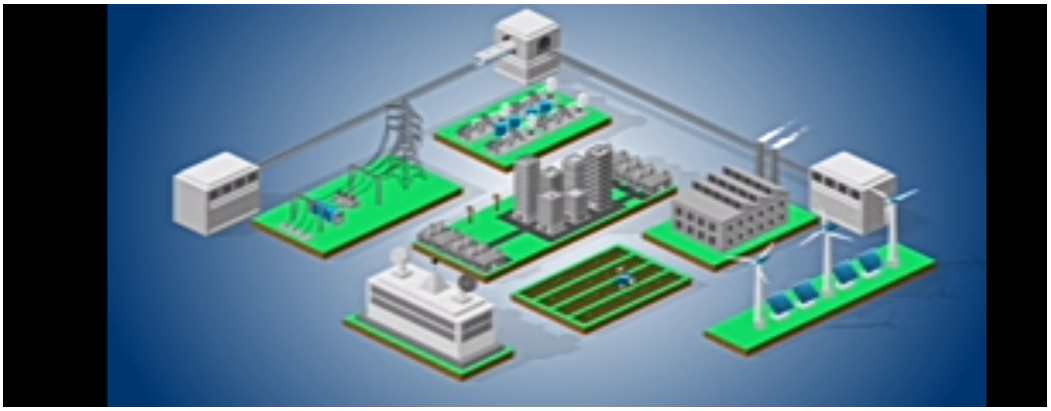
DAY 12 REPORT

Date:	01/06/20	Name:	ANKITHA C C
Course:	DIGITAL DESIGNING USING HDL	USN:	4AL16EC004
Topic:	ABOUT FPGA AND ASIC	Semester & Section:	8TH & A
Github Repository:	ankitha-course		

FORENOON SESSION DETAILS

Image of session



Report – Report can be typed or hand written for up to two pages.

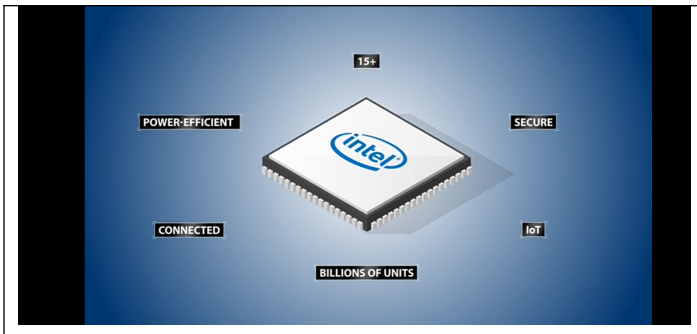
1. Industry application of FPGA

* INTEL

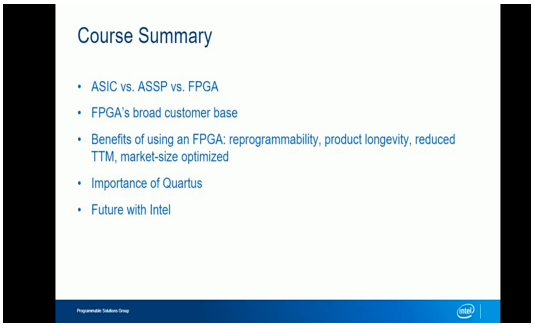
* IOT

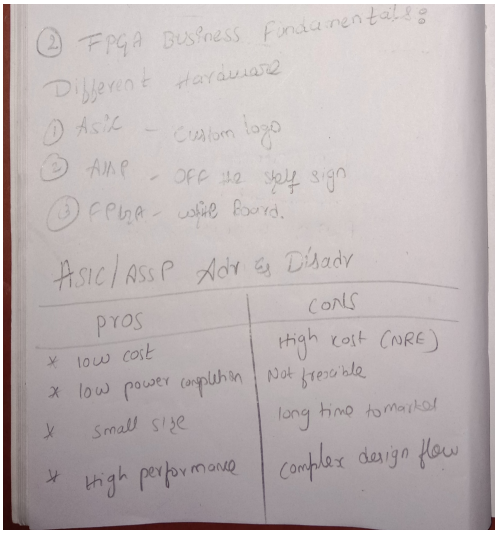
* CONNECTED

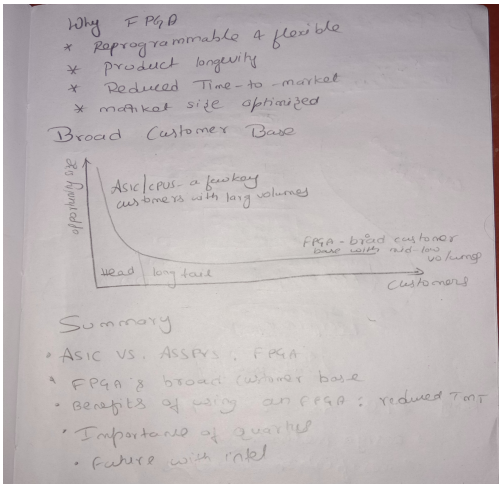
* Secure



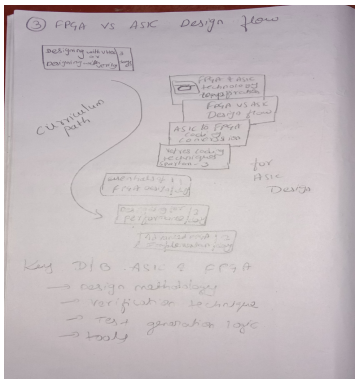
2. FPGA BUISSNESS FUNDAMENTAL

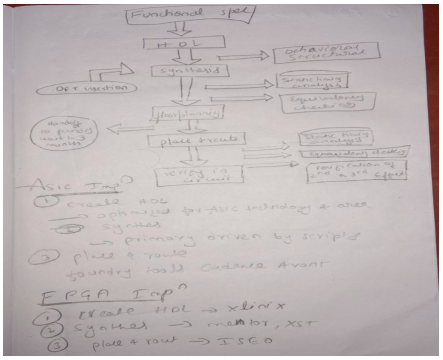






3. FPGA vs ASIC DESIGN FLOW





4. FPGA basics -A looks under the wood

An introductory look inside Field Programmable Gate Arrays. We'll go over:

Strengths & Weaknesses of FPGAs

How FPGAs work

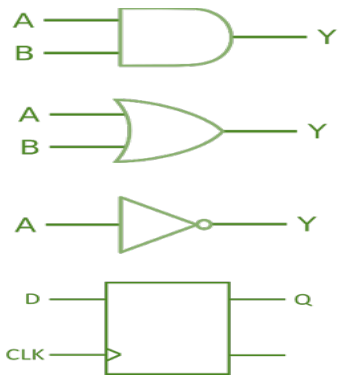
What's inside an FPGA

So you keep hearing about FPGAs being utilized in more and more applications, but aren't sure whether it makes sense to switch to a new technology. Or maybe you're just getting into the embedded world and want to figure out if an FPGA-based system makes sense for you or not.

This paper provides an overview of some of the key elements of FPGAs for engineers interested in utilizing FPGA-based technologies. It's worth noting that this is a complex topic, and as such, some topics are not covered, some are just introductory, and others will evolve over time. This paper should still give you a lot of helpful information if you're new to the world of FPGAs.

How Does an FPGA work?

FPGA-basics-gates-and-flip-flops

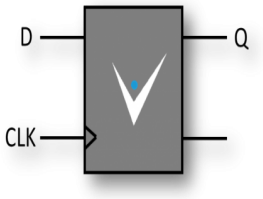


You're designing a digital circuit more than anything else, basically at one layer of abstraction above the logic gate (AND, OR, NOT) level. At the most basic level, you need to think about how you're specifying the layout and equations

at the level of LUTs (Look-Up Tables) and FFs (Flip-Flops).

Y = f(A,B)

A	B	Y
0	0	Y_1
0	1	Y_2
1	0	Y_3
1	1	Y_4



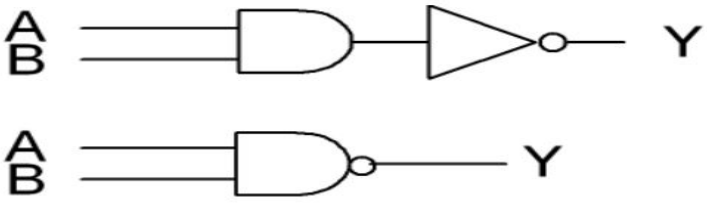
Otherwise you're circuit can get very large and slow very quickly. You've got a very detailed level of control at your fingertips, which is very powerful, but can be overwhelming, so start slow. You'll be determining the # of bits, and exact math / structure of each function.

An FPGA is a synchronous device, meaning that logical operations are performed on a clock cycle-by-cycle basis. Flip-flops are the core element to enabling this structure.

TASK 1

VERILOG CODE TO IMPLEMENT NAND GATE USING ALL MODELLING :

1. USING GATE LEVEL MODELLING




```
module NAND_2_gate_level(output Y, input A, B);
   wire Yd;
   and(Yd, A, B);
   not(Y, Yd);
endmodule
```

2. USING DATA FLOW MODELLING

The boolean equation for a NAND gate is Y = (A.B)' or ~(A & B).

```
module NAND_2_data_flow (output Y, input A, B);
   assign Y = ~(A & B);
endmodule
```

3. BEHAVIORAL MODELLING

```
module NAND_2_behavioral (output reg Y, input A, B);
always @ (A or B) begin
   if (A == 1'b1 & B == 1'b1) begin
      Y = 1'b0;
   end
   else
      Y = 1'b1;
end
endmodule
```

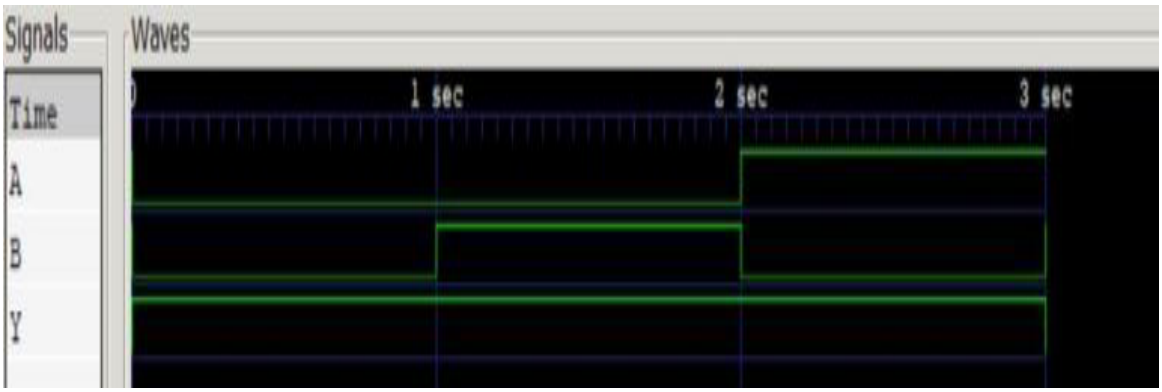
4. RTL schematic of the NAND gate

Testbench of the NAND gate using Verilog

```
`include "NAND_2_behavioral.v"
module NAND_2_behavioral_tb;
reg A, B;
wire Y;
NAND_2_behavioral Indtance0 (Y, A, B);
initial begin
   A = 0; B = 0;
 #1 A = 0; B = 1;
 #1 A = 1; B = 0;
 #1 A = 1; B = 1;
end
initial begin
   $monitor ("%t | A = %d| B = %d| Y = %d", $time, A, B, Y);
```

```
    $dumpfile("dump.vcd");
    $dumpvars();
end
endmodule
```

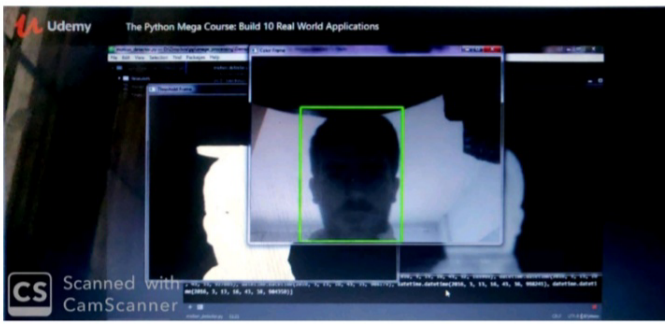
Simulation Waveform



Date:	01/06/20	Name:	Ankitha c c
Course:	Python	USN:	4al16ec004
Topic:		Semester & Section:	8th A

AFTERNOON SESSION DETAILS

Image of session



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WebCam Motion Detector in Python

This python program will allow you to detect motion and also store the time interval of the motion.

Requirement:

Python3

OpenCV(libraries)

Pandas(libraries)

Main Logic : Videos can be treated as stack of pictures called frames. Here I am comparing different frames(pictures) to the first frame which should be static(No movements initially). We compare two images by comparing the intensity value of each pixels. In python we can do it easily as you can see in following code:

filter_none

edit

play_arrow

brightness_4

```
# Python program to implement
# Webcam Motion Detector

# importing OpenCV, time and Pandas library
import cv2, time, pandas
# importing datetime class from datetime library
from datetime import datetime

# Assigning our static_back to None
static_back = None

# List when any moving object appear
motion_list = [ None, None ]

# Time of movement
time = []

# Initializing DataFrame, one column is start
# time and other column is end time
df = pandas.DataFrame(columns = ["Start", "End"])

# Capturing video
video = cv2.VideoCapture(0)

# Infinite while loop to treat stack of image as video
while True:
```

```
# Reading frame(image) from video
check, frame = video.read()

# Initializing motion = 0(no motion)
motion = 0

# Converting color image to gray_scale image
gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)

# Converting gray scale image to GaussianBlur
# so that change can be find easily
gray = cv2.GaussianBlur(gray, (21, 21), 0)

# In first iteration we assign the value
# of static_back to our first frame
if static_back is None:
    static_back = gray
    continue

# Difference between static background
# and current frame(which is GaussianBlur)
diff_frame = cv2.absdiff(static_back, gray)

# If change in between static background and
# current frame is greater than 30 it will show white color(255)
thresh_frame = cv2.threshold(diff_frame, 30, 255, cv2.THRESH_BINARY)[1]
thresh_frame = cv2.dilate(thresh_frame, None, iterations = 2)

# Finding contour of moving object
cnts,_ = cv2.findContours(thresh_frame.copy(),
```

```
                cv2.RETR_EXTERNAL, cv2.CHAIN_APPROX_SIMPLE)


for contour in cnts:
    if cv2.contourArea(contour) < 10000:
        continue
    motion = 1


    (x, y, w, h) = cv2.boundingRect(contour)
    # making green rectangle arround the moving object
    cv2.rectangle(frame, (x, y), (x + w, y + h), (0, 255, 0), 3)


# Appending status of motion
motion_list.append(motion)


motion_list = motion_list[-2:]


# Appending Start time of motion
if motion_list[-1] == 1 and motion_list[-2] == 0:
    time.append(datetime.now())


# Appending End time of motion
if motion_list[-1] == 0 and motion_list[-2] == 1:
    time.append(datetime.now())


# Displaying image in gray_scale
cv2.imshow("Gray Frame", gray)


# Displaying the difference in currentframe to
# the staticframe(very first_frame)
cv2.imshow("Difference Frame", diff_frame)
```

```
    # Displaying the black and white image in which if
    # intensity difference greater than 30 it will appear white
    cv2.imshow("Threshold Frame", thresh_frame)

    # Displaying color frame with contour of motion of object
    cv2.imshow("Color Frame", frame)

    key = cv2.waitKey(1)
    # if q entered whole process will stop
    if key == ord('q'):
        # if something is movingthen it append the end time of movement
        if motion == 1:
            time.append(datetime.now())
        break

# Appending time of motion in DataFrame
for i in range(0, len(time), 2):
    df = df.append({"Start":time[i], "End":time[i + 1]}, ignore_index = True)

# Creating a CSV file in which time of movements will be saved
df.to_csv("Time_of_movements.csv")

video.release()

# Destroying all the windows
cv2.destroyAllWindows()
```

Analysis of all windows

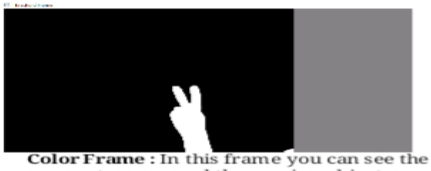
After running the code there 4 new window will appear on screen. Let's analyse it one by one:

Gray Frame : In Gray frame the image is a bit blur and in grayscale we did so because, In gray pictures there is only one intensity value

whereas in RGB(Red, Green and Blue) image thre are three intensity values. So it would be easy to calculate the intensity difference in grayscale.

2. **Difference Frame :** Difference frame shows the difference of intensities of first frame to the current frame.

3. **Threshold Frame :** If the intensity difference for a particular pixel is more than 30(in my case) then that pixel will be white and if the difference is less than 30 that pixel will be black



4. **Color Frame :** In this frame you can see the color images in color frame along with green contour around the moving objects

Time Record of movements

The Time_of_movements file will be stored in the folder where your code file is stored. This file will be in csv extension. In this file the start time of motion and the end time of motion will be recorded. As you can see in picture: