ECE 383 FINAL PROJECT

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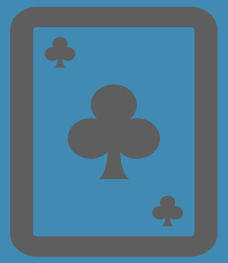
I BUILT AN EMBEDDED SYSTEM WHICH ENGAGES MINDS AND CRITICAL THINKING THROUGH A GAME OF SINGLE PLAYER BLACKJACK.

PROBLEM STATEMENT/ MOTIVATION

Project Requirement

"The final project in this class will be the design and implementation of an engineering prototype to address some need"



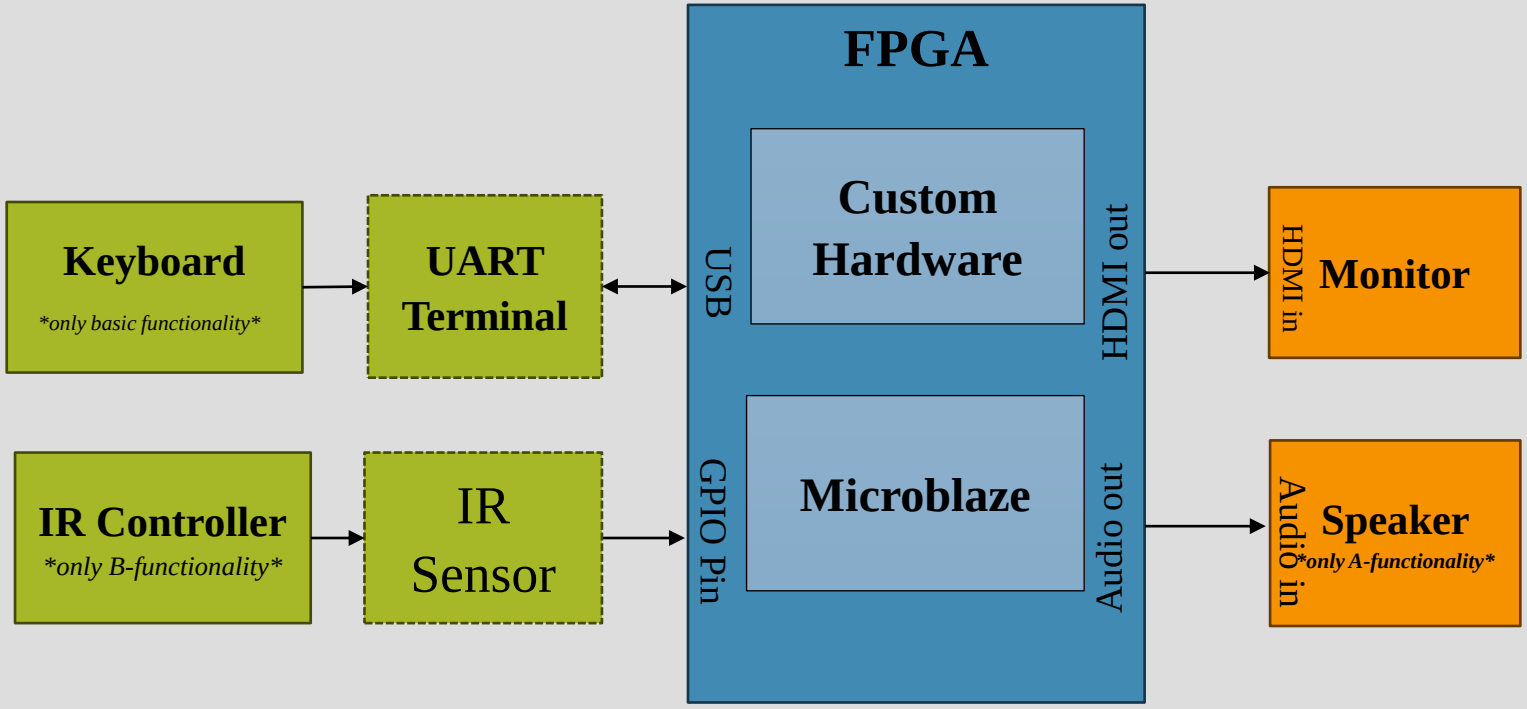
A game of single player Blackjack.

Controlled by an IR controller.

NEED AND TECHNICAL OBJECTIVE

- Provide a platform for cadets to practice strategic thinking, safe-betting, and expand intelligence (counting cards).
- Encompass all material learnt in ECE 383 and apply it to a single project showcasing ability to solve problems through the engineering process.
- Develop as a young engineer.

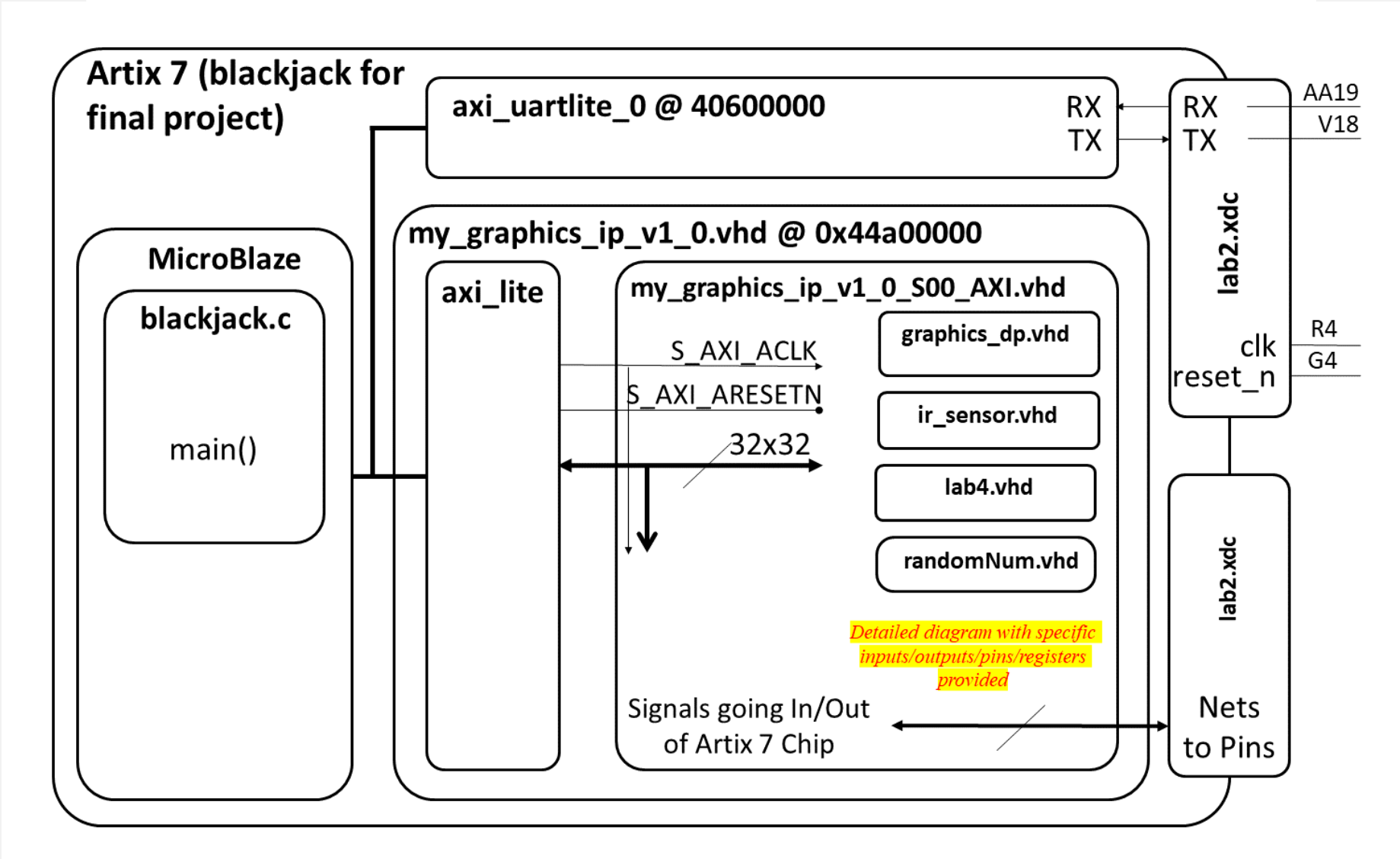
HIGH LEVEL ARCHITECTURE



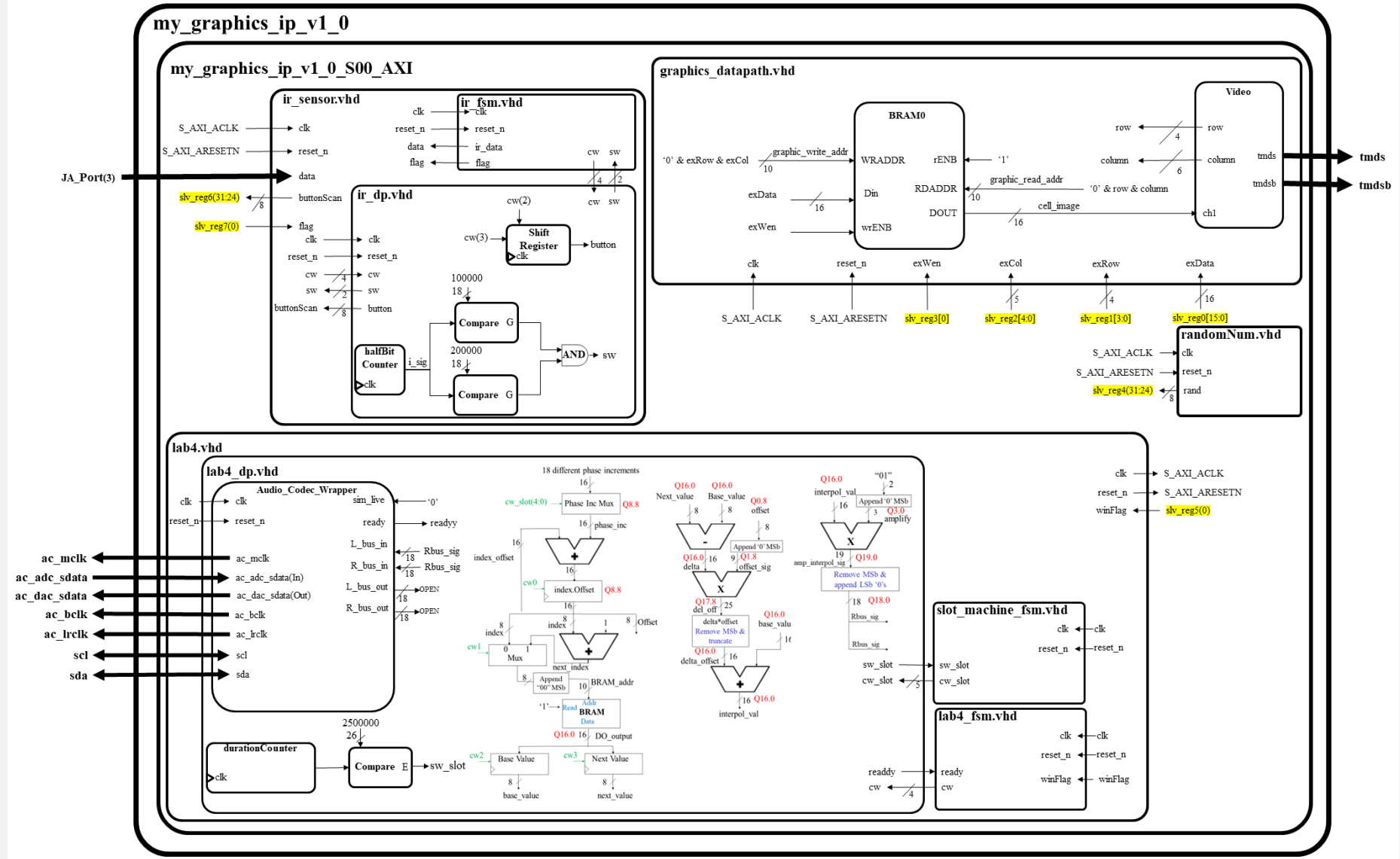
- input device
- Nexys Video FPGA board
- output device

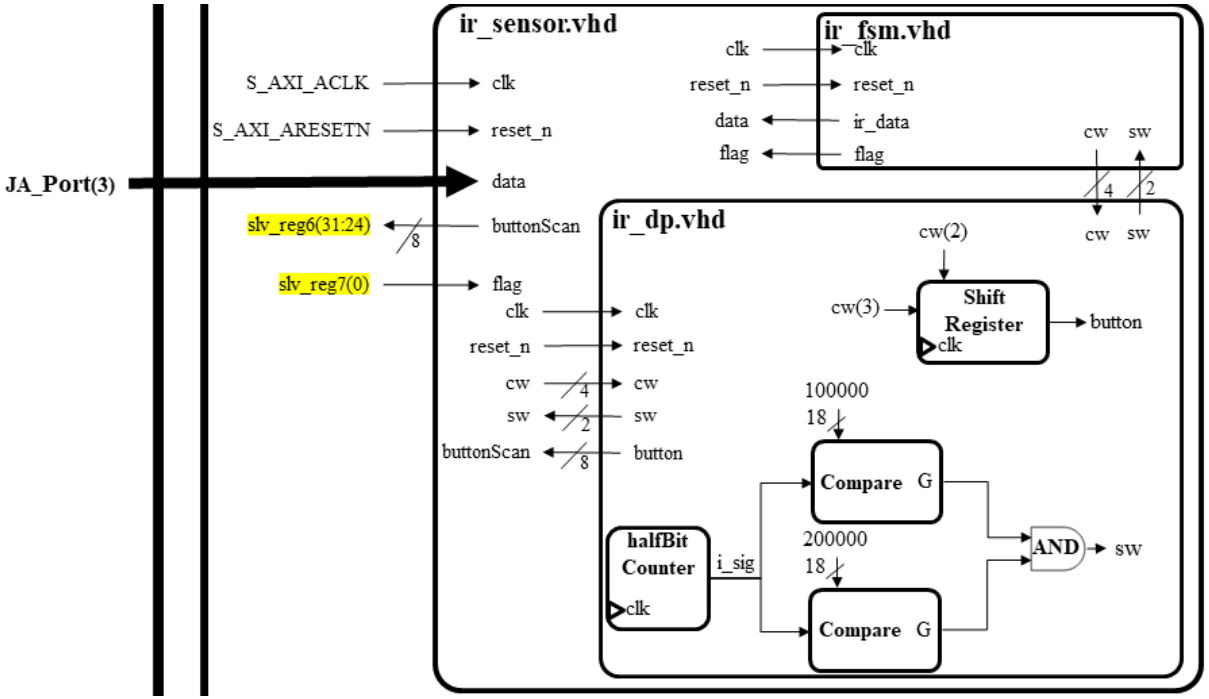
Outside Artix 7 (lab2.xdc)		
Signal	Type	Package Pin
clk	clock	R4
reset	button	G4
ac_mclk	Audio Codec	U6
ac_adc_sdata	Audio Codec	T4
ac_dac_sdata	Audio Codec	W6
ac_bclk	Audio Codec	T5
ac_lrclk	Audio Codec	U5
sda	QSPI	V5
scl	QSPI	W5
tmds[3:0]	HDMI out	T1 AB3 AA1 W1
tmdsb[3:0]	HDMI out	U1 AB2 AB1 Y1
data	Pmod header JA	AB18

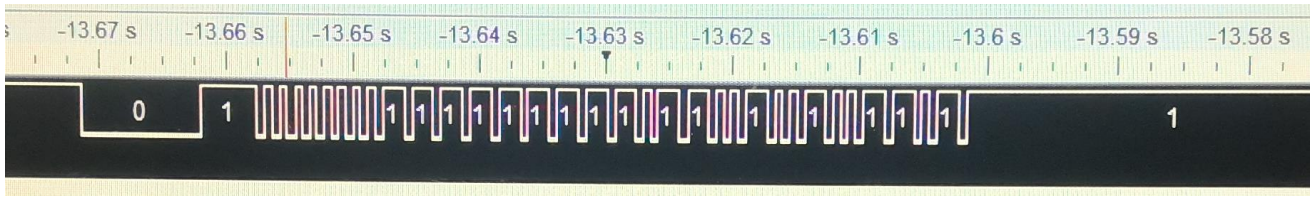
DETAILED DESIGN

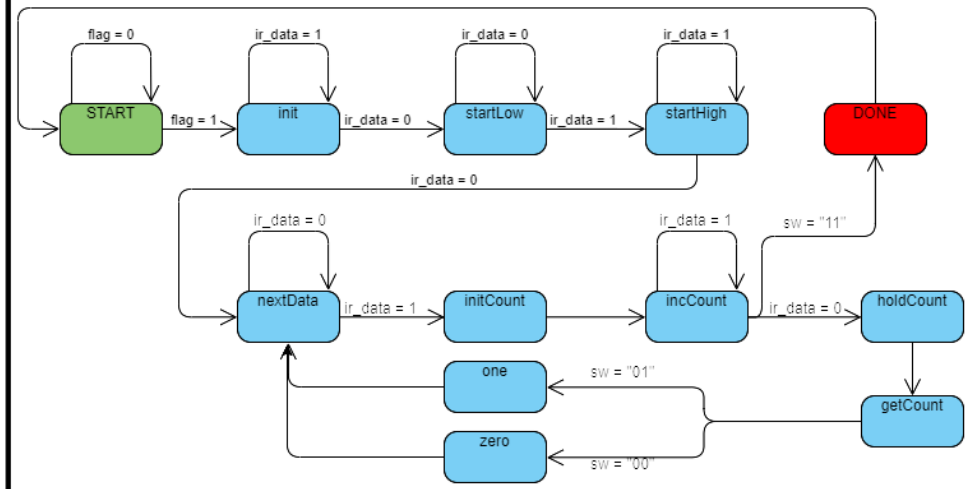


DETAILED DESIGN



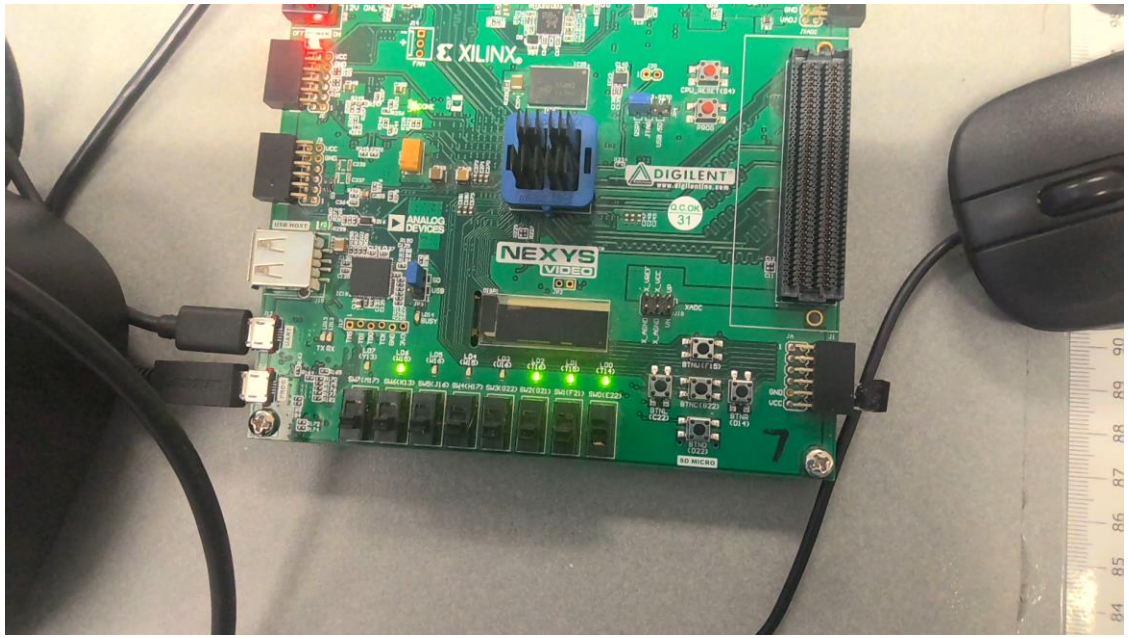


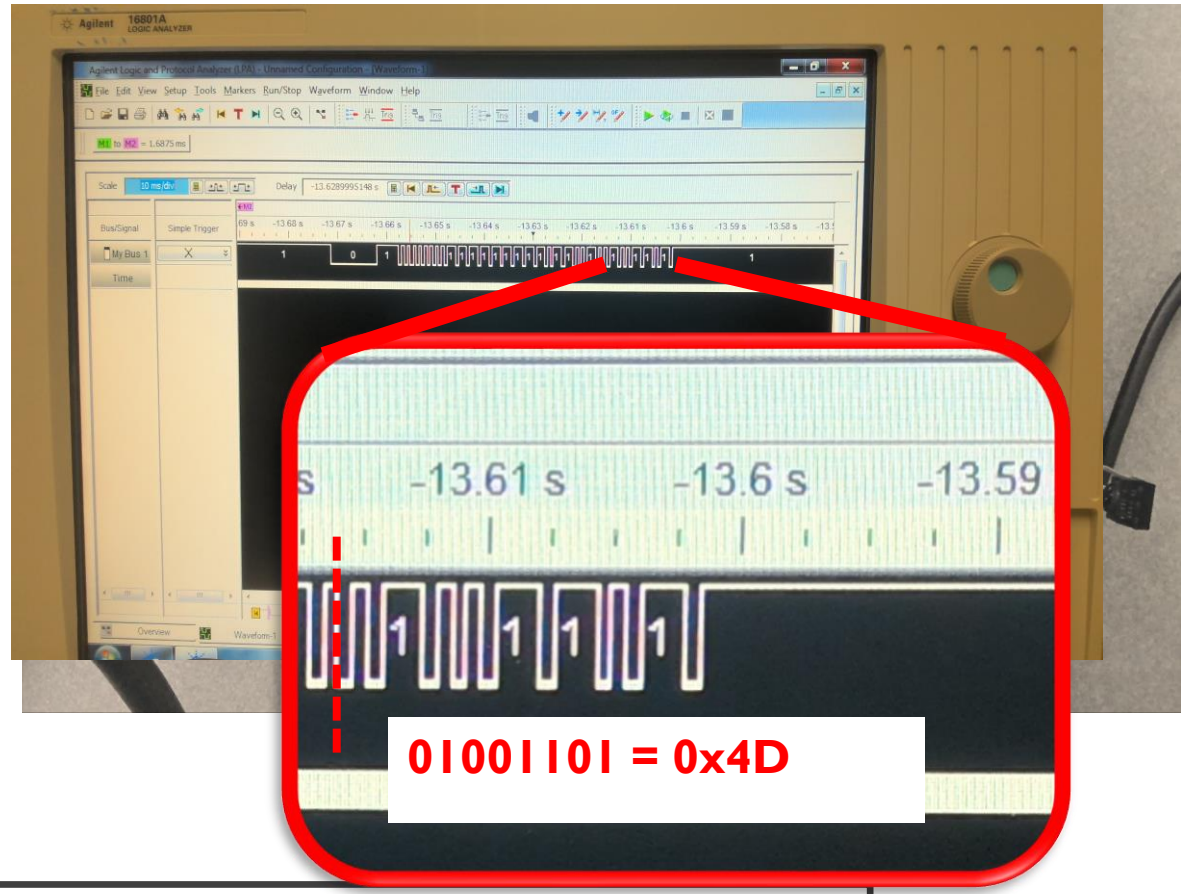




STATE	cw3	cw2	cw1	cw0
start	0	0	1	0
init	0	0	1	0
startLow	0	0	1	0
startHigh	0	0	1	0
nextData	0	0	1	0
initCount	0	0	0	0
incCount	0	0	0	1
holdCount	0	0	1	0
getCount	0	0	1	0
one	1	1	0	0
zero	1	0	0	0
DONE	0	0	1	0

IR DESIGN





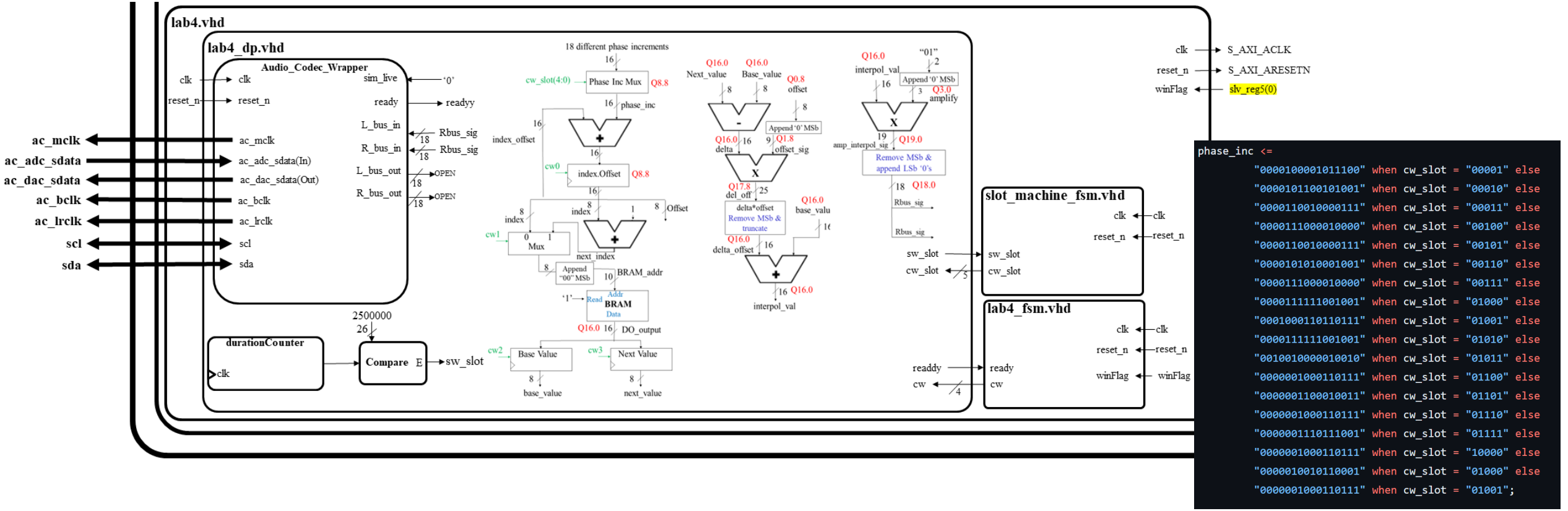
PWR	00FFB24D
Two	00FFB847
Three	00FFF807

IR TESTING

Made a separate Vivado project to test

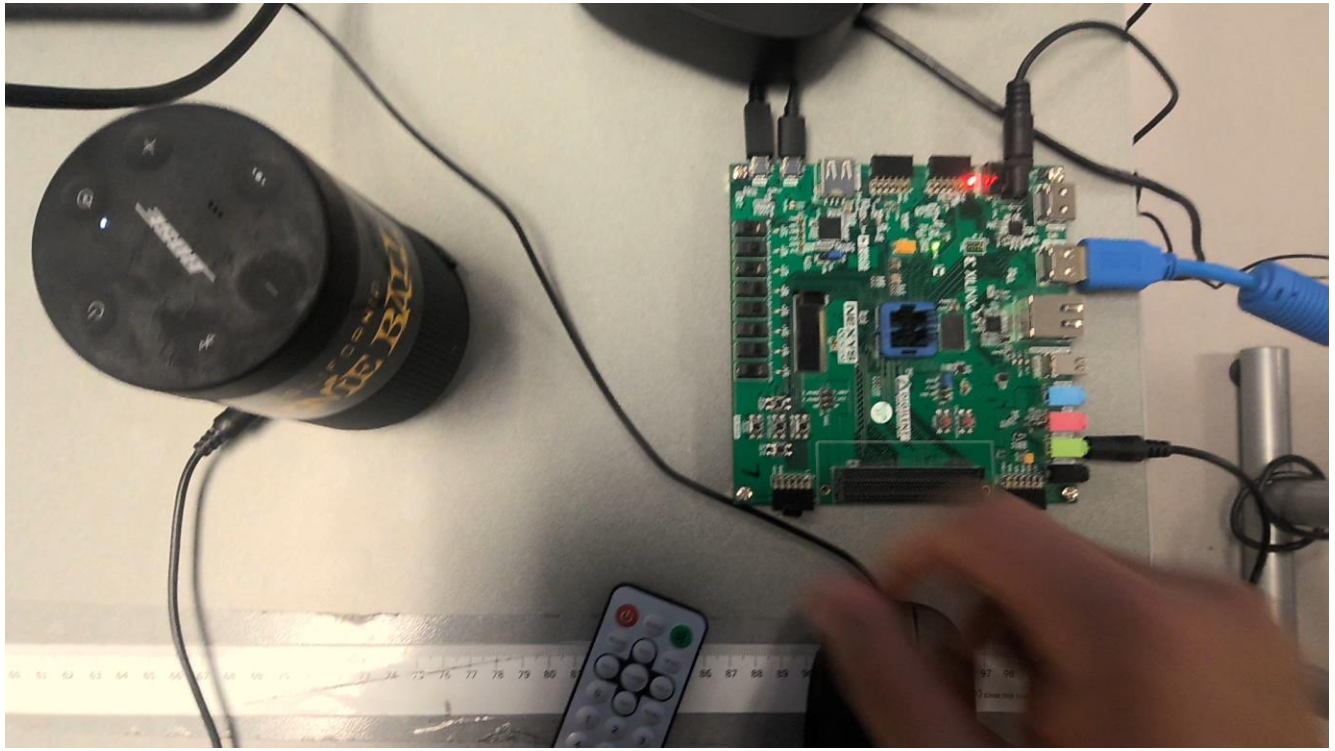
Hooked up buttonScan to LEDs

Hooked up flag to a switch




```
phase_inc <=
        "0000100001011100" when cw_slot = "00001" else
        "0000101100101001" when cw_slot = "00010" else
        "0000110010000111" when cw_slot = "00011" else
        "0000111000010000" when cw_slot = "00100" else
        "0000110010000111" when cw_slot = "00101" else
        "0000101010001001" when cw_slot = "00110" else
        "0000111000010000" when cw_slot = "00111" else
        "0000111111001001" when cw_slot = "01000" else
        "0001000110110111" when cw_slot = "01001" else
        "0000111111001001" when cw_slot = "01010" else
        "0010010000010010" when cw_slot = "01011" else
        "0000001000110111" when cw_slot = "01100" else
        "0000001100010011" when cw_slot = "01101" else
        "0000001000110111" when cw_slot = "01110" else
        "0000001110111001" when cw_slot = "01111" else
        "0000001000110111" when cw_slot = "10000" else
        "0000010010110001" when cw_slot = "01000" else
        "0000001000110111" when cw_slot = "01001";
```

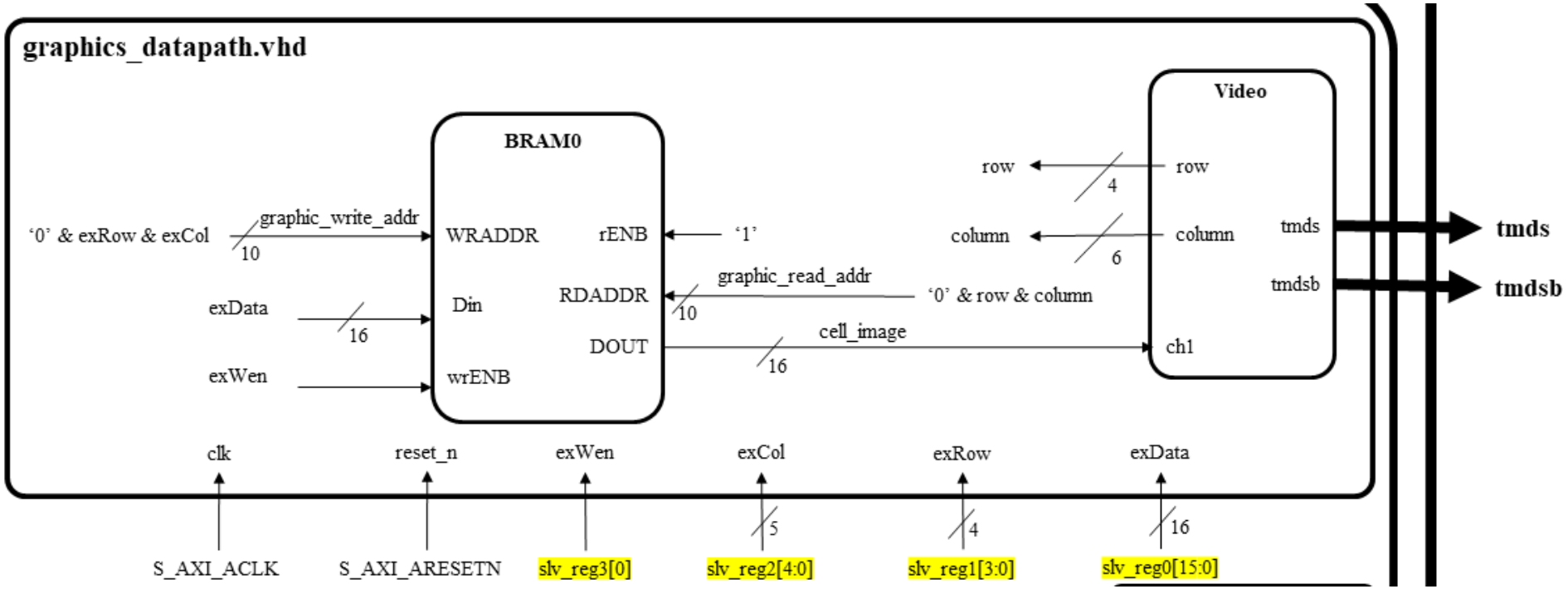
SOUND DESIGN



SOUND TESTING

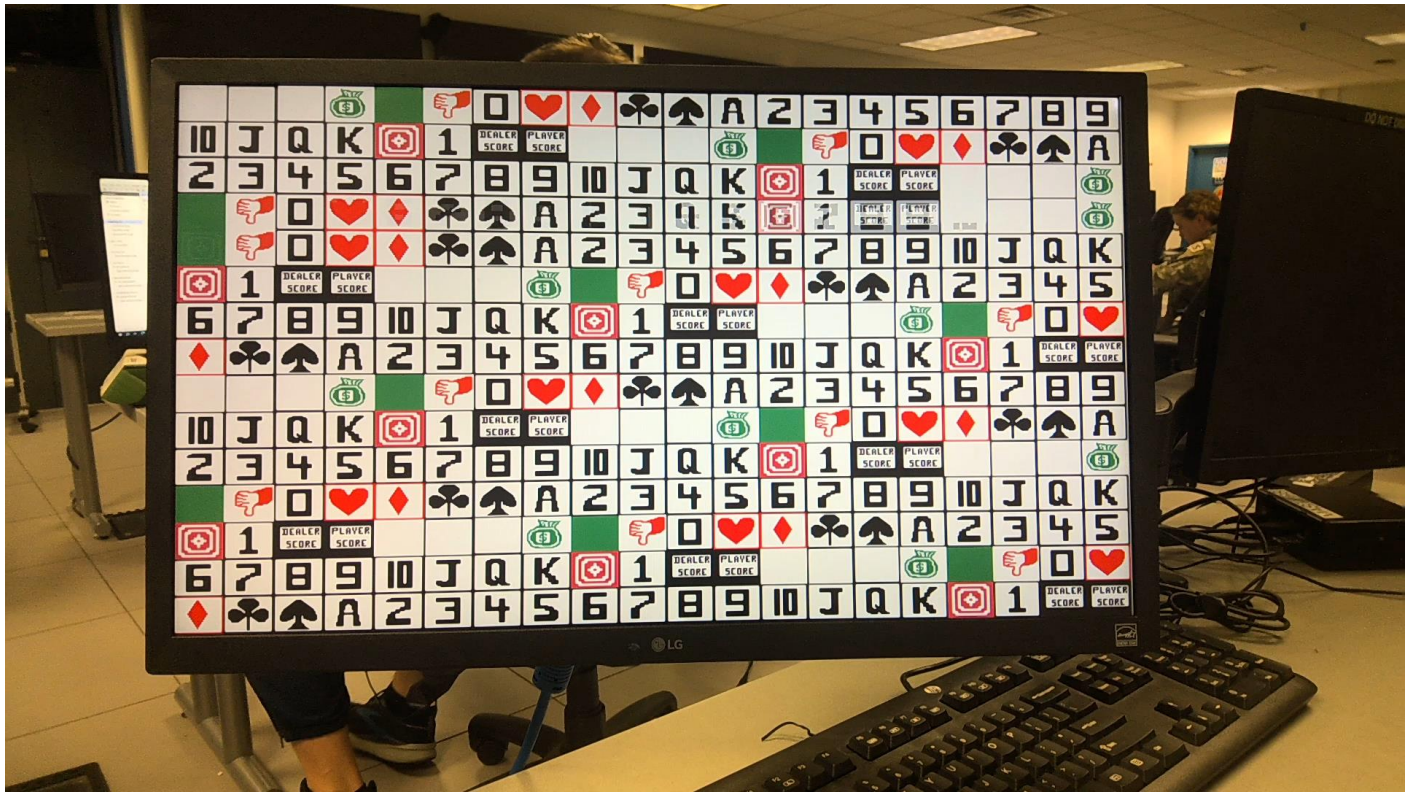
Made a separate Vivado project to test

Hooked up flag to a switch



Grid Description	Index	Binary Value	BRAM Hex Value
heart	1	00001	0001
diamonds	2	00010	0002
clubs	3	00011	0003
spades	4	00100	0004
ace	5	00101	0005
two	6	00110	0006
three	7	00111	0007
four	8	01000	0008
five	9	01001	0009
six	10	01010	000A
seven	11	01011	000B
eight	12	01100	000C
nine	13	01101	000D
ten	14	01110	000E
queen	15	01111	000F
jack	16	10000	0010
king	17	10001	0011
back	18	10010	0012
one	19	10011	0013
dealerBox	20	10100	0014
playerBox	21	10101	0015
topBorder	23	10111	0017
bottomBorder	24	11000	0018
winBox	25	11001	0019
greenBox	26	11010	001A
loseBox	27	11011	001B
zero	28	11100	001C

GRAPHICS DESIGN

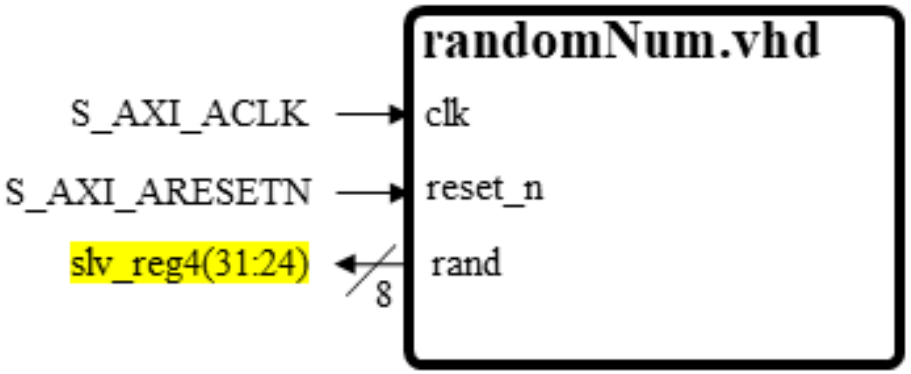


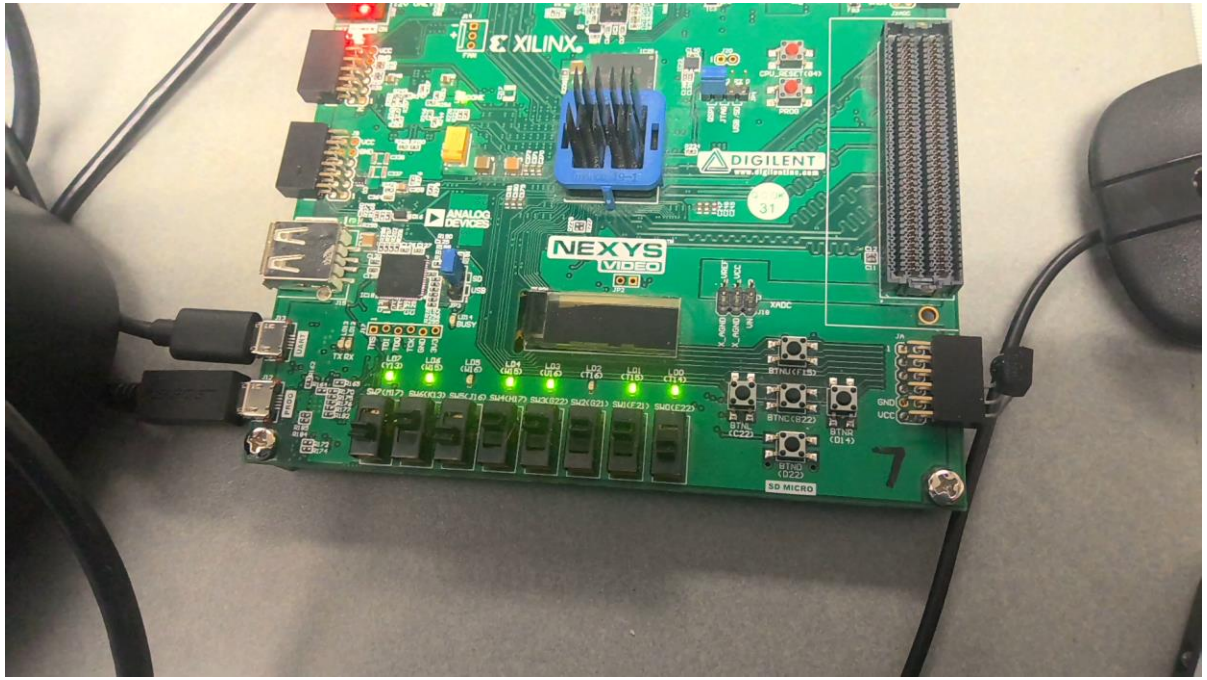
GRAPHICS TESTING

Made a separate Vivado project to test

Edited the FSM given to us in grid memory hints

Saved a lot of time





RANDOM NUMBER GENERATOR DESIGN AND TESTING

Made a separate Vivado project to test

Hooked up 8-bit random number to LEDs to see if they change

VIDEO DEMO


EXTREME UNRATED REMASTERED
JUNHYUNG PARK
DAN AGALAKOTUWA
HAROLD & KUMAR
PLAY
PICKLEBALL