



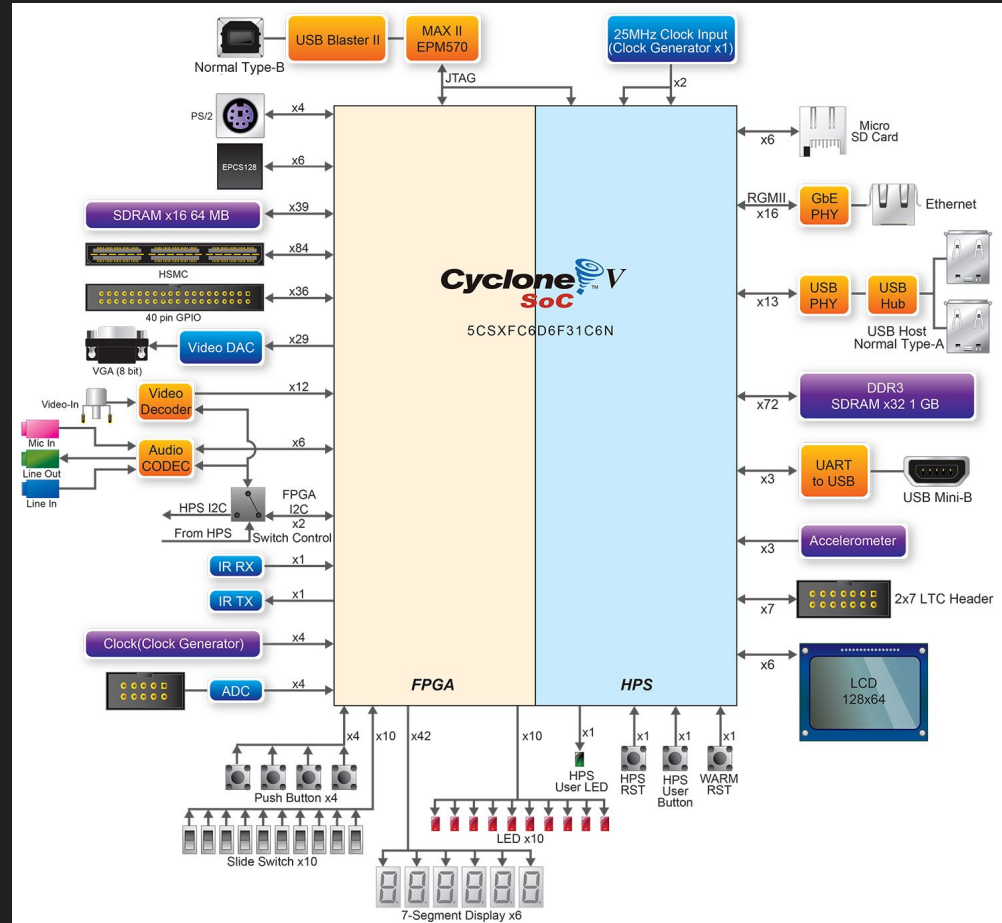
# Piano Project

Using the HPS and the FPGA of the  
DE1-SoC Board

Gabriela Olivares  
Jacqueline Hirsch

# Design

- HPS and FPGA connected through the lightweight bus of the De1-SoC board and C code to create the piano.
- Each number on the computer keyboard is assigned a sound frequency.
- The piano takes inputs from the user and plays them, creating a song.



# Procedure

- Each number input from the user correspond to different sound frequencies which are the different notes for our piano.
- Address map arm library connects both sides of the De1-SoC board through the lightweight bus, allowing the frequencies to play through the speaker.
- We used a keyboard for the keyboard!

C	D	E	F	G	A	B	
0	1	2	3	4	5	6	

Welcome! Create your own song or pick one from the menu by entering the notes below:  
\*(Use numbers from 0-6, use 9 for blank)\*

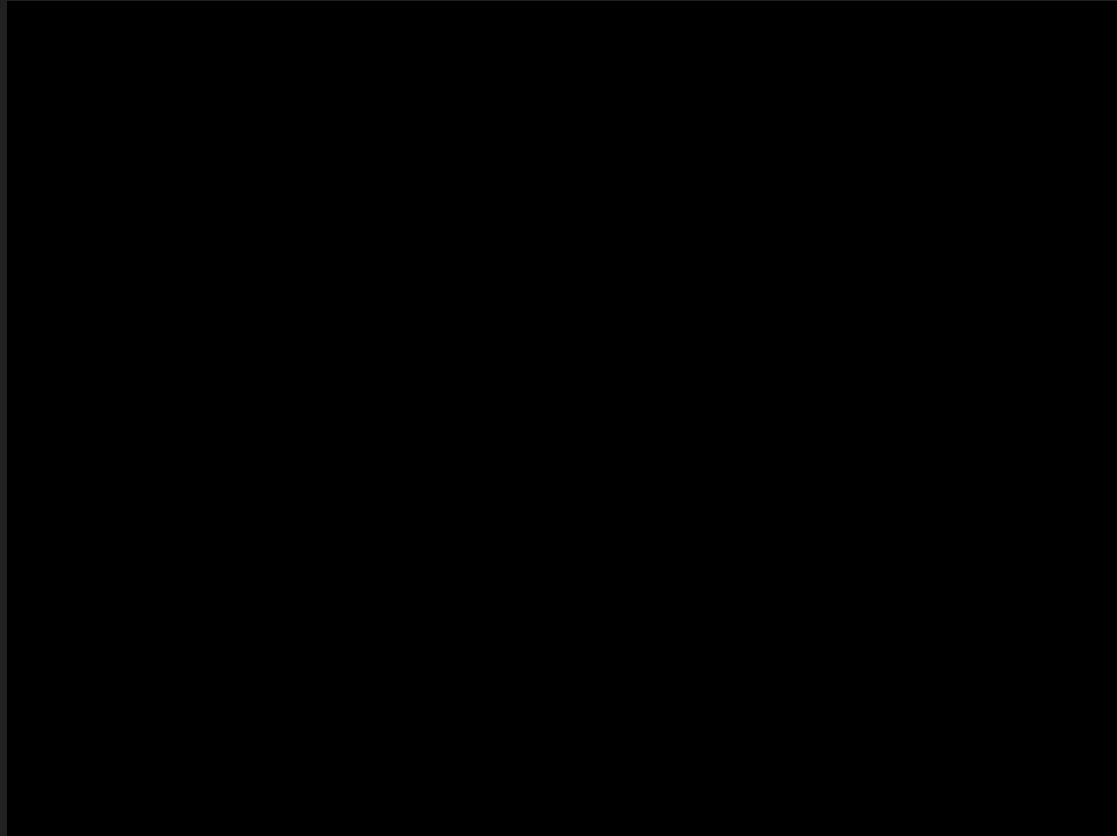
Happy Birthday to You! :           0,9,0,1,0,3,2,9,0,9,0,1,0,4,3,9,0,9,0,5,4,2,1,0.  
Hot Cross Buns :                   2,1,0,2,1,0,9,0,9,0,9,0,9,0,1,9,1,9,1,9,1,2,1,0.  
We Wish You a Merry Christmas : 0,3,9,3,4,3,2,1,9,1,9,1,4,9,4,5,4,3,2,9,1,9,1,9.  
Rudolph the Red Nose Reindeer : 4,5,4,2,6,5,4,9,4,5,4,5,4,7,6,9,3,4,3,1,6,5,4,9.

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Input 24 notes :

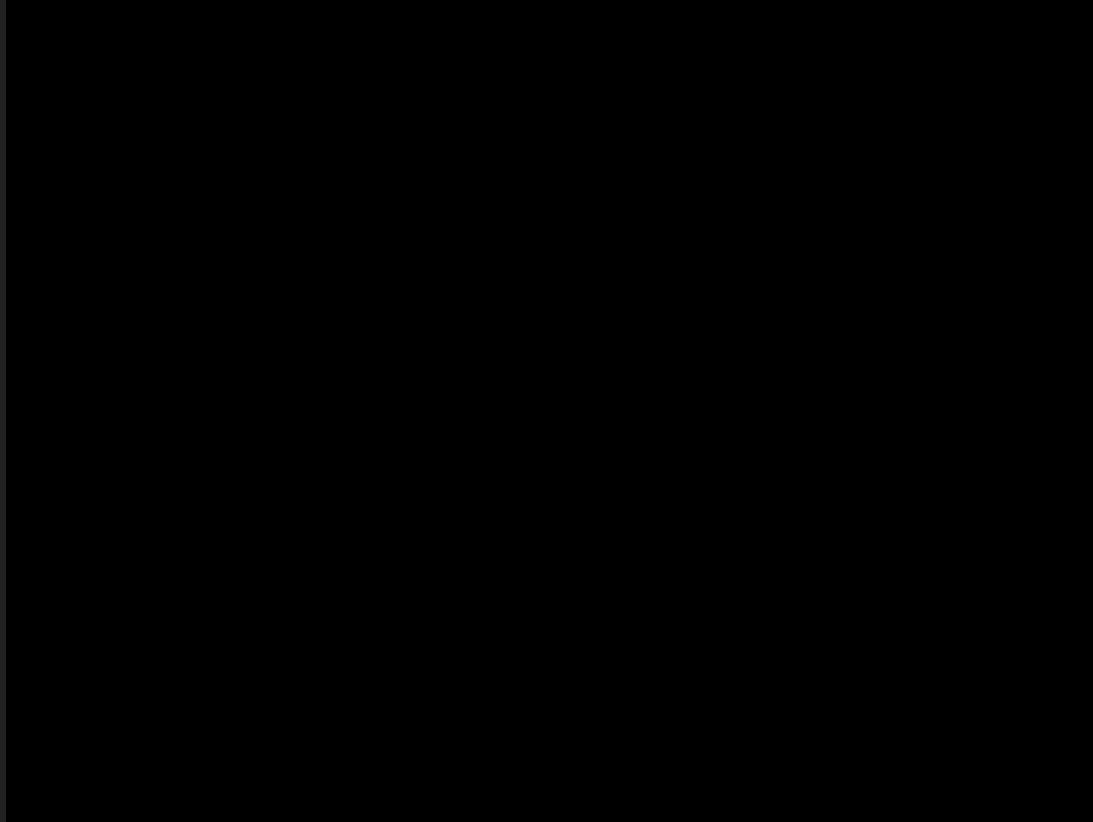
Note - 1 : 1  
Note - 2 : 4  
Note - 3 : 6  
Note - 4 : 2  
Note - 5 : 3  
Note - 6 : 5  
Note - 7 : 1  
Note - 8 : 2  
Note - 9 : 4  
Note - 10 : 3  
Note - 11 : 4  
Note - 12 : 5  
Note - 13 : 6  
Note - 14 : 5  
Note - 15 : 4  
Note - 16 : 3  
Note - 17 : 2  
Note - 18 : 1  
Note - 19 : 0  
Note - 20 : 1  
Note - 21 : 2  
Note - 22 : 4  
Note - 23 : 5  
Note - 24 : 2

Notes in song are: 1 4 6 2 3 5 1 2 4 3 4 5 6 5 4 3 2 1 0 1 2 4 5 2 0

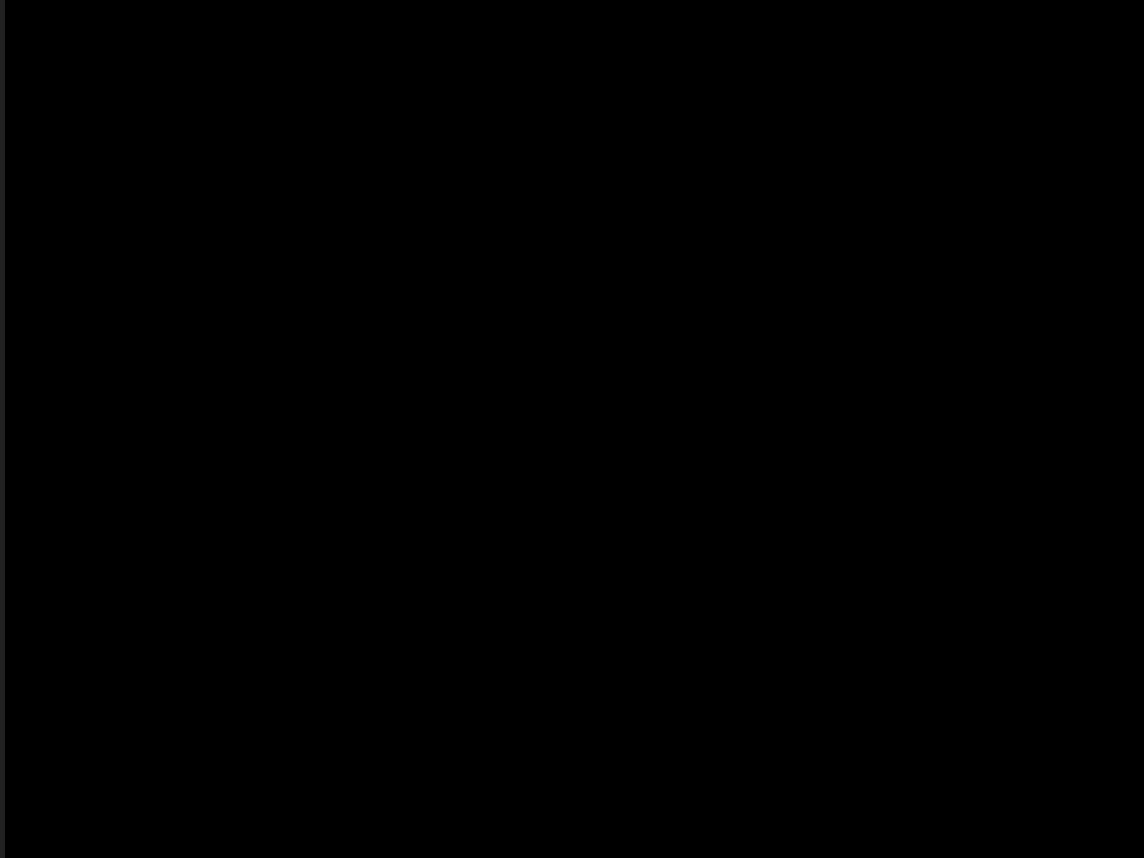
# Outcome - Happy Birthday



# Outcome - Hot Cross Buns



Outcome - We Wish You a Merry Christmas



# Outcome - Rudolph the Red Nosed Reindeer



# Outcome - Make Your Own Tune





# References

Univ Computer Graphics. (n.d.). Retrieved December 9, 2022, from [https://people.ece.cornell.edu/land/courses/ece5760/DE1\\_SOC/HPS\\_peripherals/univ\\_pgm\\_computer.index.html](https://people.ece.cornell.edu/land/courses/ece5760/DE1_SOC/HPS_peripherals/univ_pgm_computer.index.html)

DE1-SoC User Manual. Retrieved December 9, 2022, from [chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://www.ee.ic.ac.uk/pcheung/teaching/ee2\\_digital/de1-soc\\_user\\_manual.pdf](chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://www.ee.ic.ac.uk/pcheung/teaching/ee2_digital/de1-soc_user_manual.pdf)