ECE 2220 – Digital Logic

BYTE BROS

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Acknowledgements:

Introduction:

The idea of this project was create a basic **DJ LaunchPad** that would allow a user to produce a simple beat corresponding to four keypads. Each key pad produces a unique sound that allows the user to use their imagination to create a beat. We also added a seven-segmented display and **LED blinker** to add some visual stimulation, in order to reproduce a more accurate DJ experience.

LaunchPad Report

Member Contribution:

-	Vlad	Team Coordinator
-	Garrett	Visual Effects Coordinator
-	Chuka	Hardware Coordinator(#Pin Planner)
-	Mohamad	Software Coordinator

Abstract:

This report contains and explanation of our final project, "LaunchPad", for the ECE 2220 class. In this report we will discuss the various project features, including the source code and design.

This report will contain: Introduction, Summary of Features, Summary of Inputs and Outputs, Describtion of Modulees/Processing, Future Improvements,Refrences.

Summary of features which were used:

The "**Launchpad**" project utilized:

- Ribbon cable (Wire transferring signal)
- Auxiliary connector (Connector between speaker and Breadbord)
- Breadboard (Connector between DE2-115 and the outputs)
- Wires(Connecting the LED's)
- LEDs (Output)
- Speakers (Output)
- 4 Push buttons (Input)
- One switch (Input)
- The USB light (Output)
- 7-Segment Display (Output)

Summary of inputs and outputs:

We have the **inputs** as follows:

-50 Mhz clock signal from ALTERA AE2-115 device in order to give the initial frequency for sound.

- FOUR BUTTONS:
- SW0 - Calling the modulee which was responsible for generating Ambulance Sound.
- SW1 - Making the Police Sound;
- SW2 - Was generating 8 notes in the order specified in the code.
- SW3 - Making the constant frequency to play.

-The Switch (SW17) was used in if statement to display the 7 Segment text when 1. And when 0 turn it off.

We have the **outputs** as follows:

-Used 2 red diodes led's , 2 green diodes led's , 2 yellow diods led's. - In order to making them blinking for the visual effect.

-Used USB light to have constant light.

-Speakers as output for our sound. (To play music)

-7 Segment was used to display the "ECE 2200"

Description of the modules:

Our project code was divided into five internal modules, each module performed a specific function, which resulted in the overall performance of our LaunchPad.

First modules: Our first module served simply to transfer the signal (from the input) utilized to transfer the signal to the Music Module (2nd) and call the other module responsible for visual appearance of our "LaunchPad". Our input were the push buttons, these signals were to be transferred over by the first module of the code.

Second module: Our second module involved producing certain sounds that we thought would fit in with the project goals, ie producing entertaining sounds. So we decided to incorporate police and ambulance sirens.

Third module: The third module involved generating the actual frequencies/notes that we would be utilizing to produce musical sounds/beats etc. This, coupled alongside the siren effects in the second module, make the sounds production a lot more interesting.

Fourth module: We also utilized a seven segment display. In our case, we used the Seven segment display to output the class name appropriately as we play the notes. So that people can see which course they should take in order to accomplish such results.

Fifth: Our fifth module utilizes LEDS. We decided to use LEDs since most digital music devices utilize light-effects (as in DJ boards or any other digital device), to portray a more dynamic music-playing experience.

There also the comments provided inside the project at the file **ProjectLunchPadv2.v.**

After the code is done processing. We obtain outputs of various notes/frequencies, depending on our original input. This allows us to use our "Launchpad" project almost like a musical instrument. This way, this project code/type can be scaled to make much bigger music producing devices, including digital pianos, or for that matter, any type of instrument you might want to hear through a digital device (by modifying the type of frequency/note you hear).
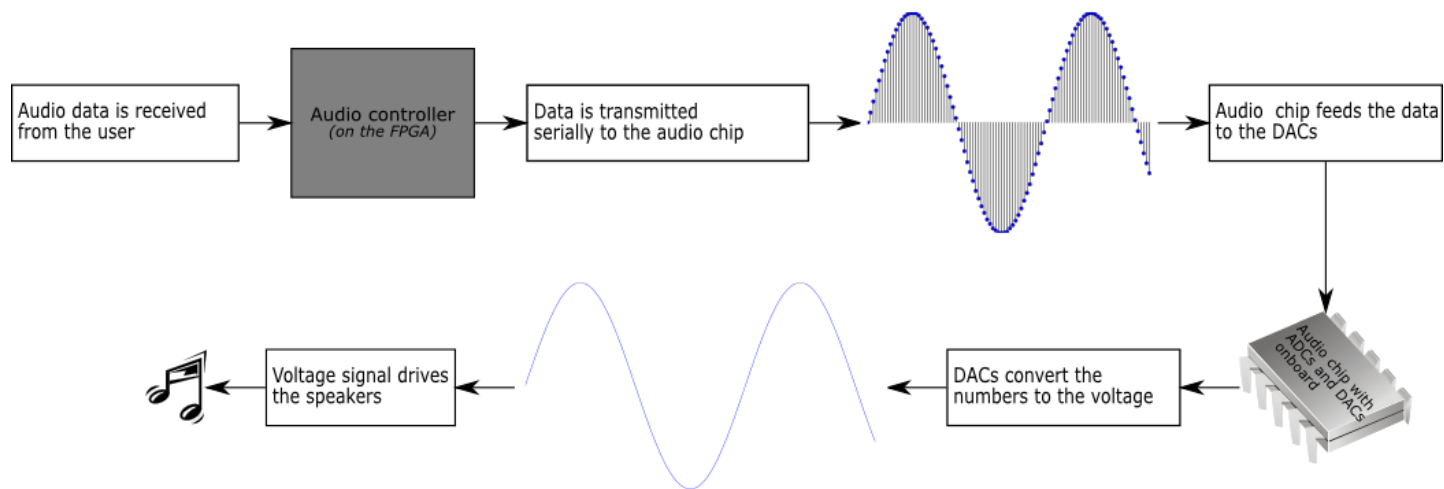
The signal propagating from the clock to the note output.

(Analog to digital audio conversion process)

Future improvements:

This LaunchPad of sorts is one of the simplest sounds generators in the "**DJ World**". Some improvements we would add in the future would include

1. Have LEDs synchronize with push key inputs and frequency transients
2. Add more sounds and keys to add more variation
3. Add different styles of waves (sine, saw, square, etc.)
4. Add wire managements so the wires are not loose
5. Allow for external inputs ie. midi keyboard for a better performance experience with our device
6. Add a" looper" so we don't have to hold keys down the whole time.
7. Add a graphical interface for the sound wave being product.

References

-The information learned thought the course ECE 2200.

- The project report based on sample provided at the web-site of course.

-http://www.fpga4fun.com/MusicBox1.html

- http://www.fpga4fun.com/MusicBox3.html

- http://www.fpga4fun.com/MusicBox2.html

-http://stackoverflow.com/questions/11268772/blinking-led-with-cpld

- http://www.eecg.toronto.edu/~jayar/ece241_08F/AudioVideoCores/audio/audio.html (Picture)