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Final Project Proposal

**Overview**

Our proposal is to design and implement a working piano simulation using the VGA display, PMOD KYPD, and PMOD AMP2. When a button is pressed on the keypad, it corresponds to a certain frequency that will be played on the PMOD AMP2. On the VGA display will be a representation of a small portion of a piano. Upon each keypress, along with playing a sound on the AMP2, the “key” on the VGA will turn blue to represent a key press.

**Modules used**

* Pmod KYPD
* Pmod AMP2
* VGA Display

**Outline of Functionality**

KeyPad Module: Will constantly read whether a key is being pressed or not. When a key is pressed, it will send a signal to the VGA and AMP2 modules. This will need to be debounced so that we are constantly sending high signals when it stays pressed, and sends no low signals when it is let go. We will need to write a Verilog Module for this portion.

AMP2 Module: Should receive input from the KYPD module and plays a specified frequency when it is high. When the key is no longer pressed, stop playing any sound. We use the AMP2 IP core to implement this functionality.

VGA Display Module: Constantly draws a piano representation of one octave only. Receives input from the KYPD module. Each key on the keypad represents a “key” on the VGA (a section of the display). When the key on the keypad is unpressed, the corresponding “key” on VGA should be black or white. When a key is pressed, its corresponding key is turned blue. We will need to write a Verilog Module for this portion.

**Challenges**

One foreseeable challenge is that we may need to modify the AMP2 IP core so that it can read in input from the KYPD since we have chosen to implement the KYPD in Verilog rather than in C.

**Project Extensions**

If time permits, we have the following ideas that we may want to pursue:

1. Extend the encoding from our KYPD module so that we can read multiple key presses at the same time and play chords. Will also need to see if and how we can play two or more frequencies at the same time.
2. Support Bluetooth Pmod so that a second user can play the piano using a second board. Can also support alternative input sources such as a smartphone device.
3. Add game functionality where the user needs to press correct keys at correct times. Would need to add animations so that it looks something like “Guitar Hero”