# PES Final Project Proposal

# Musical Notes Player based on-board MMA8451Q Accelerometer over I2C

*Project Functionality:*

- Overview: Musical Tones Player based on horizontal plane (roll angle) using on-board MMA8451Q Accelerometer over I2C communication.
- User can move FRDM-KL25Z in horizontal angle (roll) from 0 to 180 degrees. (Reference angle: 0 degrees)
- User can access the command processor through UART to display the current roll angle and to run all the tests. Terminate command to come out of the command processor and to dive into the musical player application.
- LED indication based on angle measured.
- Different musical notes that are one second apart will be played indefinitely in different angle ranges when user moves the KL25Z horizontally.
- To stop the musical player, user has to lay down the board flat. And then reset to restart.

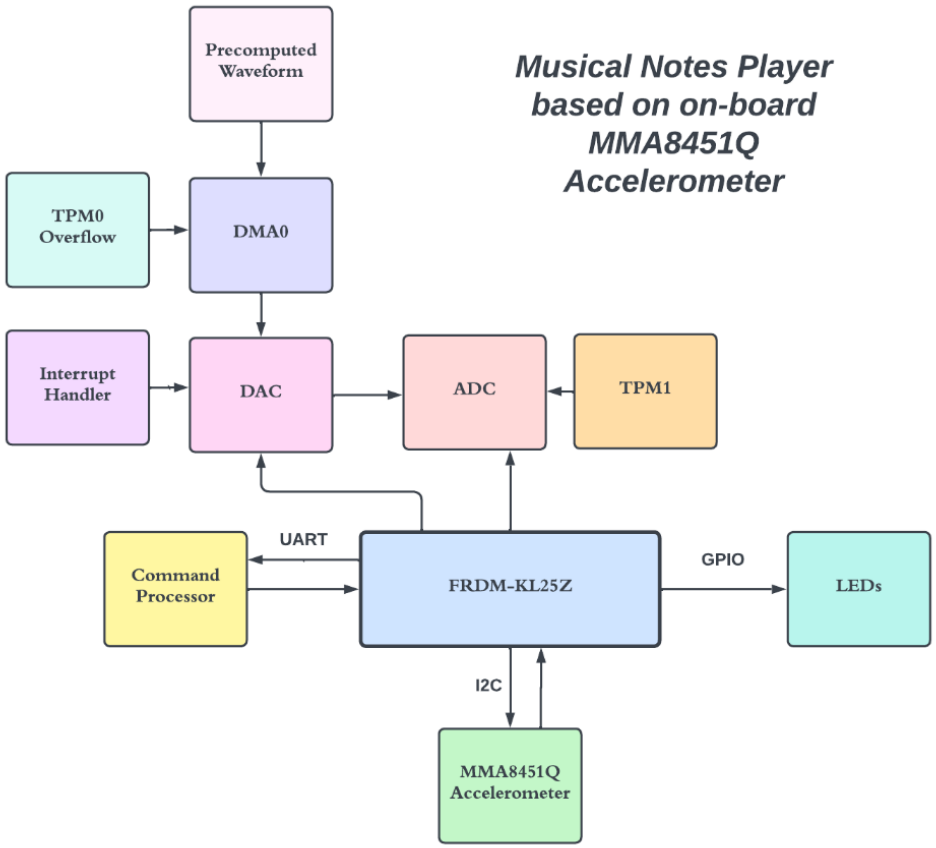
| S.No. | Accelerometer Roll Angle Range | LED | Musical Notes |
|---|---|---|---|
| 1 | 0° - 5° | Green | - |
| 2 | 6° - 45° | White | A4, D5, D6 |
| 3 | 46° - 90° | Yellow | D4, E5, F5 |
| 4 | 91° - 135° | Magenta | E6, F6, G6 |
| 5 | 136° - 180° | Cyan | D4, D5, D6 |

*Technologies:*

- I2C
- Command Processing
- Interrupts
- GPIO lines
- UART
- Timers
- Circular Buffer
- System Clock
- DMA
- ADC
- DAC

For the areas covered in class, deeper knowledge of the concepts will be demonstrated when all the modules are integrated together to get proper functionality. Getting a good amount of accuracy in angle measurement will be a challenging part which will be accomplished by constant testing and modifying the code. Getting the DAC output without tearing at the wrap point when the tone changes should be handled using interrupts.

*Block Diagram:*




*Learning & Sources:*

I anticipate to learn:

- The integration of I2C and on-board MMA8451 accelerometer.
- Playing musical notes based on the accelerometer angle sensed.
- The integration of all modules together to get proper functionality.
- Developing a good mixture of automated and manual test cases.

I plan to use

- KL25Z Reference Manual
- MMA8451Q Library

- Internet
- Dean's Book
- White's Book
- Previous Assignments 6 and 7
- SA's and Professor's guidance

to figure out how to implement the proposed functionality.

*Additional Hardware Requirement:*

My project requires an additional hardware, AT-1224-TWT Buzzer as a means to hear the musical notes out of the DAC's output. This will be connected to J10-11 pin of the FRDM-KL25Z Board. It's pretty straightforward.

*Testing Strategy:*

- Mixture of automated and manual tests will be implemented for happy, error and corner cases.
- Automated tests will be used for testing few of the individual modules.
- Manual tests will be used for testing the overall functioning of the project.
- Oscilloscope can be used to check out the output of DAC.