Lab 08: Music Player (Dec 11, 2018)

Submission deadlines:

Source Code:	18:30, Dec 11, 2018
Report:	23:59, Dec 16, 2018

Objectives

- To be familiar with the audio peripheral.

Action Item

Design a music player that is able to play 告白氣球 (we've done it for you) and Jingle Bells. It has the following functions:

- ✓ Start/resume or pause the playing.
- ✓ Mute the volume.
- ✓ Switch the music.
- ✓ Repeat or play the music once.
- ✓ Increase or decrease the volume.

It uses the following I/O parts:

BTNC: **Reset**
switch SW0: **Start(Resume)/Pause**
switch SW1: **Mute**
switch SW2: **Repeat**
switch SW3: **Music**
BTNU: **VolumeUp**
BTND: **VolumeDown**
LED3~0: **Volume**
Pmod JB1~6: **PmodI2S**

The functions of the I/O parts are explained below:

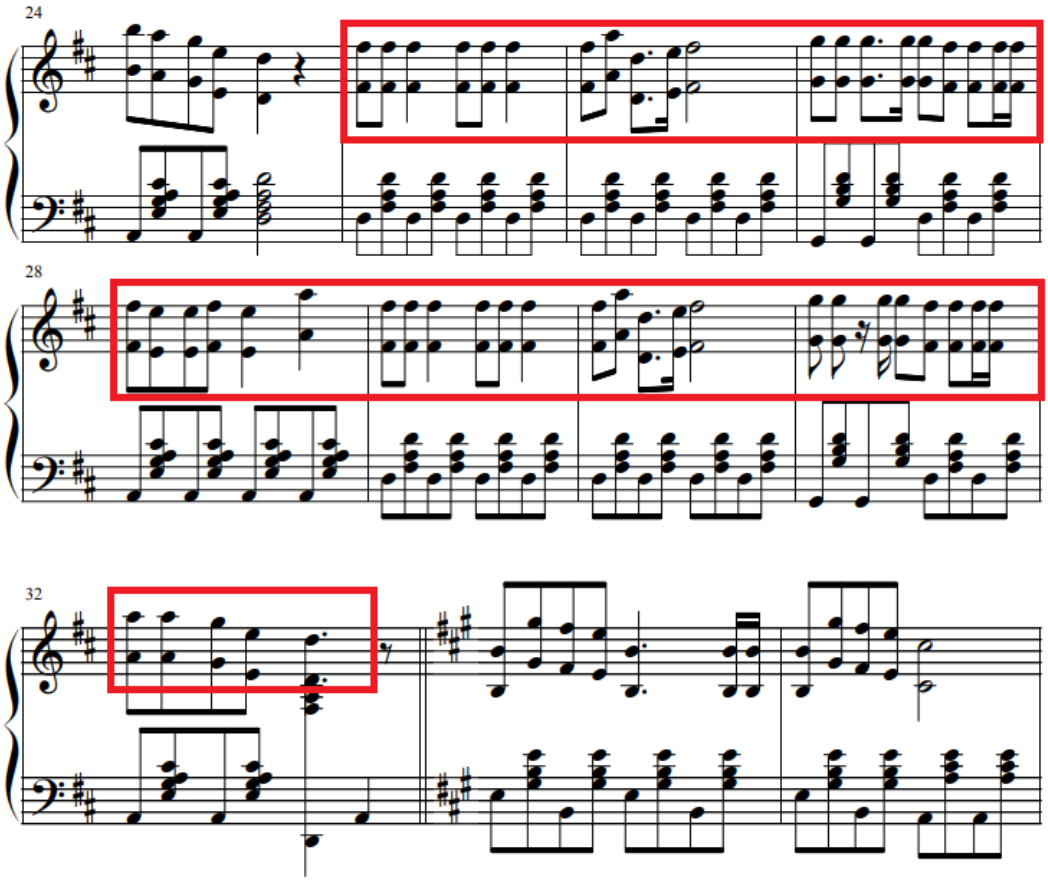
- ✓ When the player is powered on or when **Reset** pressed, the player should not play any tone until **Start(Resume)/Pause** is switched to "up" position.
- ✓ By switching **Start(Resume)/Pause** to "down", the music can be paused **immediately** while it is playing, which means the music should stop at the moment the you change the switch, and it can also be resumed from the same point after switching **Start(Resume)/Pause** again.

- ✓ When the **Music** switch is at the "down" position, the music player will play 告白氣球. When the **Music** switch is at the "up" position, the music player will play Jingle Bells.
- ✓ When the **Music** switch is switched, the music player will start playing the music from the beginning.
- ✓ The music will repeat as it reaches the end of the music while the **Repeat** switch is at the "up" position; otherwise, it will stop playing when reaching the end of the music.
- ✓ When the **Mute** switch is at the "up" position, the volume will be zero. Different from **Start(Resume)/Pause**, the music won't stop, but continues playing with zero volume.
- ✓ You need to design 4 levels of volume that TAs can distinguish. By pressing **VolumeUp**, sound volume increases by one level. On the contrary, by pressing **VolumeDown**, it decreases by one level. When it reaches the highest (lowest) level, pressing the **VolumeUp** (**VolumeDown**) buttons won't change anything.
- ✓ Use LED3~0 to show the current volume. LED3~0 being on corresponds to the highest level of volume, while LED0 corresponds to the lowest level. When the **Mute** switch is up, LED3~0 are off.

Volume Level	LED3	LED2	LED1	LED0
Mute				
0 (lowest)				●
1			●	●
2		●	●	●
3 (highest)	●	●	●	●

- ✓ Those button signals need to be preprocessed through debounce and onepulse modules.

You need to implement the highlighted part of Jingle Bells score yourselves. The higher pitch should be produced by the left channel, while the lower pitch should be produced by the right channel.



Hint:

You can use an FSM (Finite State Machine) to model the music player.

Bonus:

1. Display the music pitch notations in C, D, E, F, G, A, or B with the 7-Segment Display. You can ignore the sharp key signature. For example, if current tone is La, the 7-Segment Display will display “---A”. When the tone is silence, the 7-Segment Display should display “----”.
2. Optional: you may try to display the sharp key signature, the high/low octave, or the duration. We leave it to you to define the way to show them.