Weakness

1. The unstable light sensor input

The foot drum uses the light sensor as the input. The problem is that the light sensor is too sensitive to the changing of the light intensity in the environment.

The first problem is that the light sensor needed to be configured every time the device setup. We need to change sensitivity every time to make sure that the light sensor can detect the difference of the light intensity between the place that under our feet and environment.

The second problem is that the light sensor will be unstable if we use our foot drum in a very low speed. Since the input of the CN pin can generate several change notice and get into the interrupt several times. We write a program in matlab to prevent generating duplicated sounds in a short period, but the problem in the hardware part still exist.

2. The input capture interrupts failure

The air piano is based on the ultrasonic sensor. The problem is that when we use the input capture interrupts to catch the feedback form the ultrasonic sensor. It always can work well for several times. But then the program counter jump to a unknown memory location which leads to suspend of the program. After trying several different IC pins and external interrupt pins, we have no choice but to poll the flag of the input capture interrupt. The problem is that the timing of polling flag is not accurate, which lead to inaccurate in distance measurement and leads to wrong sound generation.

3. The range of the ultrasonic sensor

The ultrasonic sensor has a using range, inside the range, the output will be accurate, but outside the range the error becomes very large, then we can’t get the right distance. We use two ultrasonic sensors to solve the problem, but it is still not accurate when we reach the places which are correspond to the high pitch sound.

4.The sample time of the ADC

We are using ADC to convert the data we get from the acceleration sensor. But the problem is that if the ADC sample rate is too fast, the acceleration will be too small and then we can’t distinguish if the drum is hit or not. Also during one hit the acceleration sensor may detect several times. But if we use a longer sample rate, we may not be able to detect several hit of the drum in a short period. Also, the ADC converting time will affect the performance of the drum.

5. The delay of the sound generation

The first problem is that since we use matlab to do the sound generation the delay time will be longer than using the pic32 to direct generate sound. Since the matlab needs to put all the sound data into the audio card and generate sound, it will take longer time. We try to use a sound files with smaller size to solve the problem. But the problem still exists.

The second problem is that the UART communication only allows 1byte at a time, So there sure will be an order of the UART communication. Then the problem is that when two or more drums are hit at the same time, the sound can’t be generated simultaneously. There will always be a little bit difference between different sounds.

6. The project need two PIC32 boards

Since we need to determine a time period that we don’t send a new signal through UART, we need timer for each single sensor. So we need 6 timers for 6 sensors. But the PIC32 only have 5 timers, it forced us to use two PIC32 board to make the project work.