Embedded System Design Final Report

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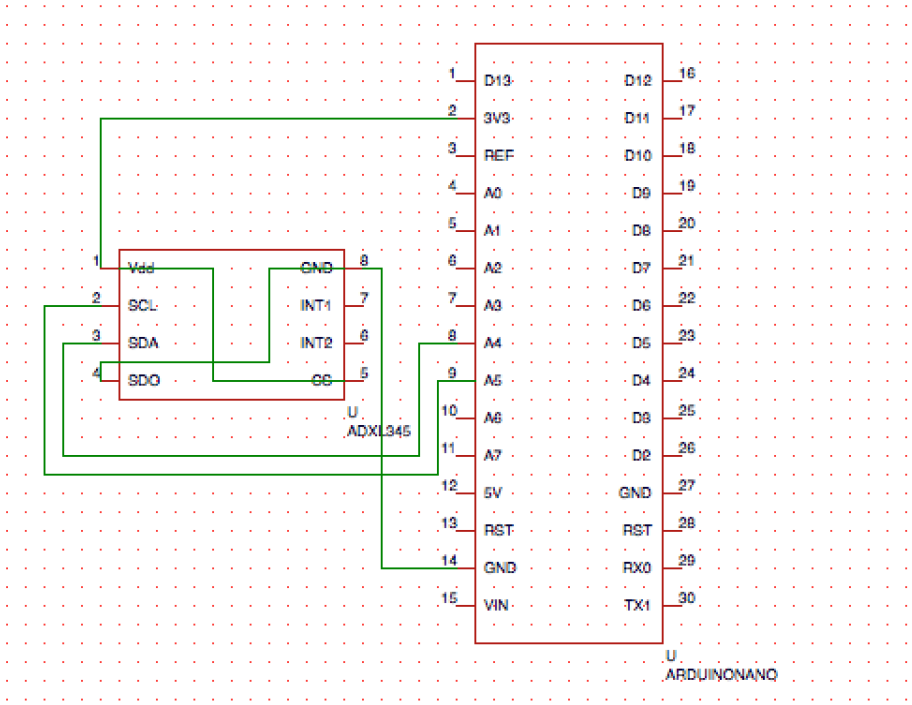
・What I made

A piano you can play by not pressing the keyboard but rolling the device itself.

・What I used

- ・Arduino Nano
- ・ADXL345
- ・Max/MSP

・Circuit



・Communication

The acceleration data is sent from Arduino to Max/MSP over serial communication.

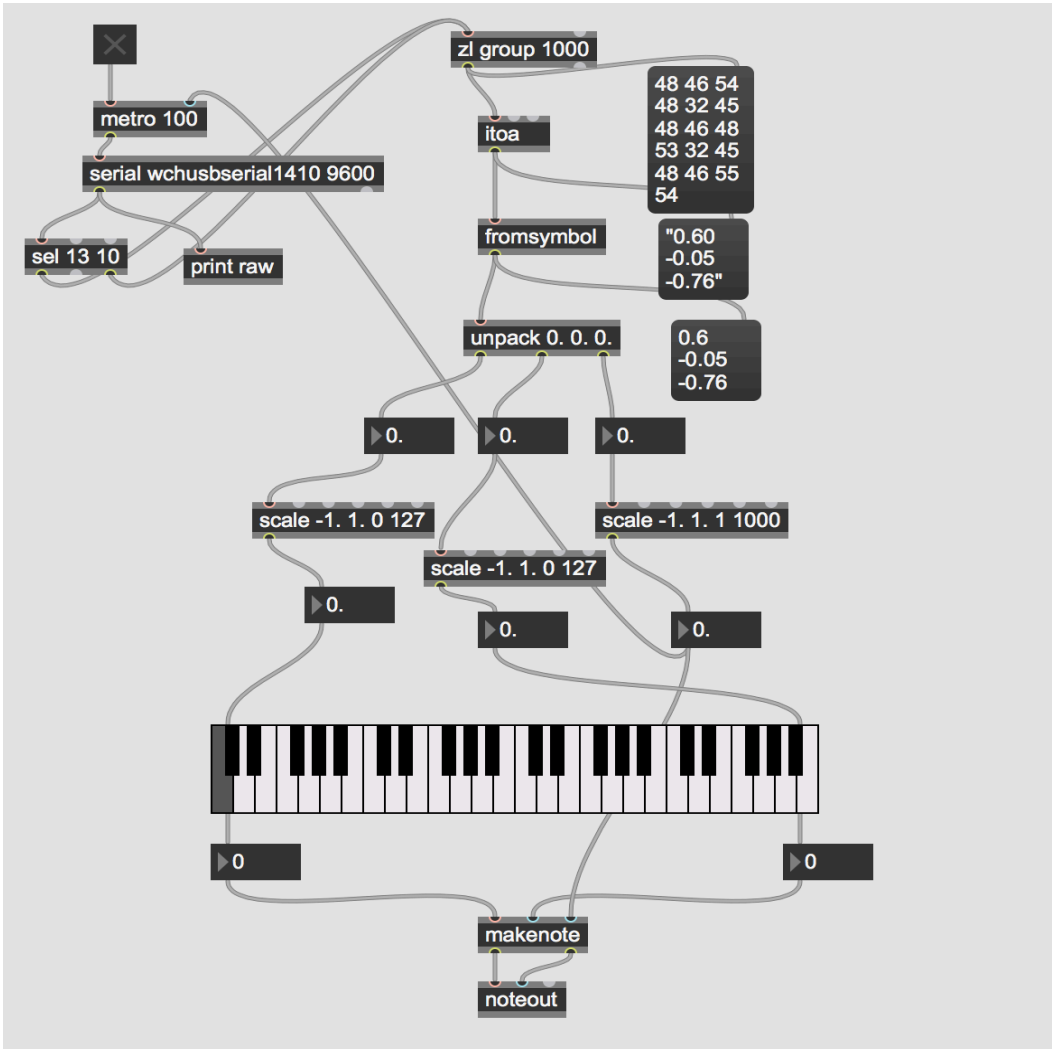
・Arduino

```ino
#include <Wire.h>  // Wire library - used for I2C communication
int ADXL345 = 0x53; // The ADXL345 sensor I2C address
float X_out, Y_out, Z_out; // Outputs
void setup() {
  Serial.begin(9600); // Initiate serial communication for printing the results on the Serial monitor
  Wire.begin(); // Initiate the Wire library
  // Set ADXL345 in measuring mode
  Wire.beginTransmission(ADXL345); // Start communicating with the device
  Wire.write(0x2D); // Access/ talk to POWER_CTL Register - 0x2D
  // Enable measurement
  Wire.write(8); // (8dec -> 0000 1000 binary) Bit D3 High for measuring enable
  Wire.endTransmission();
  delay(10);
}
void loop() {
  // === Read acceleromter data === //
  Wire.beginTransmission(ADXL345);
  Wire.write(0x32); // Start with register 0x32 (ACCEL_XOUT_H)
  Wire.endTransmission(false);
  Wire.requestFrom(ADXL345, 6, true); // Read 6 registers total, each axis value is stored in 2 registers
  X_out = ( Wire.read()| Wire.read() << 8); // X-axis value
  X_out = X_out/256; //For a range of +-2g, we need to divide the raw values by 256, according to the datasheet
  Y_out = ( Wire.read()| Wire.read() << 8); // Y-axis value
  Y_out = Y_out/256;
  Z_out = ( Wire.read()| Wire.read() << 8); // Z-axis value
  Z_out = Z_out/256;

  Serial.print(X_out);
  Serial.print(" ");
  Serial.print(Y_out);
  Serial.print(" ");
  Serial.println(Z_out);

  delay(100);
}
```

- Max/MSP



・How to play

Compile and upload the Arduino program. Then press the “X” button in the Max/MSP device to turn it on. The X axis plays the pitch, the Y axis plays the velocity, and the Z axis plays the duration.

・References

- https://sites.google.com/a/gclue.jp/fab-zang-docs/ni-yinkiiot/adxl345-i2c
- https://www.youtube.com/watch?v=6bT3G4Mep7E