

加速度センサによる 正しいスクワット指導システム

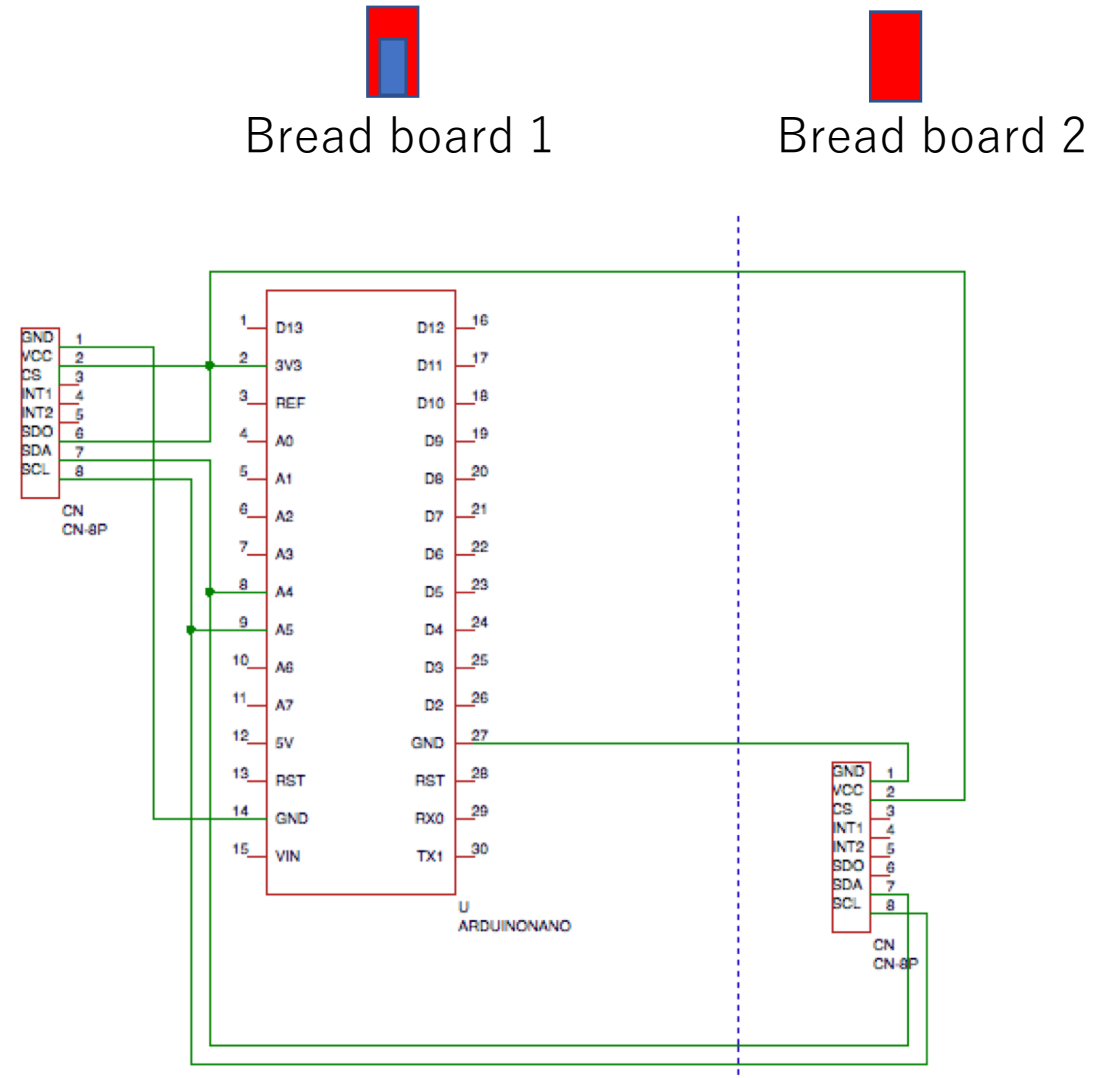
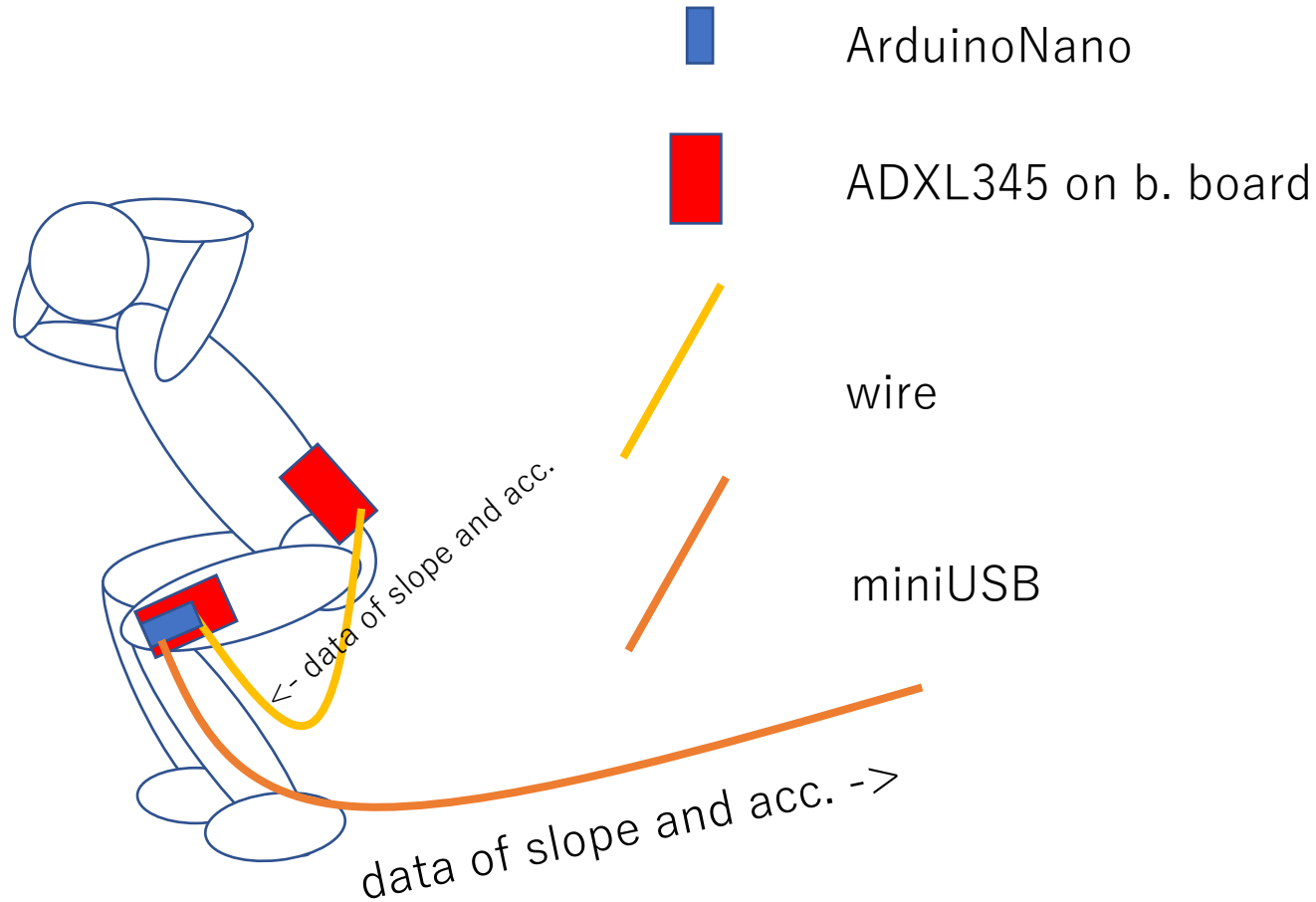
A machine trainer for squat using acc. sensor

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筋トレは、難しい。 Work out is difficult!

- 筋トレを正しく行わないと非効率的かつ怪我につながる
 - 正しいやり方が一番効率的でかつ最も安全 You have to do it properly
- だが、その正しいやり方が初心者には分らない
 - 文章で読んでもよく分からない Beginners don't know the proper way
 - 動画で見てもやる頃には忘れてる
 - そもそも調べるのが面倒、我流でやってしまう→いつの間にか怪我
- 自分だけでチェックしようとするの大変
 - 友人に見てもらうにも、四六時中付き合わせるわけにはいかない
 - 全身鏡なんて持ってない、あっても見られる範囲は限られる
 - 動画で撮影しても後でチェックするのが手間 Checking it by yourself is difficult
- →機械に助けてもらおう！ Help!

ADXL345 on b. board and ArduinoNano



Program (Arduino and Processing)

Arduino Nano:

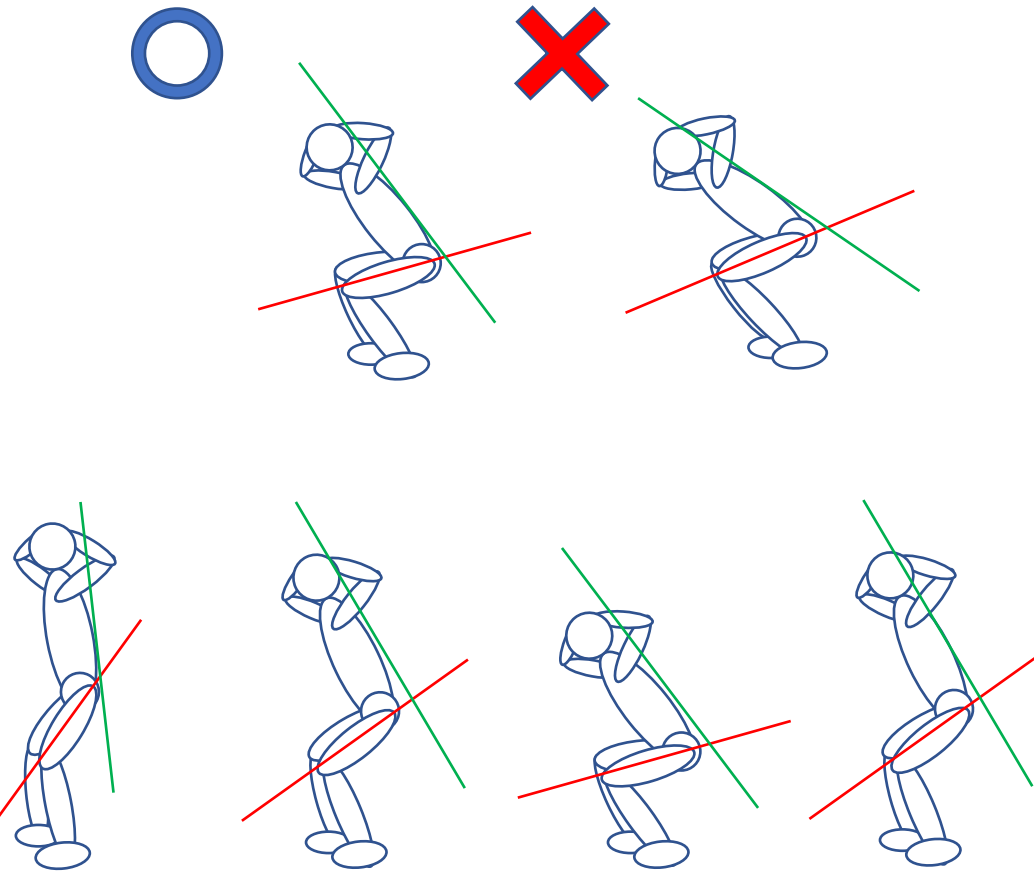
Send two pitch data from the two ADXL345

Processing

Warn if the user was:

- about to turn over
- bending his back too much
- bending his legs too much

If the squat was completed, show message



Program

```
#include <Wire.h>
#include "ADXL345.h"
```

```
const float alpha = 0.5;
```

```
double fXg[2];
double fYg[2];
double fZg[2];
```

```
ADXL345 acc1(0x53); // lower SDO
ADXL345 acc2(0x1D); // higher SDO
```

```
void setup()
{
  acc1.begin();
  acc2.begin();
  Serial.begin(9600);
  delay(100);
}
```

```
void loop()
```

```
{
  double pitch[2], roll[2], Xg[2], Yg[2], Zg[2], hpv[2];
```

```
  acc1.read(&Xg[0], &Yg[0], &Zg[0]);
  acc2.read(&Xg[1], &Yg[1], &Zg[1]);
```

```
  //Low Pass Filter
```

```
  fXg[0] = Xg[0] * alpha + (fXg[0] * (1.0 - alpha));
  fYg[0] = Yg[0] * alpha + (fYg[0] * (1.0 - alpha));
  fZg[0] = Zg[0] * alpha + (fZg[0] * (1.0 - alpha));
  fXg[1] = Xg[1] * alpha + (fXg[1] * (1.0 - alpha));
  fYg[1] = Yg[1] * alpha + (fYg[1] * (1.0 - alpha));
  fZg[1] = Zg[1] * alpha + (fZg[1] * (1.0 - alpha));
```

```
  //Roll & Pitch Equations
```

```
  pitch[0] = (atan2(fXg[0], sqrt(fYg[0] * fYg[0] / 100 + fZg[0] * fZg[0])) * 180.0) / M_PI;
  pitch[1] = (atan2(fXg[1], sqrt(fYg[1] * fYg[1] + fZg[1] * fZg[1])) * 180.0) / M_PI;
```

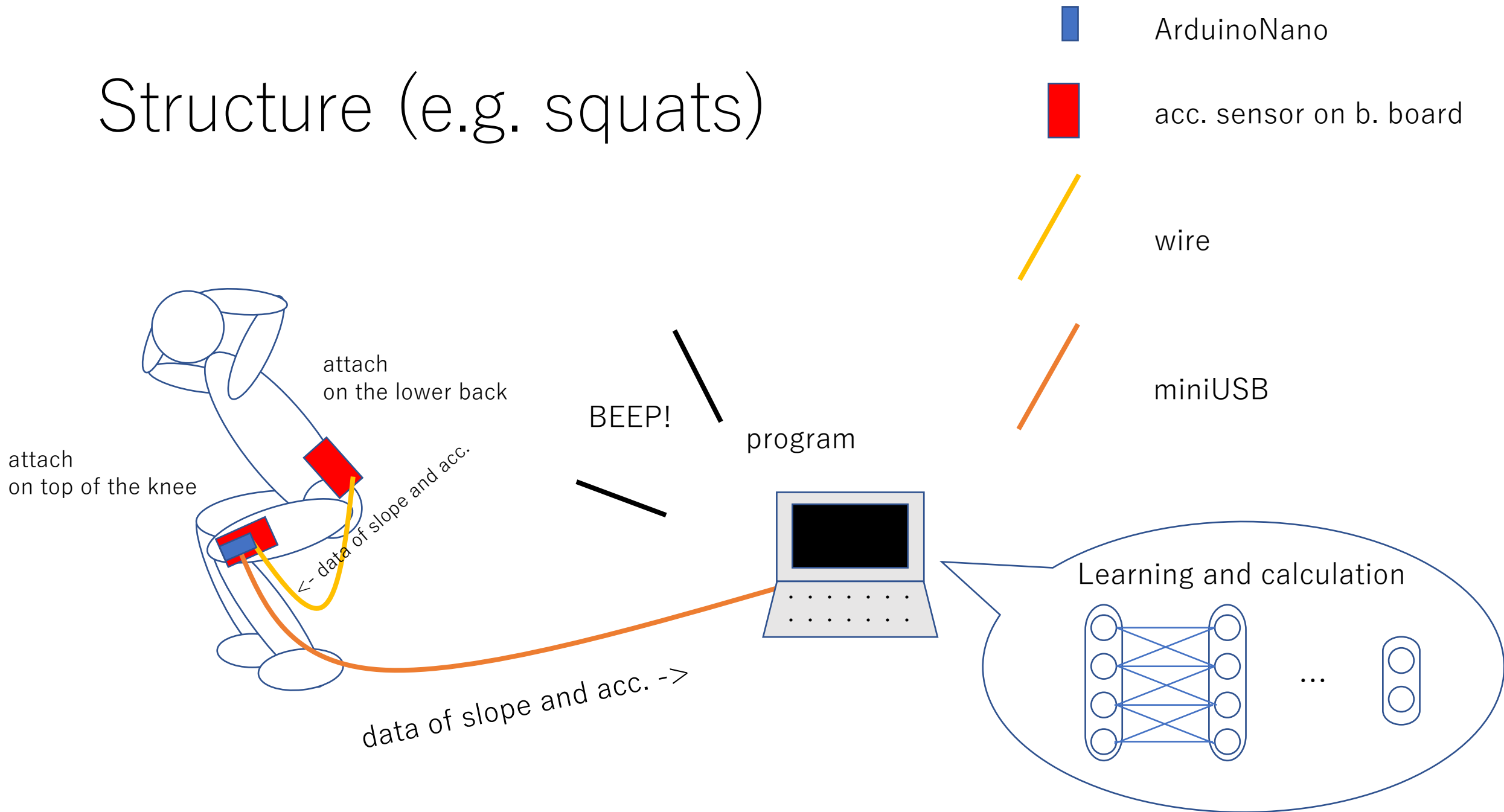
```
  Serial.print(int(100 * pitch[0]));
  Serial.print(":");
  Serial.println(int(100 * pitch[1]));
```

```
  delay(1000);
```

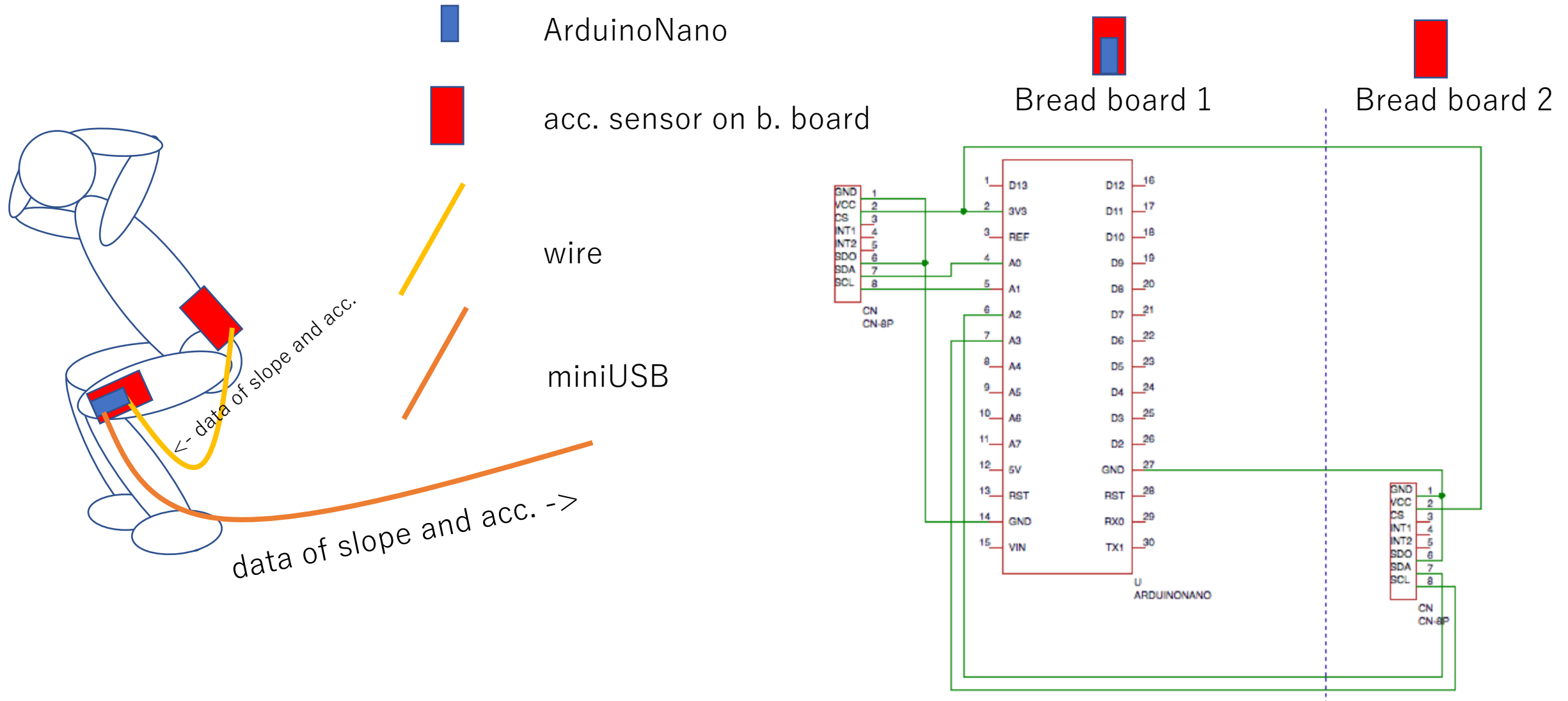
```
}
```

以下中間発表

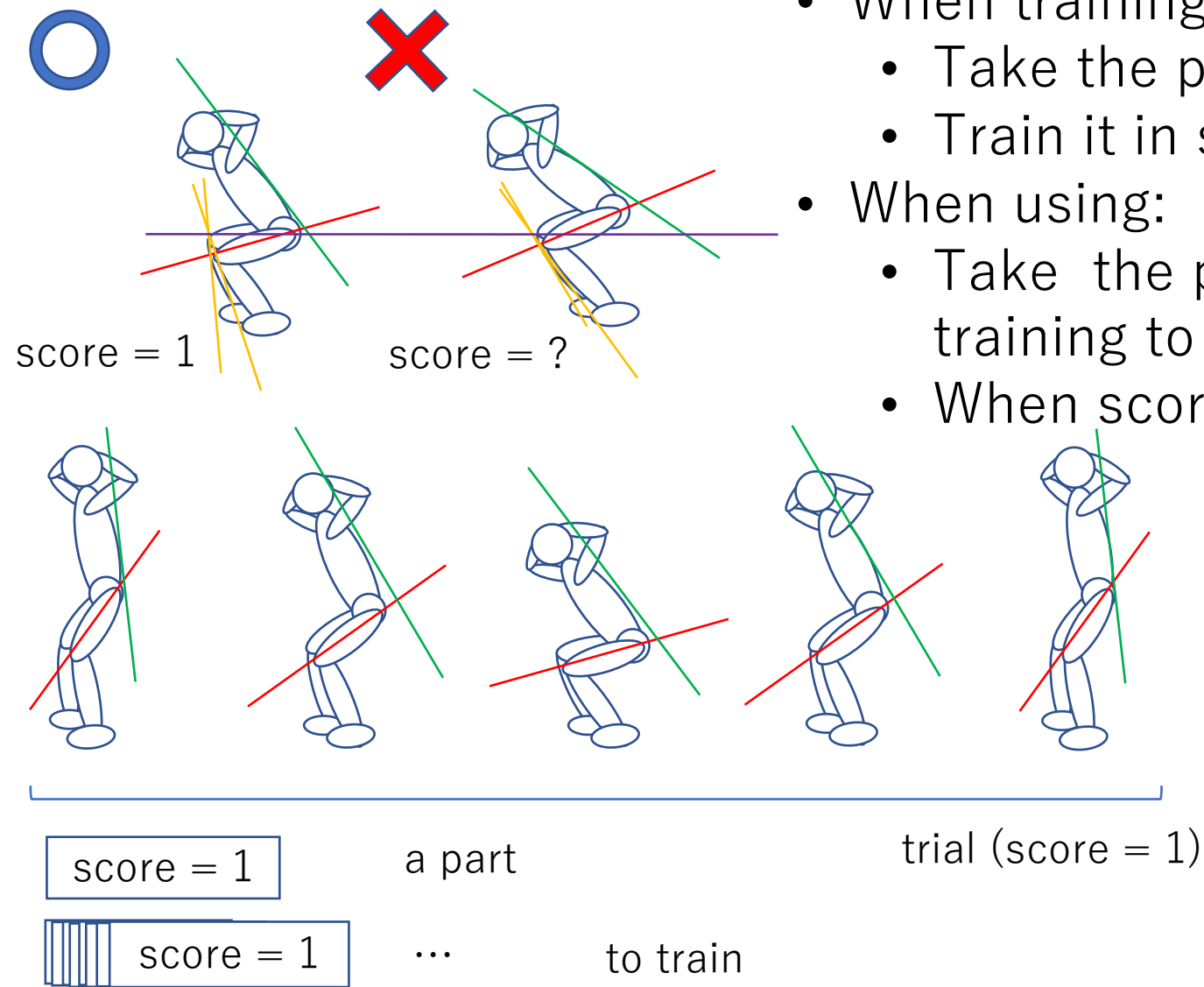
Structure (e.g. squats)



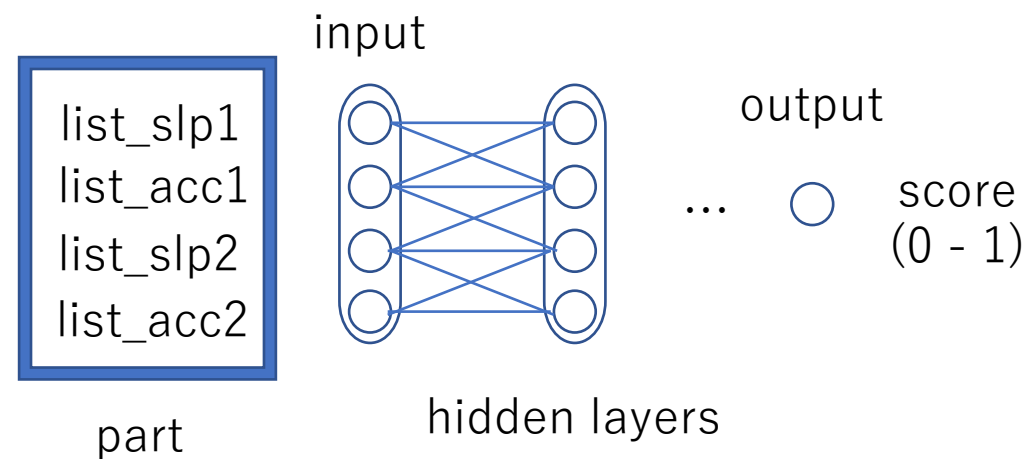
Acc. sensor on b. board and ArduinoNano



Programs



- Take data of slope and acc. by PySerial (Python)
- Take all data of a trial and divide it into parts
- For each parts,
- When training:
 - Take the part as input and score as output
 - Train it in scikit-learn for each different values
- When using:
 - Take the part as input use hidden layers from training to calculate its score
 - When score was lower than a threshold, notice it



「結果にコミットする」ために

- データをどう加工すればいいかよく分からない

How should I edit raw data into useful data?

- どういうデータに仕上げれば欲しい結果が得られるのかがよく分からない

What kind of data do I really want?