DSP LAB 9

1.Abstract

End-Point Detection， EPD (端點檢測)是用來取得信號語音開始以及結束的位置，所以又可以稱為Speech Detection或Voice Activity Detection（VAD）。常見端點檢測的方法大多是使用音量以及time domain的方式檢測，但各有利弊。

2.Goal of this Lab:

本次 Lab 的目的是要detect出笑聲的波段或是特別音訊的波段並且將各個部份擷取下來成各個音檔，藉由選擇不同的閾值，可以將笑聲/數字的頻段擷取下來，並將笑聲/數字的頻段完整的擷取下來。

3.Method

以這次實驗來說，使用音量大小來當作評估依據，透過Energy大小以及閾值的選擇來濾掉非笑聲的區段，再透過index相距等於一的區塊，把這些區塊合併成一塊，以及分開那些index相距大於1的區塊，將相鄰笑聲的區塊合併並且把不相鄰的笑聲區塊切割出來，最後透過各區間內點的數量大於10認定它為笑聲並存下來。

4. Pseudo code

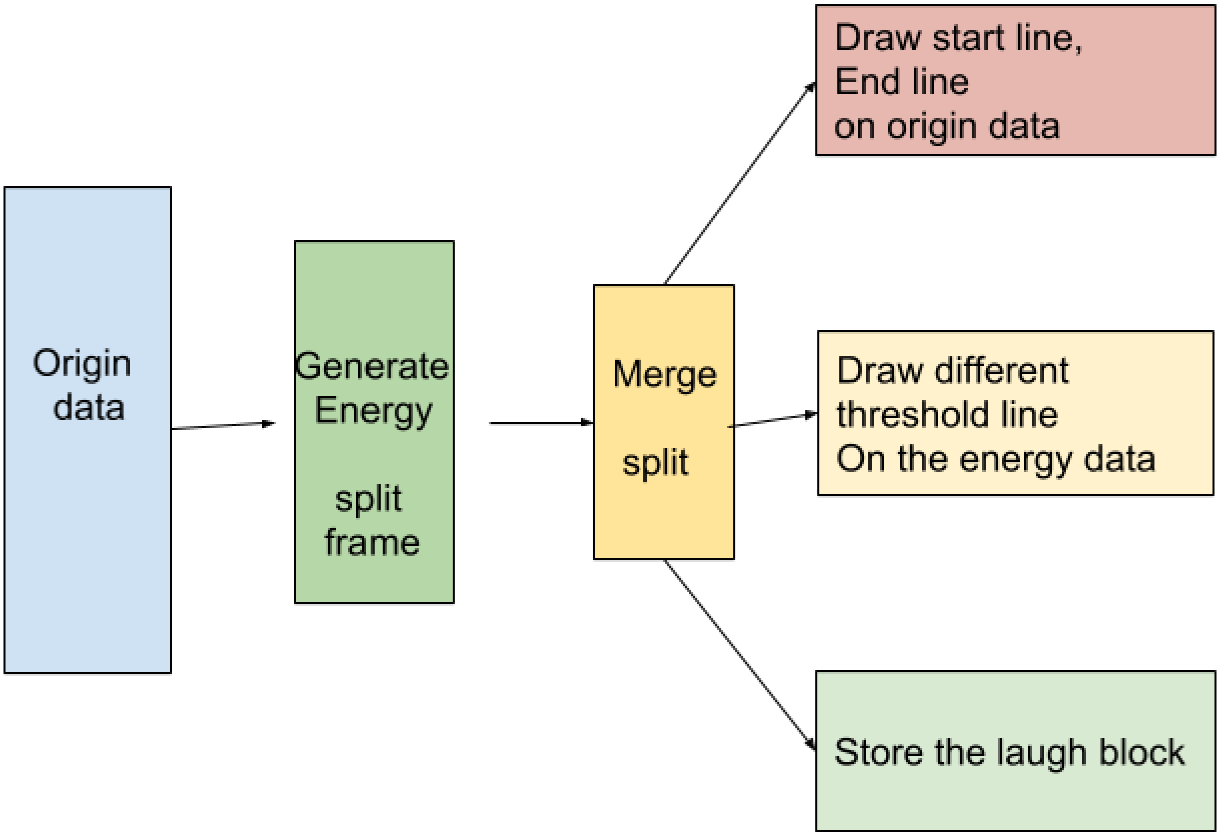
```
取得　audio的所有資料點，audio 的sample rate

frameSize = 2048
overLap = 1024

use CALenergy split data in multiple frame and generate Energy list

CAlEnergy function
        Step = frameSize - overLap
        Framenum = ceil(（len(data）) /Step)
        for i in Framenum:
           extract frame which is in ith block on data
           E[i]=sum(frame * frame)
        Return E

Filter_array = energy內所有array大於threshold的index
Split_array  = consecutive(Filter_array)

threshold1 = max(Audio_Energy)*0.1
threshold2 = min(Audio_Energy)*5000.0
threshold3 = min(Audio_Energy)+max(Audio_Energy)*0.0005
threshold4 = np.sqrt(max(Audio_Energy))*450

Consecutive function
```

```
if  |Filter_array[a+1]-Filter_array[a] |  !=1
          add the (a+1) to the variable temp
Use np.split to generate every block in data  by the temp
#target is to merge the consecutive indexes to  be a one block and split nonconsecutive index to become two different array.
```

```
plot(audio_data)
for i in split_array:
   if len(i) >10:
      I[0] -> start line index,i[-1] -> end line index.
      plot(start line),
      plot(end line)
      store(i)
```

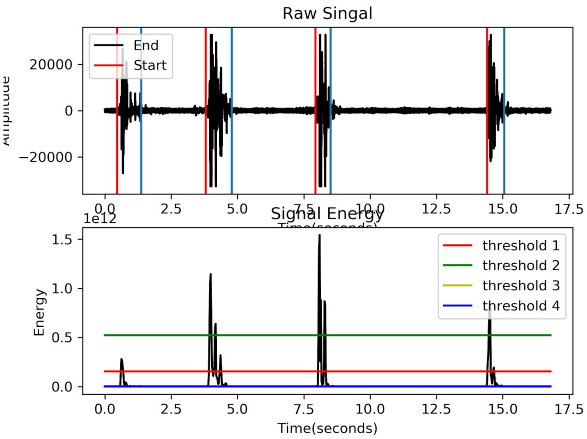
```
A is the length of energy_array
zeros =  initialize a array have length A and element are all 0
Plot (theshold1) use zeros
Plot (theshold2) use zeros
Plot (theshold3) use zeros
Plot (theshold4) use zeros
```

4.flowchart

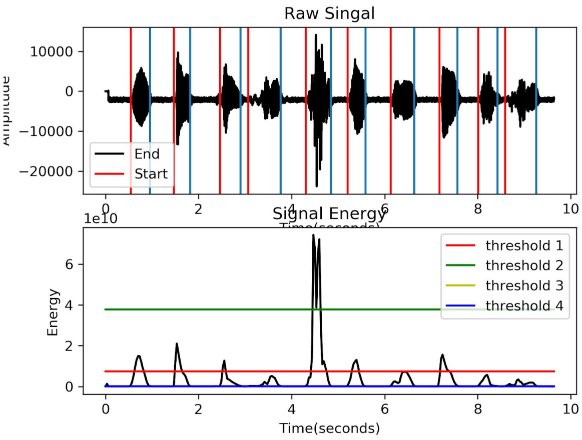


5.Result

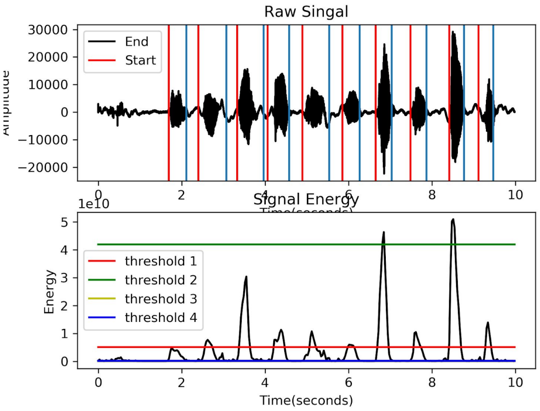
Laughter(demo)



數字1-9(sample_audio.wav)



數字0-9(sample_audio_1.wav)


Raw Singal
End
Start
Signal Energy
1e10
threshold 1
threshold 2
threshold 3
threshold 4
Energy
Time(seconds)