Digital Speech Processing HW#1

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1. Runtime Environment

1.1. System : macOS Sierra 10.12.4

1.2. Processor : 2 GHz Intel Core i5

1.3. Memory : 16 GB 1867 MHz LPDDR3

2. Execute Method

2.1. Training

```
./train ITER INITIAL_MODEL OBSERVED_SEQUENCE TRAINED_MODEL
```

- ITER = iteration time
- INITIAL_MODEL = model_init.txt
- OBSERVED_SEQEUNCE = seq_model_01.txt ~ seq_model_05.txt
- TRAINED_MODEL = model_01.txt ~ model_05.txt

2.2. Testing

```
./test MODEL_LIST TESTING_DATA PREDICT_ANS
```

- MODEL_LIST = modellist.txt
- TESTING_DATA = testing_data1.txt & testing_data2.txt
- PREDICT_ANS = result1.txt & result2.txt

2.3. Comparing

```
ruby acc.rb result1.txt testing_answer.txt
```

- By running the acc.rb, it will compute the accuracy by comparing the models you predicted in result.txt with the correct answers form the testing_answer.txt, then print the output in the form of correct : X , total : 2500. (X is the number of correctly predicted models)

3. Analysis and Results

- Highest Accuracy Observed : 0.8700 (iter = 1500)
- Analysis : Iteration times

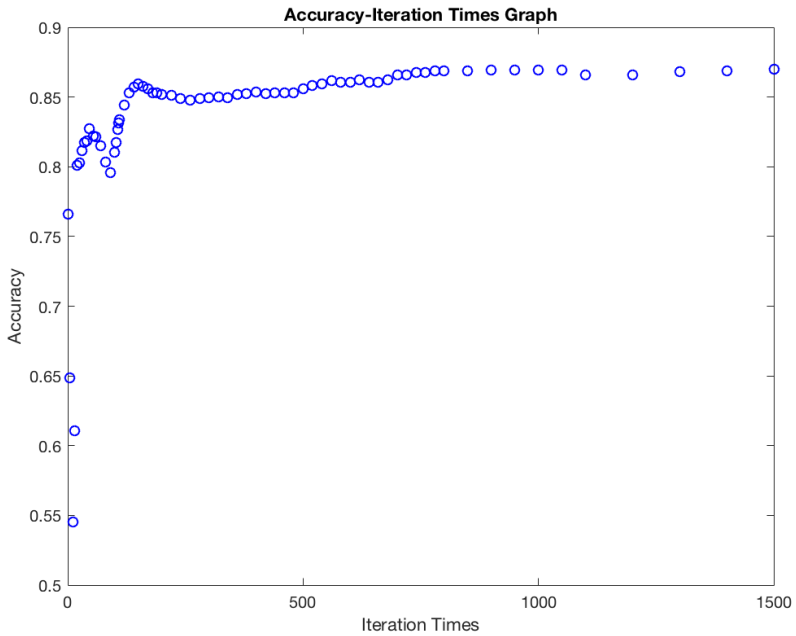
- In order to obtained a better model with the higher accuracy in this DSP assignment, I wrote a shell script run.sh with a simple while loop which will execute the training process and testing process with different value of iteration times, and it will also record the accuracy tested by the testing_data1.txt. However, the entire execution time become pretty long when it comes to iteration time = 200 or above, therefore, we only choose the iteration time = 1 + 20n where n are integers, which was already enough for us to observe the trend of the accuracy when we increase the iteration time.

```
#!/bin/sh

t=1

while [ $t -lt 1500 ]
do
        echo $t
        ./train $t model_init.txt seq_model_01.txt model_01.txt
        ./train $t model_init.txt seq_model_02.txt model_02.txt
        ./train $t model_init.txt seq_model_03.txt model_03.txt
        ./train $t model_init.txt seq_model_04.txt model_04.txt
        ./train $t model_init.txt seq_model_05.txt model_05.txt
        ./test modellist.txt testing_data1.txt result.txt
        ruby acc.rb result.txt testing_answer.txt final.txt
        t=`expr $t + 20`
done
```

- As you can see we can observe two local maximum around iteration time = 50 and 150, however, the maximum accuracy still happened at iteration = 1500 which the accuracy is estimated as 0.8700 .



4. Reference

http://www.csie.ntnu.edu.tw/~u91029/HiddenMarkovModel.html