

Digital Speech Processing Homework#1

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1. Environment:

compiler: gcc

```
Configured with: --prefix=/Applications/Xcode.app/Contents/Developer/usr --with-  
gxx-include-dir=/usr/include/c++/4.2.1  
Apple LLVM version 6.0 (clang-600.0.57) (based on LLVM 3.5svn)  
Target: x86_64-apple-darwin13.4.0  
Thread model: posix
```

OS: OS X 10.9.5

2. How to execute:

compile:

make all

("gcc ./count_accuracy.c -o ./count_accuracy" if needed)

execute: in Makefile:

```
run:  
./train $(ITER) model_init.txt seq_model_01.txt model_01.txt  
./train $(ITER) model_init.txt seq_model_02.txt model_02.txt  
./train $(ITER) model_init.txt seq_model_03.txt model_03.txt  
./train $(ITER) model_init.txt seq_model_04.txt model_04.txt  
./train $(ITER) model_init.txt seq_model_05.txt model_05.txt  
./test modellist.txt testing_data1.txt result1.txt  
./test modellist.txt testing_data2.txt result2.txt  
./count_accuracy ./result1.txt ./testing_answer.txt ./acc.txt
```

```
$ make run ITER=100
```

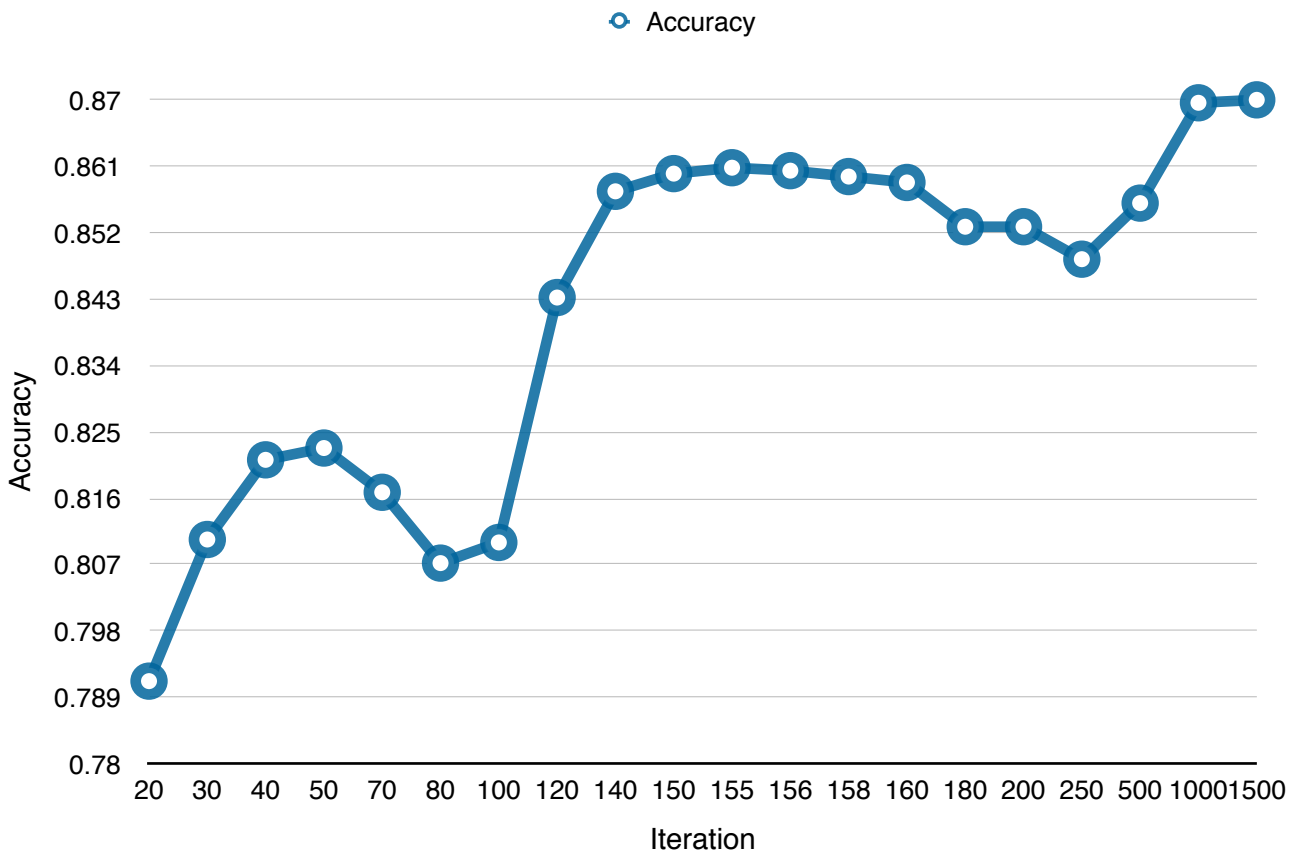
ITER = the number of iterations

./count_accuracy read strings from both result.txt and testing_answer.txt, and compare two strings' 8th character (index = 7, e.g. model_0X.txt. only compare the 'X'), and then store the accuracy in acc.txt.

When executing, ./train print out the current iteration(use fprintf() and stderr) to let users see the program running.

```
***** ITERATION 61 *****  
initial: 6  
1.00000 0.00000 0.00000 0.00000 0.00000 0.00000  
transition: 6  
0.62241 0.16494 0.09982 0.11282 0.00000 0.00000  
0.00053 0.59895 0.23449 0.16603 0.00000 0.00000  
0.00002 0.00465 0.28344 0.66453 0.02556 0.02182  
0.00000 0.00046 0.20768 0.27408 0.38881 0.12978  
0.00066 0.49570 0.00000 0.00000 0.15369 0.34307  
0.00067 0.50115 0.00000 0.00000 0.07697 0.42121  
observation: 6  
0.42941 0.00068 0.00793 0.10569 0.00002 0.00000  
0.35611 0.10169 0.00721 0.10724 0.00005 0.00000  
0.10376 0.79963 0.48403 0.20615 0.00003 0.00000  
0.03072 0.00000 0.49760 0.39188 0.00000 0.00000  
0.00000 0.00000 0.00303 0.10904 0.00000 0.00000  
0.00000 0.00000 0.00000 0.00000 0.99990 1.00000
```

3. Summary:



HMM need to train the model iteratively because models sometimes converge only slowly to a local max.

Accuracy has a rising trend before approaching its limitation, but with some ups and downs of comparatively small amount.

I use 1000 iterations for my HMM result (accuracy = 0.869600).
I do not choose more iterations to avoid the overfitting.