DSP Homework 2 report

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Environment

CSIE WorkStation

- Compile: gcc version 6.2.1
- Environment: Linux oasis2 4.6.4-1-ARCH

Training process & accuracy

I have changed three files:

(1) lib/proto —> # state: 15

This is for increasing the number of state, which can split more groups to improve the precision on modeling a phoneme.

(2) lib/mix2_10.hed —> # GMM: 13

This is for increasing the number of Gaussian Mixture Model, which can make the mixture more likely the true GMM that to improve the precision on a state.

(3) 03_training.sh —> # iteration times: 50

This is for increasing the number of training iteration times, which can make the extent of convergence thoroughly.

Discovery

Following graph is other tests to find some relationship between these parameters.

First, I just increase the # of state and # of GMM. I find that the effect of increasing the # of GMM is not that obvious then the # of state at fixed iteration times. I guess it's because the iteration times wasn't too much, it's fast for # GMM to converge to a stable point. Therefore, adding more # of GMM has limited effect. Moreover, adding to much # of GMM even lower the accuracy (like test 3 & test 4).

With the convergence of # of GMM, I start increase # of state, and the accuracy increase again. But also, adding to much # of GMM lower the accuracy (like test 5 & test 6).
After modifying the # of state and # of GMM, I start to increasing the iteration times (test 7 & 8 & 10). I find that the CP value is not that good for iterating too much time, it's time-consuming but just

make accuracy a little up. And between test 8 and test 9, we can support our guess above again, the effect of # of GMM is little compared with the counterpart of # of state.

In conclusion, The # of state take the most effect on increasing the accuracy. # of GMM and # of iteration times play the supporting roles, and the effect # of GMM is more significant than # of iteration times which makes the training time longer (test 7 & test 9). However, # of GMM has its limited size, it's not good for too low but not good for too high.

```
>>> Default Settings
>>> # state: 5; # gmm: 2
====================== HTK Results Analysis =======================
  Date: Thu Nov 24 10:32:34 2016
  Ref : labels/answer.mlf
  Rec : result/result.mlf
------------------------ Overall Results --------------------------
SENT: %Correct=38.54 [H=185, S=295, N=480]
WORD: %Corr=96.61, Acc=74.34 [H=1679, D=13, S=46, I=387, N=1738]
===================================================================

>>> Test 1
>>> # state 10; # gmm: 2
====================== HTK Results Analysis =======================
  Date: Thu Nov 24 10:24:20 2016
  Ref : labels/answer.mlf
  Rec : result/result.mlf
------------------------ Overall Results --------------------------
SENT: %Correct=80.83 [H=388, S=92, N=480]
WORD: %Corr=96.61, Acc=93.67 [H=1679, D=26, S=33, I=51, N=1738]
===================================================================

>>> Test 2
>>> # state 10; # gmm: 10
====================== HTK Results Analysis =======================
  Date: Thu Nov 24 10:41:48 2016
  Ref : labels/answer.mlf
  Rec : result/result.mlf
------------------------ Overall Results --------------------------
SENT: %Correct=86.25 [H=414, S=66, N=480]
WORD: %Corr=97.35, Acc=95.34 [H=1692, D=26, S=20, I=35, N=1738]
===================================================================

>>> Test 3
>>> # state 10; # gmm: 12
====================== HTK Results Analysis =======================
  Date: Thu Nov 24 10:54:03 2016
  Ref : labels/answer.mlf
  Rec : result/result.mlf
------------------------ Overall Results --------------------------
SENT: %Correct=87.71 [H=421, S=59, N=480]
WORD: %Corr=97.41, Acc=95.97 [H=1693, D=27, S=18, I=25, N=1738]
===================================================================

>>> Test 4
>>> # state 10; # gmm: 13
====================== HTK Results Analysis =======================
  Date: Thu Nov 24 10:58:06 2016
  Ref : labels/answer.mlf
  Rec : result/result.mlf
------------------------ Overall Results --------------------------
SENT: %Correct=86.46 [H=415, S=65, N=480]
WORD: %Corr=97.30, Acc=95.45 [H=1691, D=29, S=18, I=32, N=1738]
===================================================================

>>> Test 5
>>> # state 15; # gmm: 13
====================== HTK Results Analysis =======================
  Date: Thu Nov 24 11:08:27 2016
  Ref : labels/answer.mlf
  Rec : result/result.mlf
------------------------ Overall Results --------------------------
SENT: %Correct=92.08 [H=442, S=38, N=480]
WORD: %Corr=97.81, Acc=97.58 [H=1700, D=29, S=9, I=4, N=1738]
===================================================================

>>> Test 6
>>> # state 15; # gmm: 15
====================== HTK Results Analysis =======================
  Date: Thu Nov 24 11:14:52 2016
  Ref : labels/answer.mlf
  Rec : result/result.mlf
------------------------ Overall Results --------------------------
SENT: %Correct=90.83 [H=436, S=44, N=480]
WORD: %Corr=97.07, Acc=96.89 [H=1687, D=35, S=16, I=3, N=1738]
===================================================================

>>> Test 7
>>> # state 15; # gmm: 13; # iter: 10
====================== HTK Results Analysis =======================
  Date: Thu Nov 24 11:23:50 2016
  Ref : labels/answer.mlf
  Rec : result/result.mlf
------------------------ Overall Results --------------------------
SENT: %Correct=92.92 [H=446, S=34, N=480]
WORD: %Corr=97.87, Acc=97.70 [H=1701, D=30, S=7, I=3, N=1738]
===================================================================

>>> Test 8
>>> # state 15; # gmm: 13; # iter: 15
====================== HTK Results Analysis =======================
  Date: Thu Nov 24 11:32:56 2016
  Ref : labels/answer.mlf
  Rec : result/result.mlf
------------------------ Overall Results --------------------------
SENT: %Correct=93.33 [H=448, S=32, N=480]
WORD: %Corr=98.04, Acc=97.93 [H=1704, D=26, S=8, I=2, N=1738]
===================================================================

>>> Test 9
>>> # state 15; # gmm: 3; # iter: 15
====================== HTK Results Analysis =======================
  Date: Thu Nov 24 11:36:56 2016
  Ref : labels/answer.mlf
  Rec : result/result.mlf
------------------------ Overall Results --------------------------
SENT: %Correct=90.83 [H=436, S=44, N=480]
WORD: %Corr=97.30, Acc=97.12 [H=1691, D=37, S=10, I=3, N=1738]
===================================================================

>>> Test 10
>>> # state 15; # gmm: 13; # iter: 50
====================== HTK Results Analysis =======================
  Date: Thu Nov 24 11:55:58 2016
  Ref : labels/answer.mlf
  Rec : result/result.mlf
------------------------ Overall Results --------------------------
SENT: %Correct=93.96 [H=451, S=29, N=480]
WORD: %Corr=98.16, Acc=98.10 [H=1706, D=26, S=6, I=1, N=1738]
===================================================================
```