Assigned: Tuesday 2001-02-06 Due: Tuesday 2001-02-13

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Background reading:

Read the chapters 8 and 9 in Gold & Morgan, on pattern recognition

Reading assignment:

"Construction and evaluation of a robust multifeature speech/music discriminator," E. Scheirer and M. Slaney, Proc. ICASSP-97 Munich, 1331-1334. This is a very thorough paper looking at the problem of discriminating speech from music signals; in addition to suggesting a wide range of possible features, they make an interesting comparison between different classification algorithms. However, it's a short paper, so their treatment of the algorithms is brief - don't expect to be able to completely understand everything they did. Add a summary to your web page.

http://www.ee.columbia.edu/~dpwe/courses/e6820-2001-01/papers/ScheiS97-mussp.pdf

Practical assignment:

On the web site you will find several files containing formant frequencies measured from vowels produced by different male speakers. (These data are actually from a study performed by Pols, Tromp and Plomp reported in the Journal of the Acoustical Society of America, vol. 53, pages 1093-1101, 1973, although I got them from the PRAAT program). File fmtU.txt consists of 50 rows each containing 3 numbers – the frequencies of the first three formants – for the "u" vowel spoken by different speakers. Files fmtA.txt and fmtO.txt similarly contain the formant frequencies for "a" and "o" respectively.

- Read the data into Matlab e.g. download the files to your machine then:

```
load fmtU.txt
```

- Make a scatter plot of F1 versus F2 for the "a"s and the "o"s. For instance, to plot the first two formants of the "a"s as red dots, you would type:

```
plot(fmtA(:,1),fmtA(:,2),'.r');
```

.. and you can repeat sets of arguments to `plot` for successive datasets.
Describe a rule that would allow you to decide if an unlabeled point came from the "a" set or the "o" set.

- Now compare "u" and "o". Devise a simple (linear) rule to distinguish the data points. How many mistakes does it make on these 100 examples?

http://www.ee.columbia.edu/~dpwe/courses/e6820-2001-01/matlab/fmtA.txt

Problems:

From the chapter-end exercises in Gold and Morgan:
Problems 10.8, 11.4 ("sh" is an example voiceless fricative), 12.6, 13.3.