Exercise Multimedia Technology
WS 2003/2004

Sheet 6 (November 28th, 2003)

Exercise 6.1 Linear Predictive Coding (part 2)

On the last sheet we did LPC based on examples in which a signal was constructed such that it was possible to predict the signal with no residual. This time a sample should be LP coded. This involves a least-square optimization in which the coefficients are chosen in order to minimize the difference between the prediction signal and the original sample.

The optimization is often done by means of a singular value decomposition (remember Analysis I). There is a very handy public domain library, the so-called GNU scientific library (GSL for short), which includes a vast number of optimization functions that have been improved and extensively tested over the years. The GSL will probably satisfy all the computational needs you will ever have in your working life.

Use the GSL or any other library to LP code the sample provided below. You can code small chunks (e. g., 5-100 samples) of the signal since approximating the whole signal in one pass is computationally not feasible. Vary the size of the data chunks and the number of coefficients which approximate them. What characteristics do the approximations have?

The sample is provided in the .au format, a very simple raw data format. A very brief description of the .au format is also provided below. You can play it on Linux using the play command: on windows the media player should handle the playback by default. Use your own samples if you like.

Hint: In the upcoming exam at the end of the term you can use the SGL function call (or an equivalent library call) and simply assume that it will do all the computation for you. If you have no experience with a numerical library, you will also be allowed to perform the singular value decomposition on your own.

References

Homepage of the GSL: http://www.gnu.org/software/gsl/

Manual: http://www.gnu.org/software/gsl/manual/gsl-ref_toc.html

If you don't want to read too much, this page probably includes all you need to know with an additional example: http://www.gnu.org/software/gsl/manual/gsl-ref_35.html#SEC460

Description of the .au format: http://www.informatik.uni-mannheim.de/informatik/pi4/data/au.txt

Sample signal 1: http://www.informatik.uni-mannheim.de/informatik/pi4/data/sample_mono_1.au

Sample signal 2: http://www.informatik.uni-mannheim.de/informatik/pi4/data/sample_mono_2.au

Exercise 6.2.1 Quality of Service parameters

In reference to both networks and endsystems, what kinds of parameters did you get to know that influence QoS (find at least 6 of them) ?

Exercise 6.2.2 Quality of Service artifacts

Describe the influence of unmatched quality contraints on a video stream. What kinds of artifacts does each parameter cause? Suggest solutions for solving or lessening those problems.

Exercise 6.2.3 Quality of Service artifacts

Have a look at the slides (the pdf-file) of the 2001 Keynote Talk at the annual Workshop IWQoS and despite the massive use of acronyms, try to guess what it is about.

(1) Why isn't there something like QoS on the internet after so many years of research?

(2) Do you think that QoS is worth the effort and will it ever catch on?

http://www.cs.columbia.edu/~hgs/papers/Schu0106_Quality.pdf