State University of New York at Buffalo

CSE 534 Spring 2017 Homework Set #1

Assignment Date: Thursday February 16, 2017; Due: ***Tuesday February 28, 2017 at 11:00pm***

Name: _____ Student Number: _____

Problem (1) **(Digital Speech Coding – A Hands-on Exercise)**

This exercise is intended to practice both recording of speech signal as well as encoding of digital speech signals created by each student. You may use any programming language to implement the encoding process. Display of the speech signals at various stage of speech creation, processing, and reconstruction is also required. Each student is required to complete the following steps:

(a) Record a few seconds of their own speech (8-10 seconds) (**to be submitted**)

(b) Partition the recorded speech into proper length of speech segments for display and processing subsequently

(c) Display and output the graphical rendering the original recorded samples (one typical segment is adequate) (**to be submitted**)

(d) For each speech segment, perform the following: (**Estimated parameters for all segments need to be made into a list and to be submitted**)

- i) Voiced/unvoiced decision and pitch detection for voiced speech for each speech segment (Figure 2.5)
- ii) LPC coefficient estimation (Equation 2.3 and Lecture Notes)
- iii) Perform Gain estimation (Lecture notes, can be derived from LPC estimation)
- iv) Select proper quantization parameters (bits per sample coefficient, pitch parameter, and gain parameter) for bitstream representation for each segment of speech
- v) Reconstruct from these estimated parameters using LPC-10 (Figure 2.4)

(e) Complete the encoding for all segments and reconstruct the speech (**to be submitted**)

(f) Repeat the above speech reconstruction based on your own proper selection of vector excitations (based on either Figure 2.9, Figure 2.10, or Figure 2.13) (**to be submitted**)

(g) Compare these reconstructed speeches with the original speech and discuss your evaluation of the LPC speech encoding at different excitations (**1/2 page discussion to be submitted**)

(h) Each student is required to submit electronically the following:

- i) all immediate results (see above)
- ii) all final encoding results (see above)
- iii) brief report discussing evaluation of LPC encoding (see above)
- iv) all runnable codes and references

(i) **Important Notice:** Only standard commercial software functions may be called. Any routines developed by any individual other than yourself cannot be called or adopted.