University of Sheffield

COM3502-4502-6502
Speech Processing

Main Programming Assignment

Your Name 1

Your Name 2

Department of Computer Science

November 13, 2018

QUESTION 1 ***(worth up to 5 marks)***

Provide a screenshot of `[wsprobe~]` for a typical voiced sound, and explain the features in the waveform and spectrum that distinguish it from an unvoiced sound. *Hint: use the 'snapshot' feature in `[wsprobe~]` to obtain a static display.*

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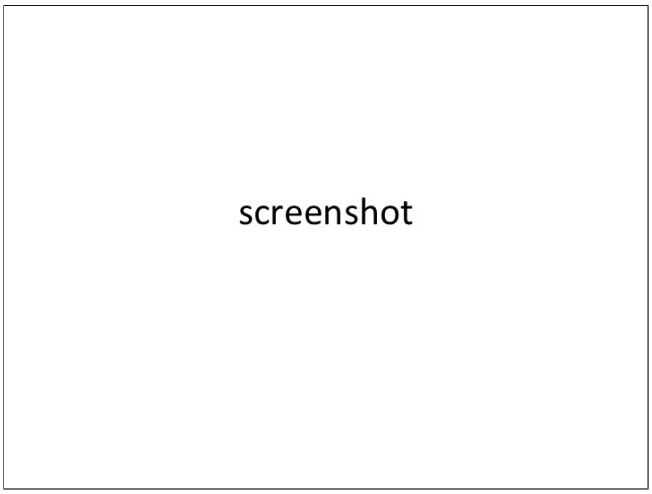

QUESTION 2 ***(worth up to 5 marks)***

Which sounds are most affected when the low-pass cut-off frequency is set to around 500 Hz - vowels or consonants - and why?

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QUESTION 3 ***(worth up to 5 marks)***

How is it that the speech is still quite intelligible when the high-pass cut-off frequency is set to 10 kHz?

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QUESTION 4 ***(worth up to 5 marks)***

COM3502-4502-6502: The `[GraphicEqualiser~]` object uses an FFT internally; what does FFT stand for and what does an FFT do?

COM4502-6502 ONLY: What is a DFT and how is it different from an FFT?

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QUESTION 5 ***(worth up to 10 marks)***

With `speed = 50` and `depth = 0.5`, what are the minimum and maximum amplitudes of your LFO output, and how do they vary with changes in these two settings? Also, please provide two screenshots: (a) your `[LFO~-help]` object and (b) the internal structure of your `[LFO~]` object.

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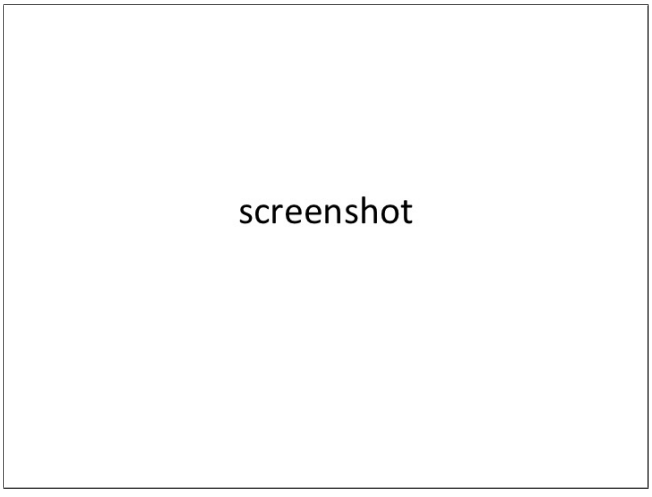

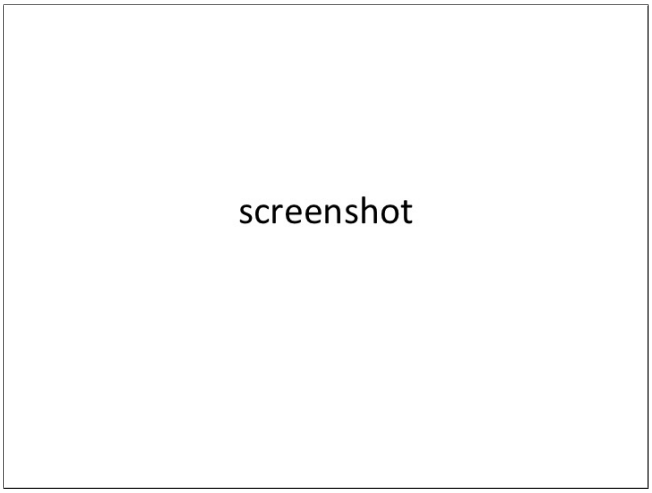

QUESTION 6 ***(worth up to 5 marks)***
In your own words[1], why is this effect known as 'ring modulation'?

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QUESTION 7 ***(worth up to 5 marks)***
Why is SSB commonly used in long-distance radio voice communications?

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QUESTION 8 ***(worth up to 5 marks)***
COM3502-4502-6502: Why can the voice be shifted up in frequency much further than it can be shifted down in frequency before it becomes severely distorted? /emphHint: look at `[wsprobe~]`.
COM4502-6502 ONLY: Your frequency shifter changes all the frequencies present in an input signal. How might it be possible to change the pitch of a voice *without* altering the formant frequencies?

[1] I.e. do not plagiarise from Wikipedia.

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QUESTION 9 ***(worth up to 5 marks)***

In a practical system, why is it important to keep the feedback gain less than 1?

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QUESTION 10 ***(worth up to 50 marks[2])***

Please provide a short[3] description of the operation of your `[VoiceChanger]` application, together with a screenshot of your final GUI.

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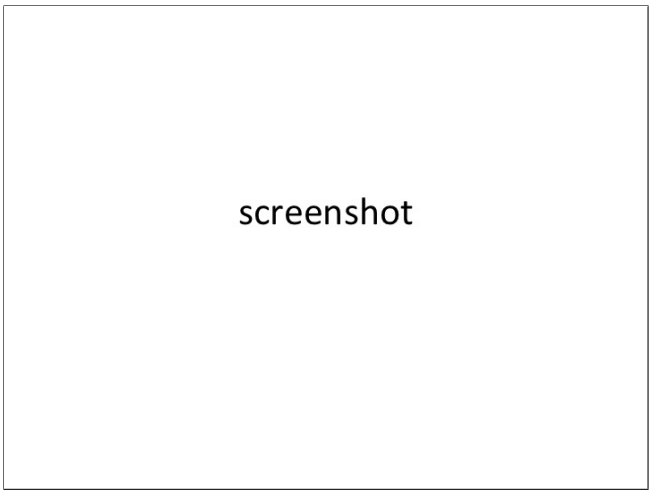

[2] 25 for functionality, 15 for design/layout, 5 for `Pd` features, 5 for innovations

[3] no more than 200 words