Praktikum Instrumentalphonetik, Anleitung für Übung 2

Introduction and Background

Overall aim: To get experience in understanding the relationship between position and velocity signals of the articulators.

In this exercise we will examine whether there are any differences in the velocity of the movement of the tongue-tip for the different Arabic consonants already examined in the first exercise.

In addition, we will use the velocity signals to determine the time-point at which to extract the target position of the vowel following the consonant (there are clear audible differences in the quality of the vowel depending on whether the consonant is emphatic or not; the aim here is to quantify the relevant differences in tongue position).

Procedure

1.
As for exercise 1

Log on as user matlab (ask me for the password)
`cd mview/mca2all`
Start matlab (simply type '`matlab`')

2.
We load all utterances containing a particular target consonant into mview by typing
`mviewgo_ex1_v('t')`
This is a variant of the procedure used for exercise 1, and loads a different selection of signals.
As for exercise 1, specifiying `'t'` as the input argument loads all utterances with non-emphatic /t/.
The other sounds that can be chosen are:

```
'T': emphatic /t/
'd': non-emphatic /d/
'D': emphatic /d/
's': non-emphatic /s/
'S': emphatic /s/
'n'
'l'
'r': a flap or tap
```

The main mview window will be opened. Resize this a little bit smaller.
It should then be possible to also see the array editor window (this will be used to record analysis results in a sort of spreadsheet). Resize this so that about 5 lines and 7 columns are visible, and try and position array editor and mview window so that both can be viewed at once.
(As for exercise 1, the actual results will be entered in the array editor in the variable 'data'. The contents of each column of 'data' will be explained below, but can also be viewed by looking at the variable 'descriptor')

3.
In mview's 'Variables' drop-down menu choose the specific utterance to be analyzed.
For each target sound, e.g non-emphatic /t/, usually 7 utterances will be loaded. The number of the repetition is the 10^{th} character in the complete filename of the utterance. In order that every participant can analyze as many different utterances as possible we will divide up the work so that each participant will be responsible for analyzing a specific repetition number of each target consonant (possibly simply determined by the number of your machine - this will be organized in the course).
Choose the specific utterance you have been assigned to.

Refer to the instructions of the first exercise for explanation of basic mview commands.

4.
The articulatory signals shown for this exercise are slightly different from those shown in the first exercise. These are (from top to bottom):

TTIPPOS: Position of the frontmost of the tongue-tip sensors. Remember that the brighter line shows the x-coordinate and the fainter line the y-coordinate.

vTTIPPOSy: This stands for velocity of the y component of TTIPPOS. In other words, it is the first derivative with respect to time of the fainter line in the TTIPPOS panel immediately above.

TBACKPOS: Position of the rear-most of the three tongue sensors.

vTBACKPOSx: Velocity of the x (i.e horizontal) component of TBACKPOS (i.e first derivative of the brighter line in the TBACKPOS panel).

<u>Task 1</u>
The first task is to record the maximum velocity of the tongue-tip in the closing and opening movement for the medial consonant in the target word.
Note that in the two velocity panels there is a faint dashed horizontal line. This corresponds to zero velocity.
For closing movements the y-value of the sensor is increasing, so maximum velocity of the closing movement corresponds to the most **positive** value in the vTTIPPOSy panel.
Place the mouse pointer in this panel, hold the left mouse button down, and move the cursor. It is now possible to read off the velocity values in the numeric display at the bottom left of the figure.
Example: Utterance m_at_abc_1_0045
You should find a value of 19.2 (cm/s) for the maximum velocity of the closing movment from /a/ to /t/. This value occurs at about 1379 ms on the time axis, just about at the start of the closure phase for /t/ as shown in the sonagram.
For the maximum velocity of the opening movement from /t/ to the following /a/ we need the most **negative** value. You should find a value of -12.5 at about 1515ms (this occurs roughly at the onset of voicing for the /a/ after the aspiration phase of the /t/).

Record the two velocity values (19.2 and -12.5) in the fourth and fifth columns respectively of the 'data' variable in the array editor spreadsheet display.

Note that the second value (for the opening movement) MUST be negative.

Enter the same information in the first three columns that we used in the first exercise, i.e the consonant (in single quotes) in the first column, the repetition number in the second column, and the trial number in the third column.

In this exercise we are only considering the vertical component of movement towards and away from the consonant. While doing the exercise, try and notice which consonants show particularly strong **horizontal** movement.

Task 2

To determine how strongly the articulation of the vowel depends on the identity of the neighbouring consonant we will now record the coordinates of the tongue-back sensor when the tongue is at its most extreme position for the vowel.
First, try and determine an appropriate location by eye by moving the cursor through the vowel and observing the movement of the tongue in the spatial display in the top left part of the figure.
For the present exercise we will try whenever possible to use the most retracted position of the tongue during the vowel segment.
This will correspond to a negative zero crossing in the vTBACKPOSx pane, i.e the location where the signal crosses the horizontal dashed zero line from positive to negative - or, in other words, where the x coordinate of TBACKPOS reaches a peak and changes from increasing to decreasing. (Observe the relationship between the signal in the vTBACKPOSx panel and the (bright) x-coordinate in the TBACKPOS panel.)
For the example utterance, the appropriate timepoint is at about 1795ms on the time axis (about two thirds of the way through the voiced part of the vowel).
The TBACKPOS values at this time point are x = 62.4 and y = -9.9 (make sure the mouse pointer is in the correct panel when you press the left button to read off the values!)
Enter these two values in the sixth and seventh columns of the spreadsheet respectively (in the same line you just used for the velocity results).

Repeat these tasks for other target sounds.
(After closing mview don't forget to type 'return' in matlab's command window before going back to step 2 above to choose new utterances with `mviewgo_ex1_v)`

Note that some utterances may not show very much retraction of the tongue from consonant to vowel, so the vTBACKPOSx trace may not show a very well-defined zero-crossing. In such cases, an alternative criterion is to choose a location where the tongue-tip is close to its **lowest** value, i.e where vTTIPPOSy has a ***positive*** zero crossing.