# Adding Tones to Coupling Graphs

# First generate constriction gesture coupling graph

```
>> gest (id, input_string);
```

input_string can be English text (lower case) or syllabified ARPABET (upper case)

```
>> gest ('da4', '(DAA)(DAA)(DAA)(DAA)');
```

TVda4.o

```
% Input string: <(DAA)(DAA)(DAA)(DAA)>
%
%
% Word 1:   (DAA)(DAA)(DAA)(DAA)
% arpabet:  (D-AA_)(D-AA_)(D-AA_)(D-AA_)
%
%
% syllable 1:   D-AA_
%
%    onset cluster = <D>
%    segment 1 [D]:
'TTCL' 'ons1_clo1' 56 8 1 JA=32,CL=32,CA=32,TL=1,TA=1 1 1
'TTCL' 'ons1_rel1' 24 8 1 JA=512,CL=512,CA=512,TL=1,TA=1 1 1
'TTCD' 'ons1_rel1' 11 8 1 JA=512,CL=512,CA=512,TL=1,TA=1 1 1
'TTCD' 'ons1_clo1' -2 8 1 JA=32,CL=32,CA=32,TL=1,TA=1 100 0.01
'VEL' 'ons1_clo1' -0.1 8 1 NA=1 0 0
%
%    nucleus cluster = <AA>
%    segment 1 [AA]:
'TBCD' 'v1' 11 4 1 JA=1,CL=1,CA=1 1 1
'TBCL' 'v1' 170 4 1 JA=1,CL=1,CA=1 1 1
%

….
```

PHda4.o

```
%'OSC_ID' NatFreq m,n escap amp_init phase_init / riseram
'v1' 2   1   4   1 NaN/ 10 200 210
'v2' 2   1   4   1 NaN/ 10 200 210
'v3' 2   1   4   1 NaN/ 10 200 210
'v4' 2   1   4   1 NaN/ 10 200 210
'ons1_clo1' 2   1   4   1 NaN/ 5 60 65
'ons1_clo2' 2   1   4   1 NaN/ 5 60 65
'ons1_clo3' 2   1   4   1 NaN/ 5 60 65
'ons1_clo4' 2   1   4   1 NaN/ 5 60 65
'ons1_rel1' 2   1   4   1 NaN/ 5 20 25
'ons1_rel2' 2   1   4   1 NaN/ 5 20 25
'ons1_rel3' 2   1   4   1 NaN/ 5 20 25
'ons1_rel4' 2   1   4   1 NaN/ 5 20 25

/coupling/

%'OSC_ID1' 'OSC_ID2' strength1(to OSC1) strength2(to OSC2
'ons1_clo1' 'ons1_rel1' 1  1 65
'ons1_clo2' 'ons1_rel2' 1  1 65
'ons1_clo3' 'ons1_rel3' 1  1 65
'ons1_clo4' 'ons1_rel4' 1  1 65
'ons1_clo1' 'v1' 1 1 0
'ons1_clo2' 'v2' 1 1 0
'ons1_clo3' 'v3' 1 1 0
'ons1_clo4' 'v4' 1 1 0
'v1' 'ons1_clo2' 1   1 180
'v2' 'ons1_clo3' 1   1 180
'v3' 'ons1_clo4' 1   1 180
```

# Add a tone string to coupling graph

- AddTones (*input_id, output_id, tone_string, direction, phase*)
- *tone_string* sequence of symbols delimited by space
  - H (default f0 175 Hz)
  - L (default f0 125 Hz)
  - - syllable with no tone
  - H~ floating H
  - L~ floating L
- *direction*
  - 'left'
  - 'right'

Gives mechanism for input of tones that are not intrinsically coupled to syllables;
Code for dealing with them should be part of the language-specific model;
In this generic function, they will be coupled either to the syllable on the left or right, depending on value of *direction*.
With complete overlap (*phase* = 0), downstep tones can be generated.
With sequential coupling (*phase* = 90), contour can be generated.

Phase is not yet implemented.

```
>> AddTones ('da4', 'da4T', 'H L H L');
```

TVda4T.o

```
% Input string: <(DAA)(DAA)(DAA)(DAA)>
%
%
% Word 1:    (DAA)(DAA)(DAA)(DAA)
% arpabet:   (D-AA_)(D-AA_)(D-AA_)(D-AA_)
%
%
% syllable 1:    D-AA_
%
%    onset cluster = <D>
%    segment 1 [D]:
'TTCL' 'ons1_clo1' 56 8 1 JA=32,CL=32,CA=32,TL=1,TA=1 1 1
'TTCL' 'ons1_rel1' 24 8 1 JA=512,CL=512,CA=512,TL=1,TA=1 1 1
'TTCD' 'ons1_rel1' 11 8 1 JA=512,CL=512,CA=512,TL=1,TA=1 1 1
'TTCD' 'ons1_clo1' -2 8 1 JA=32,CL=32,CA=32,TL=1,TA=1 100 0.01
'VEL' 'ons1_clo1' -0.1 8 1 NA=1 0 0
%
%    nucleus cluster = <AA>
%    segment 1 [AA]:
'TBCD' 'v1' 11 4 1 JA=1,CL=1,CA=1 1 1
'TBCL' 'v1' 170 4 1 JA=1,CL=1,CA=1 1 1
%

. . .

%
% Tones:
%
'F0' 't1' 175 4 1 F0a=1 1 1
'F0' 't2' 125 4 1 F0a=1 1 1
'F0' 't3' 175 4 1 F0a=1 1 1
'F0' 't4' 125 4 1 F0a=1 1 1
##
```

PHda4T.o

```
%'OSC_ID' NatFreq m,n escap amp_init phase_init / riseram
'v1' 2   1   4   1 NaN/ 10 200 210
'v2' 2   1   4   1 NaN/ 10 200 210
'v3' 2   1   4   1 NaN/ 10 200 210
'v4' 2   1   4   1 NaN/ 10 200 210
'ons1_clo1' 2   1   4   1 NaN/ 5 60 65
'ons1_clo2' 2   1   4   1 NaN/ 5 60 65
'ons1_clo3' 2   1   4   1 NaN/ 5 60 65
'ons1_clo4' 2   1   4   1 NaN/ 5 60 65
'ons1_rel1' 2   1   4   1 NaN/ 5 20 25
'ons1_rel2' 2   1   4   1 NaN/ 5 20 25
'ons1_rel3' 2   1   4   1 NaN/ 5 20 25
'ons1_rel4' 2   1   4   1 NaN/ 5 20 25
't1' 2   1   4   1 NaN/ 10 200 210
't2' 2   1   4   1 NaN/ 10 200 210
't3' 2   1   4   1 NaN/ 10 200 210
't4' 2   1   4   1 NaN/ 10 200 210

/coupling/

%'OSC_ID1' 'OSC_ID2' strength1(to OSC1) strength2(to OSC2
'ons1_clo1' 'ons1_rel1' 1  1 65
'ons1_clo2' 'ons1_rel2' 1  1 65
'ons1_clo3' 'ons1_rel3' 1  1 65
'ons1_clo4' 'ons1_rel4' 1  1 65
'ons1_clo1' 'v1' 1 1 0
'ons1_clo2' 'v2' 1 1 0
'ons1_clo3' 'v3' 1 1 0
'ons1_clo4' 'v4' 1 1 0
'v1' 'ons1_clo2' 1   1 180
'v2' 'ons1_clo3' 1   1 180
'v3' 'ons1_clo4' 1   1 180
't1' 'v1' 1 1 0
't2' 'v2' 1 1 0
't3' 'v3' 1 1 0
't4' 'v4' 1 1 0
```

```
>> AddTones ('da4', 'da4T', 'H L - L');
```

TVda4T.o

```
. . .

%
% Tones:
%
'F0' 't1' 175 4 1 F0a=1 1 1
'F0' 't2' 125 4 1 F0a=1 1 1
'F0' 't3' 125 4 1 F0a=1 1 1

##
```

PHda4T.o

```
. . .

't1' 'v1' 1 1 0
't2' 'v2' 1 1 0
't3' 'v4' 1 1 0

##
```

```
>>AddTones ('da4', 'da4T', 'H L H L~ H', 'left');
```

TVda4T.o

```
. . .
% Tones:
%
'F0' 't1' 175 4 1 F0a=1 1 1
'F0' 't2' 125 4 1 F0a=1 1 1
'F0' 't3' 175 4 1 F0a=1 1 1
'F0' 't4' 125 4 1 F0a=1 1 1
'F0' 't5' 175 4 1 F0a=1 1 1
##
```

PHda4T.o

```
. . .
't1' 'v1' 1 1 0
't2' 'v2' 1 1 0
't3' 'v3' 1 1 0
't4' 'v3' 1 1 0
't5' 'v4' 1 1 0
```

```
>>AddTones ('da4', 'da4T', 'H L H L~ H', 'right');
```

TVda4T.o

```
. . .
% Tones:
%
'F0' 't1' 175 4 1 F0a=1 1 1
'F0' 't2' 125 4 1 F0a=1 1 1
'F0' 't3' 175 4 1 F0a=1 1 1
'F0' 't4' 125 4 1 F0a=1 1 1
'F0' 't5' 175 4 1 F0a=1 1 1
##
```

PHda4T.o

```
. . .

't1' 'v1' 1 1 0
't2' 'v2' 1 1 0
't3' 'v3' 1 1 0
't4' 'v4' 1 1 0
't5' 'v4' 1 1 0


##
```