

Lab 9 Formant synthesis

The purpose of this lab is to learn formant synthesis. We will use the KlattGrid synthesizer in Praat, which is based on the Klatt formant synthesizer (Klatt 1980, Klatt & Klatt 1990). You should read the article “[The KlattGrid speech synthesizer](#)” and the KlattGrid manual (<http://www.fon.hum.uva.nl/praat/manual/KlattGrid.html>).

Part I. Synthesizing /da/ and /shi/ using the KlattGrid speech synthesizer in Praat, as shown in the Praat scripts below.

1. To synthesize /shi/:

```
#creates a new KlattGrid, named 'shi'.
Create KlattGrid... shi 0 0.3 6 1 1 6 1 1 1
#add frication formants
Add frication amplitude point... 0.1 50
Add frication amplitude point... 0.3 0
Add frication formant frequency point... 2 0.1 1800
Add frication formant amplitude point... 2 0.1 20
Add frication formant bandwidth point... 2 0.1 100
Add frication formant frequency point... 3 0.1 3000
Add frication formant amplitude point... 3 0.1 10
Add frication formant bandwidth point... 3 0.1 300
Add frication formant frequency point... 4 0.1 4000
Add frication formant amplitude point... 4 0.1 10
Add frication formant bandwidth point... 4 0.1 500
#add voicing amplitude, vowel formants, and pitch targets.
Add voicing amplitude point... 0.05 0
Add voicing amplitude point... 0.15 90
Add voicing amplitude point... 0.25 90
Add voicing amplitude point... 0.3 60
Add pitch point... 0.1 125
Add pitch point... 0.3 120
Add oral formant frequency point... 1 0.1 300
Add oral formant bandwidth point... 1 0.1 50
Add oral formant frequency point... 2 0.1 2200
Add oral formant bandwidth point... 2 0.1 50
Add oral formant frequency point... 3 0.1 3000
Add oral formant bandwidth point... 3 0.1 100
#synthesis
Play
To Sound
```

2. To synthesize /da/:

```
#creates a new KlattGrid, named 'da'.
Create KlattGrid... da 0 0.3 6 1 1 6 1 1 1
#add formant loci for /d/, from 0 to 0.03s is closure
Add oral formant frequency point... 1 0.03 150
Add oral formant bandwidth point... 1 0.03 50
Add oral formant frequency point... 2 0.03 1800
Add oral formant bandwidth point... 2 0.03 50
Add oral formant frequency point... 3 0.03 2600
Add oral formant bandwidth point... 3 0.03 50
#add burst
Add frication amplitude point... 0.029 0
Add frication amplitude point... 0.03 40
Add frication amplitude point... 0.031 0
Add frication bypass point... 0.03 25
Add frication formant frequency point... 4 0.03 3600
Add frication formant amplitude point... 4 0.03 35
Add frication formant bandwidth point... 4 0.03 100
#add voicing amplitude, vowel formants, and pitch targets
Add voicing amplitude point... 0.0 0
Add voicing amplitude point... 0.04 90
Add voicing amplitude point... 0.25 90
Add voicing amplitude point... 0.3 60
Add pitch point... 0.0 125
Add pitch point... 0.3 120
Add oral formant frequency point... 1 0.1 750
Add oral formant bandwidth point... 1 0.1 50
Add oral formant frequency point... 2 0.1 1150
Add oral formant bandwidth point... 2 0.1 50
Add oral formant frequency point... 3 0.1 2400
Add oral formant bandwidth point... 3 0.1 100
#synthesis
Play
To Sound
```

Part II. Select “KlattGrid shi” in the object window. Click on “Edit phonation –” -> “Edit Pitch tier”, “Edit voicing amplitude tier”, and “Edit filters” -> “Edit oral formant grid”, “Edit frication amplitude tier”, “Edit frication formant grid”, “Edit frication bypass tier”, etc. Repeat the same for “KlattGrid da”. Learn how to modify these tiers.

Part III. Record the following words: *sigh*, *two*, *speak*. Then synthesize these words using the KlattGrid Synthesizer. Your synthetic words should be at least intelligible. You should also try to make them sound natural, and even more challenging, to make them sound like your own.

Prepare to present your synthetic sounds in the lab next Friday, Nov. 13.