Notes on SYNTAL
Chapter 6: Secondary Voice Parameters (V.00.2)
For OSX

Wayne Slawson

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What Are "Secondary Voice Parameters" and Why?

So far we've discussed two parameters of the vocal source—the loudness, AV, and the pitch, F0. If these were the only parameters controlling the pitched sounds in SYNTAL, there would be little more than a nasty-sounding buzz when using **vw** or even **tv** and the other event types.

In each of these event types, there are some automatic (default) settings of a number of other parameters that control the vocal source. These are set to nearly subliminal levels, generally; you tend not to notice them unless they are not controlled at all. Because they are typically not noticed, I call them "secondary". Here follows a brief description of them.

Open Quotient (OQ). The open quotient (OQ) is the proportion of a single period of the vocal source when the vocal folds are open and air is permitted to pass from the lungs into the vocal track. For the remainder of the vocal pulse period the vocal folds are pressed together and air cannot flow. The frequency of the alternation of closed and open vocal folds is what controls the voice pitch; the volume of the air flowing in the open portion controls the intensity of the voiced sound. A typical value (the default: nOQ) for OQ is 0.5. Values less than 0.5 sound slightly "pressed"; values greater than 0.5 sound softer and more flute-like.

Flutter (FL). In natural speech, the vocal source is never quite periodic. Rather, there is a very slight random variation in the pitch period. This effect is synthesized in SYNTAL by modulating the vocal pitch with a "slow random" signal, the amplitude of which is FL. The default value (nFL) is 0.001. Experiment with higher values; they're weird.

Diplophonia (DI). In certain kinds of speech—usually at the beginnings or ends of utterances—the vocal folds lose their periodicity and begin to flap every *other* period with a reduced amplitude. The effect is for the voice to sound as if it suddenly jumps down an octave in pitch. The typical value is zero, but I've assigned a default value (nDI) of 0.0001.

Spectral Tilt (TL). Although spectral tilt is a result of characteristics of the vocal source, its effect is primarily on the spectrum. And it is specified in terms of a frequency above which the spectrum begins to fall in amplitude. When TL is 1000., the default value (nTL), we can say that the sound is sort of average or "normal". When TL is lower, say 500., then the sound is darker or duller; with TL higher than the default, say 1500., the sound is brighter or even perhaps more "edgy" than normal. I realize that we've used words like "bright" and "dark" to distinguish among the sound colors. Spectral tilt doesn't change these color relationships, rather it affects the overall sound of *all* the colors.

Vibrato Depth (DV). These last two parameters control *vibrato*. The depth of the vibrato is controlled by DV. You might say DV determines *how much* vibrato there is. Most opera singers have lot of vibrato; madrigal singers typically don't have much at all. The default value of DV (nDV), 0.001, is essentially arbitrary. At this value, there is almost no vibrato at all, so mostly adjustments are toward higher values. My best advice is to experiment, but values higher than, say, 0.01 sound less like vibrati than glissandi.

Vibrato Frequency (FV). All generalizations about the sound of different values of DV are dependent on FV, the *frequency* of the vibrato. The default value of FV (nFV) is 1.0, or one complete cycle of up and down movement of the pitch in a second. This is a very slow vibrato, which at the default value of DV (0.001), is barely perceptible. Vibrator frequencies in singing and playing instruments generally vary between about two and ten complete cycles in a second. Some singers have fast, "heavy" vibratos—say, $DV = 0.01$ and $FV = 8.0$; others have slow, but marked vibratos—say, $DV = 0.01$ and $FV = 4.0$. Of course one need not use DV and FV to imitate vocal or instrumental custom, so you can certainly try outlandish values of these parameters. Do experiment!

Summary of Secondary Voice Parameters

Parameter	Defaults	Description
OQ	nOQ = 0.50	Open Quotient
FL	nFL = 0.001	Flutter
DI	nDI = 0.0001	Diplophonia
TL	nTL = 1000.	Spectral Tilt
DV	nDV = 0.001	Vibrato Depth
FV	nFV = 1.000	Vibrato Frequency

Use them in combination!

Some of the best results for all sorts of reasons are obtained by controlling the secondary vocal parameters in combination. As in so much of the sounds produced by SYNTAL, one needs to listen carefully to the details of the sounds produced and to learn to compose on the basis of that close listening. You might try, for example, to simulate a single note in which the vibrato increases in frequency and depth right after the beginning of the note and then is reduced in frequency at the end of the note. Once you get a pleasing result in this case, you could then try increasing the flutter toward the end of the note—maybe likewise the diplophonia.

Testing

It's best to set up a test file in which you can easily change values of the secondary parameters, alone and in combination, and hear the results quickly. Such a file is shown here:

```
/*    ‘vtest2.c’ */
#include "/usr/local/bin/qmSYNTAL2K.dfs"
#include "./mymacs.dfs"

/***************START HERE********************   */

START( 40.)

r(     .5)
/*
 *  Default (normal) values:
 *     nOQ = 0.50
 *     nFL = 0.001
 *     nDI = 0.0001
 *     nTL = 1000.
 *     nDV = 0.001
 *     nFV = 1.00
```

```
 * vow(DR,C1, LD, F0,  OQ,  FL,  DI,  TL,  DV,  FV, AS)
 */
vow(   .3,AA,Nte,CN2, nOQ, nFL, nDI, nTL, nDV, nFV,Nte)
vow(   .5,AA, FF,CN2, nOQ, nFL, nDI, nTL, nDV, 5.0,Nte)
vow(  1.7,AA,Nte,CN2, nOQ,.005,.020, nTL,0.01, nFV,Nte)

vow(   .3,AA,Nte,CN2, nOQ, nFL, nDI, nTL, nDV, nFV,Nte)
vow(   .5,AA, FF,CN2, nOQ, nFL, nDI, nTL, nDV, 5.0,Nte)
vow(  1.7,AA,Nte,CN2, nOQ,.005,.020, nTL,0.04, nFV,Nte)

vow(   .3,AA,Nte,CN2, nOQ, nFL, nDI, nTL, nDV, nFV,Nte)
vow(   .5,AA, FF,CN2, nOQ, nFL, nDI, nTL, nDV, 5.0,Nte)
vow(  1.7,AA,Nte,CN2, nOQ,.005,.020, nTL,0.07, nFV,Nte)

vow(   .3,AA,Nte,CN2, nOQ, nFL, nDI, nTL, nDV, nFV,Nte)
vow(   .5,AA, FF,CN2, nOQ, nFL, nDI, nTL, nDV, 5.0,Nte)
vow(  1.7,AA,Nte,CN2, nOQ,.005,.020, nTL,0.10, nFV,Nte)

r(     1.)

END
```

Here the **vow** event is used in groups of three, with each three statements constituting a single "sound". Notice that the loudest part of the sound is where the frequency of vibrato goes up to 5.0. Then some other secondary parameters are increased during the 1.7 beat decay of the sound.

You're welcome to use this file as a sort of testbed for your own experiments.

Good luck!