

Graphical Score #2  
by Jukka-Pekka Kervinen

An Experimental Drone Realization

**Introduction:**

A series of graphical scores were offered by Jukka-Pekka Kervinen during the ImprovFriday Event of 10-1-10 with the idea that they could be used as starting points for improvs. Score #2 is shown below:



## **General Directions:**

“Any number of players, duration of each box can be free, fixed and/or coordinated. Interpret any symbol as you like but keep some consistent actions between same symbol. Numbers: seconds, milliseconds, number of sounds, chordal structures; lines: glissandi, movement on the stage from one point to another, "melodic lines"; other symbols as you like. Repeat any box, start anywhere, stop anywhere, left to right and/or vice versa, top to down and/or vice versa. Duration of performance: 5 to 16 minutes.”

## **An Experimental Drone Plan as Based on the Score:**

The idea here is to use the graphical score to set a series of parameters that will be used to create a short series of drones using the Scruti Drone Box v 2.6 by Dave Siedel. The graphical score contains numbers and letters in each of its six segments. These will be used with numerical algorithms to determine the Scruti Box settings. The parameters to be calculated for each of the score segments are:

- Base Frequency & Octave
- Duration
- Arpeggio Offset
- Arpeggio Level
- Binaural BPS
- Binaural Level

These parameters will be loaded in by hand and each drone segment recorded. All six segments will be spliced together sequentially in Audacity and converted to MP3.

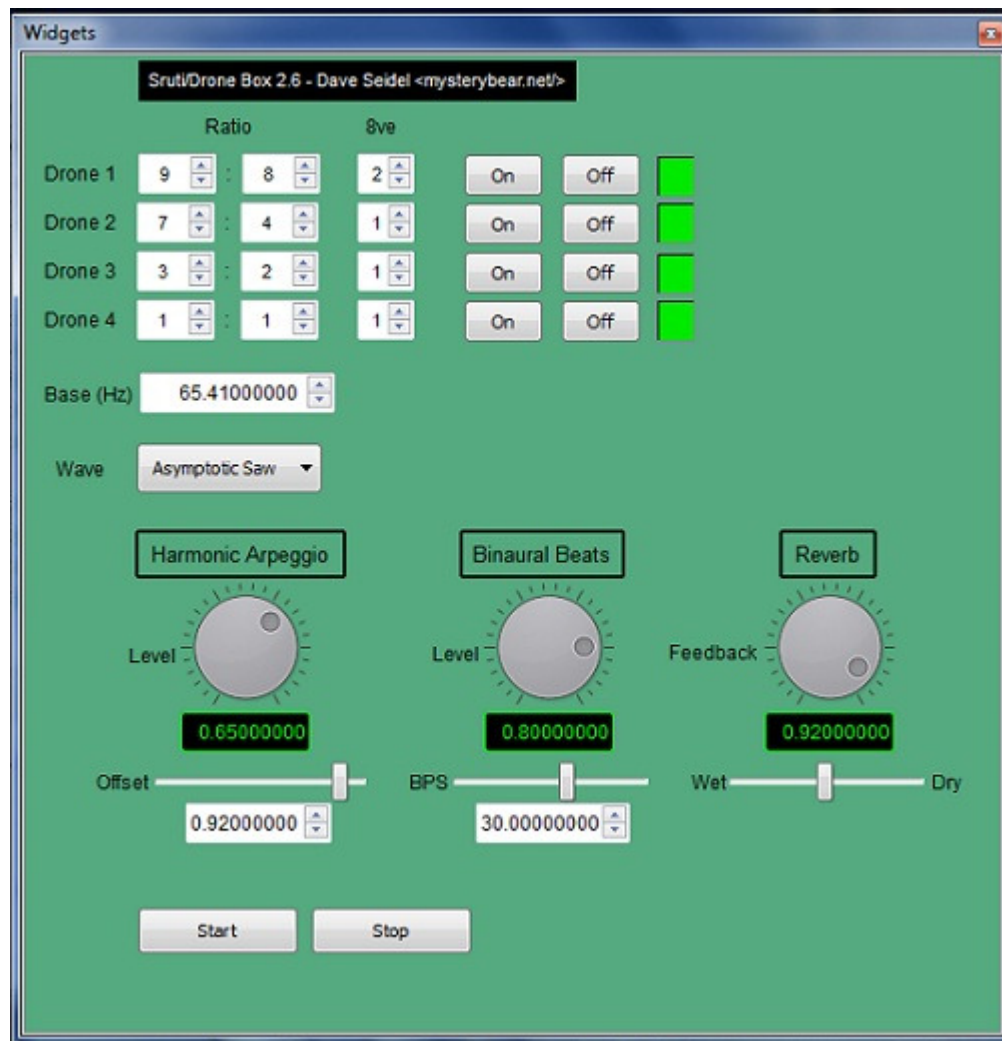
## **Scruti Drone Box 2.6**

Dave describes the Scruti Drone Box as follows:

“There are four different drones, each with its own pitch ratio and octave (relative to the base pitch, which is also settable). To play a drone, click its On button. Each drone has a green “LED” that lights up to indicate that it’s playing. Click Off to stop the drone.

- Use the Wave button to select a waveform; this is applied to all four drones.
- The Ratio, 8ve (i.e., Octave), Base, and Wave settings will not change any drones that are already playing. If you change any of these and want to hear the changes, turn the drones off and on again.
- There are three different effects: Risset harmonic arpeggio, binaural beating, and reverb. You may change any of these settings at any time, even when the drones are playing, and your changes will take place immediately.
- To disable the harmonic arpeggio effect, set its level to 0.
- To disable binaural beating, set its level to 0.
- To disable reverb, set the slider all the way to “Dry”.

Scruti Drone Box V 2.6 screen is shown here:



### Calculating the Drone Parameters:

Jukka's graphical score will allow several of the drone parameters to be determined by algorithm. Listed below are each of the variables that have been used to create the final sounds:

Base Frequency – The frequency of the drone is determined by a letter that appears in the score segment. The alphabet is arranged from A to Z in a spreadsheet and a number and pitch assigned to each. The pitches are A, B, C, D, E, F and G and these simply are cyclec through the entire alphabet – letter I, for example, is assigned to pitch B.

The base frequency of the drone is the pitch assigned to the highest letter. In the first score segment there are letters e, V and X. the highest of these is X, assigned to pitch C.

## **Octave:**

Once the pitch is established, its octave is based on the lowest number appearing in the score segment + 2. For the first score segment the lowest number appearing is 2, so the pitch is in octave 4 – this translates into a frequency of 261.63 Hz.

## **Duration:**

The duration of the segment in seconds is determined by the following formula:

$$\text{Duration} = (\text{highest number} * \text{lowest number}) + 15$$

Where the highest and lowest numbers are from the score segment. In this score the numbers run from 0 to 5 and this helps to create the algorithms so they do not fall out of range of the possible Sruti Drone Box parameters.

## **Arpeggio Offset:**

The Arpeggio Offset is a number between 0 and 1 and is determined as follows:

$$\text{Arpeggio Offset} = \text{highest letter}/26$$

The highest letter is the numeric value assigned by its place in the alphabet. Score segment #1, for example, has the letters e, V and X so the highest of these is X with a value of 24. This calculates to an Arpeggio Offset of 0.92

## **Arpeggio Level:**

The Arpeggio Level is also a value from 0 to 1 and is calculated as follows:

$$\text{Arpeggio Level} = 0.5 + ((26 - \text{lowest letter})/52)$$

The lowest letter in score segment #1 is E with a position in the alphabet of 5, so the Arpeggio Level calculates out to about 0.9

The level has been set to be at least 0.5 in this algorithm so that the effect can be easily heard. But this can be changed to taste.

## **Binaural Beats, BPS:**

This value may be set from 0 to 50, so the following calculation is used:

$$\text{BPS} = (\text{highest number} - \text{lowest number}) * 10$$

In this case the only number in score segment #1 is 2, so BPS = 0.

## Binaural Level:

The level may be a value between 0 and 1 and is calculated as follows:

$$\text{Binaural Level} = 0.5 + ((\text{highest number} - \text{lowest number}) / 10)$$

For score segment #1 the level is 0.5.

## Drone Parameter Spreadsheet

These parameter calculations lend themselves to a spreadsheet to keep track of the settings for each drone segment.

This is shown below for Score #2. The segments are labeled JPK1, JPK2, etc and were read from right to left in the graphical score image.

	A	B	C	D	E	F	G	H	I
1	JP Kervinen Score #1 - ImprovFriday 10-1-10								
2									
3	Letter #	1	2	3	4	5	6	7	8
4	Alphabet Pitch Converter	A	B	C	D	E	F	G	H
5	Pitch	A	B	C	D	E	F	G	A
6									
7									
8	Score Image	JPK1	JPK2	JPK3	JPK4	JPK5	JPK6		
9									
10	Lowest Letter	E	R	E	E	R	E		
11	Lowest Letter #	5	18	5	5	18	5		
12									
13	Highest Letter	X	X	V	X	R	X		
14	Highest Letter #	24	24	22	24	18	24		
15									
16	Lowest Number	2	0	0	0	2	2		
17	Highest Number	2	3	2	4	5	5		
18									
19	Base Frequency	C	C	A	C	D	C		
20	Octave	4	2	2	2	4	4		
21	Base Freq, Hz	261.63	65.41	110	65.41	293.66	261.63		
22									
23	Duration	19	15	15	15	25	25		
24									
25	Arpeggio Offset	0.92	0.92	0.85	0.92	0.69	0.92		
26	Arpeggio Level	0.9	0.65	0.9	0.9	0.65	0.9		
27									
28	Binaural Beats, BPS	0	30	20	40	30	30		
29	Binaural Beats Level	0.5	0.8	0.7	0.9	0.8	0.8		

## Creating the Drone:

The calculated drone parameters are loaded into the Scruti Box and each segment recorded for the duration required. These are saved as .wav files and can be loaded into Audacity in the sequence dictated by the score.

With some final shaping, fade-in and fade-out, etc the piece is ready for export to MP3.