

Filter IV – P.I.X.L. Study No. I

for 1 or more Tam Tam(s), 1 or more Cello(s), 2 or more sets of Cymbals (bowed), and 2 or more Voices

Michael Winter (2004)

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Notes:

In Filter IV, the signals of several sets of instruments are sent through a spectral filter. The filtered result is then output to speakers. Pictures are utilized to determine the amplitude of each passband and to determine location in space. The piece is a four-voice mensuration canon. It is Larry Polansky's Four Voice Canon No. 13 – DIY. I thank him for asking and encouraging me to write this piece.

Notes For the Tam Tam Player(s):

The Tam Tam Player(s) are the only instruments that are not filtered. They are to always play very soft, almost inaudible. They may play small swells lasting from 10 to 20 seconds. The sound radiating from the Tam Tam(s) is the silence of the piece. It is everywhere where the filtered instruments are not and should function as the ambient noise in a room.

Notes For the Cello Player(s):

The Cello(s) should sound continuously at a high dynamic. Bow changes should be as subtle as possible. If more than one cello is played, then the players should alternate down-bow strokes. If more than two cello(s) are played, each cello should bow on a different area between the end of the neck and the bridge to produce a fuller spectrum sound.

Notes For the Cymbal Players:

The cymbals are bowed throughout. Each player should use a set of cymbals that produces a diverse range of harmonic to quasi-harmonic timbres in a wide pitch range. Enough cymbals should be used so that no patterns are perceived and so all cymbals are allowed to ring freely before re-bowing. The performer should be bowing at all times moving as quickly as possible from the release of one bowing to the onset of another on a different cymbal.

Notes For the Vocalist(s):

All vocalists are matching pitches from the signal of another group fed through headphones. The Voice I group should try to match any of the pitches from the Bowed Cymbals. Transpositions at the octave are encouraged to exploit the range of a particular performer. The Voice II group may sing any of the pitches in the harmonic series of the

Cello(s)' low C. The pitches are notated in the score with a cent deviation (one-hundredth of a semitone) above the nearest tempered pitch in the traditional 12-tone equal tempered system and a harmonic number (located below the note). The performer(s) may choose any of the pitches within their range.

All vocalists, may sing on the a as in the English father. For the most part, tone durations should be more than one second and as long as possible under one comfortable breath. The players may occasionally perform mellismas from 3 to 5 tones within the aforementioned durations. In either case, the performer should enter and exit as imperceptibly as possible.

Stage Placement:

The Tam Tam(s) are the only instrumentalists that are not filtered. If one Tam Tam is used, then it should be placed center stage flanked by speakers. If several are used, they may be distributed in the space freely.

The unamplified, unfiltered sound from the Cello(s), Cymbals, Voice(s) I, and Voice(s) II should not reach the audience or each other. An optimum setup would be each group (represented by a staff in the score) placed in separate isolation booths on stage. These booths can be distributed in the space freely. Some bleed through the booths is acceptable as long as it is completely masked by the filtered signal from the speakers. An alternate option is placing each group in a separate room or area off stage.

Notes On The Pictures And The Electronics:

The pictures are data charts that are read live. Each color affects the input from a particular group of instruments.

Red – Cello(s)

Green – Bowed Cymbals

Blue – Voice(s) I and II

The pictures presented in the score are rather deceiving. They have been resized for optimum resolution in the score. Actually, the picture for the filters is 233 pixels on the y-axis and 633880 pixels on the x-axis and the pan picture is 1 pixel on the y-axis and 633880 on the x-axis. A printout of the pictures that includes all pixels may be obtained from me personally.

In the picture for the filters, each row represents one passband of approximately 21.5 Hz (actually $44100 / 2048$). Since there are 233 rows, the picture represents 0 to approximately 5017 Hz. Any higher frequencies should be completely attenuated. RGB values from 0 to 255 should be scaled from 0 to 1 and convolved with the incoming signal for each passband. This may be done by performing a live Fourier Transform (with a fft window size of 2048 samples for a sample rate of 44100 samples per second) and convolving each bin or by a similar process with a filter bank.

The picture for the panning also uses RGB values from 0 to 255. With a stereo speaker setup, 0 is full left and 255 is full right. However, if a multiple speaker setup is used, one can choose arbitrarily which locations 0 and 255 represent as long as all points in the space can be reached by the numbers between 0 and 255.

Both pictures are read from left to right at a rate of 1378 pixels per second. Thus the picture represents exactly 460 seconds.

The signals coming into each filter should be as strong as possible without clipping. Each group of instruments should be sounding as continuously as possible throughout the piece. To ensure this continuous sounding, instruments must be recorded into buffers (one for each group) and granulated before being sent to the filters. At all times, there should be 5 to 10 grains extracted from any part of the buffer that has been recorded. Granular durations should be between 5 and 15 seconds with Gaussian envelopes. Thus the instrumentalists must start playing and the buffers start recording 30 seconds before the filters are implemented and the pictures read.

An application that performs all of the aforementioned procedures is either included with the score or can be obtained. There is also a timer and a function that allows the user to zoom in on the picture so that one may view them at pixel size. Also included with the score, are 80 picture files (40 for the filters and 40 for the panning). These can be viewed by many programs or used to create an application like the one included with the score. They are numbered accordingly from left to right (I am currently trying to figure out a way to stitch them together for one big picture file).

Mixing and Signal Destinations:

Each group of instruments, except for the Tam Tam(s), plays into microphones. These signals should all be as strong as possible without clipping before being sent through the application. Also, the granulated signal from the Bowed Cymbals should be sent to all the vocalists in the Voice I group via headphones and the signal from the Cello(s) to the Voice II group via headphones.

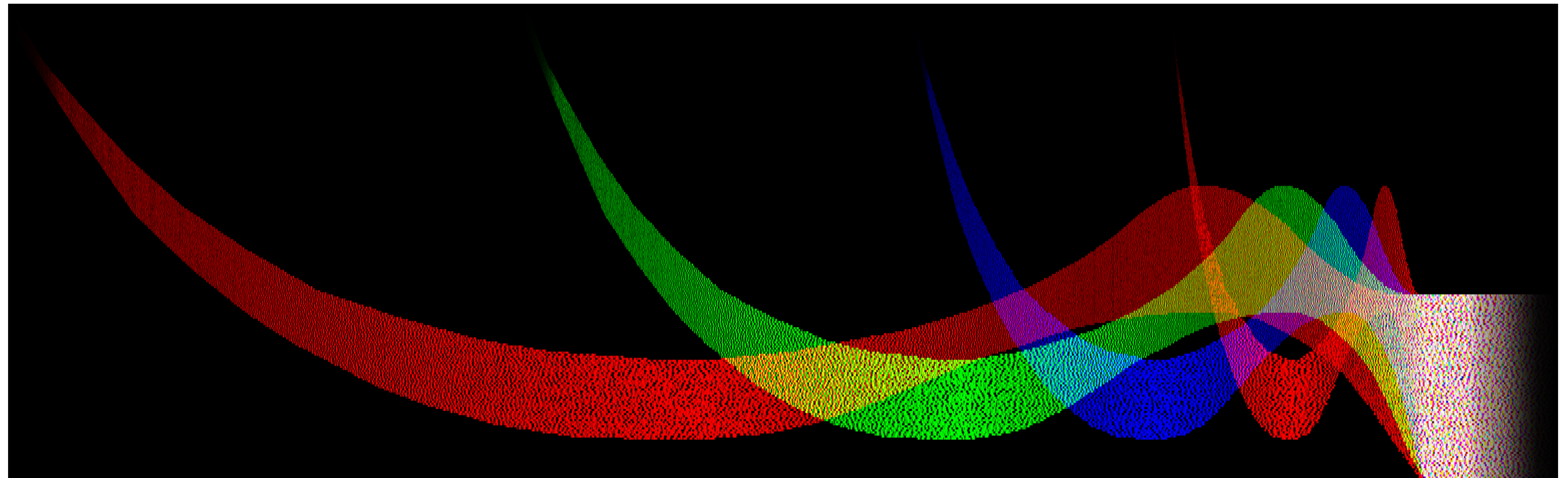
Each voice in the canon should always be as clear as possible. The mixer may have to compensate for the strength of the particular groups during the piece. In general, many of the instruments are weaker in the higher registers. It is important that the entrances of each voice in the canon be heard and that each trough be the focal region of the spectrum at that particular point in time.

Towards the end of the piece, at 450 seconds, the granulated signals from all groups except the Voice I group should be mixed in with the filtered signal. All groups should sound clearly, but the mixer may ride the faders to highlight different instruments. By 490 seconds, the granulated texture should be completely faded out just as the filtered signal fades out. During the final 30 seconds, just the Tam Tam(s) should be heard.

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Picture for the Filters



Picture for Panning



