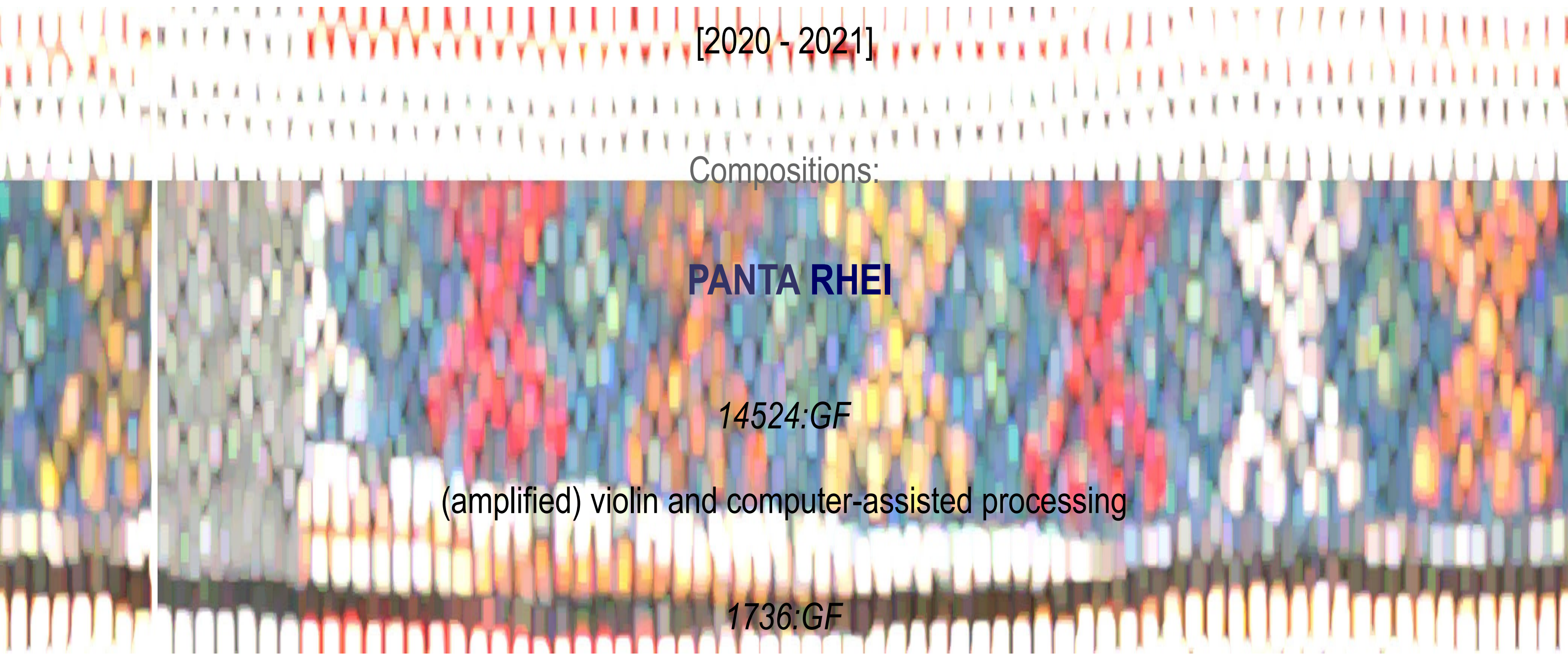
Composer / researcher:

Dimitri Voudouris

Composed:



[2020 - 2021]

Compositions:

PANTA RHEI

14524:GF

(amplified) violin and computer-assisted processing

1736:GF

solo (amplified) violin

Duration:

19 min 48 sec

Composition

The electronic section was composed of weaving data information relating to colour-intensity, spacing, dimensions related to weaving types as in angular, horizontal, vertical threading, deviations and dispersion obtained from power loom-driven automatic, and the violin part from manual systems. Software recognizing fabric profiles from fabric images linked to Matlab a programming numeric computing platform was used.

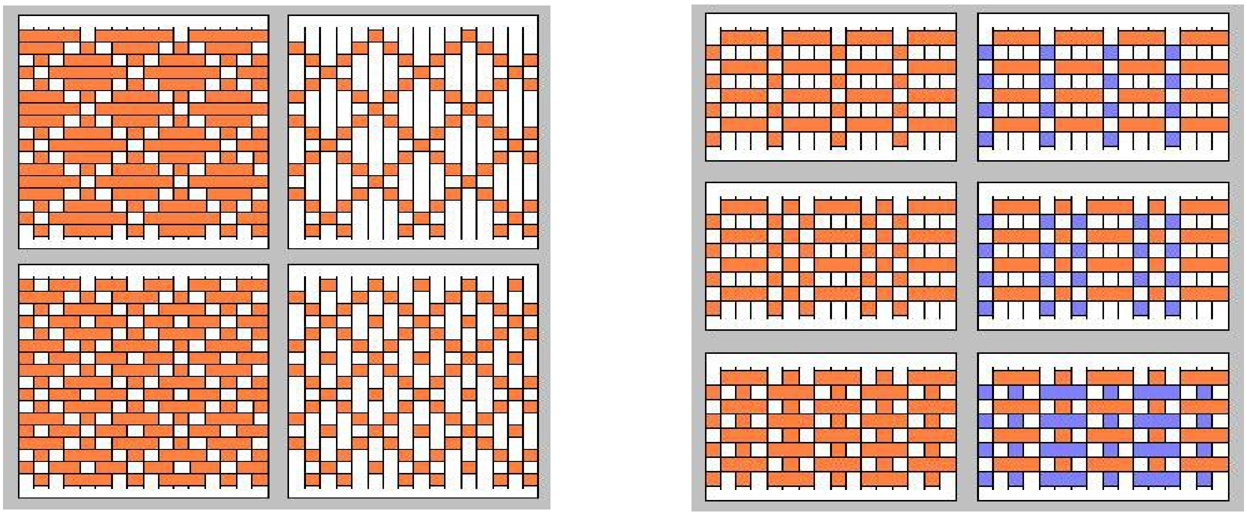


Fig1: A textile weave in which the filling threads pass over one and under two or more warp threads to give an appearance of diagonal lines.

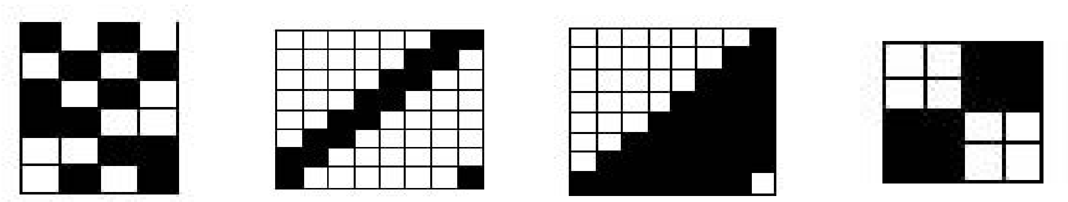
In Matlab graphic representations extracted primary fragments with a linear time restriction of 15 seconds – 40 seconds from the data population, these were further processed creating a greater variety of subordinates transforming them into various selective composition modules that can be expanded, extended in time, space and size.

Collectively micro-structure inclusivity based on different (waffle, jacquard, crape, stripped, Celtic) weave patterns created fragments of information that appears open on all sides and repeatedly assumes a state of motionlessness with the continuous interweaving sound patterns swelling and contracting in progression.

Extended bowing techniques, high hand positions, artificial harmonics, flautato notes played on the fingerboard near the bridge produced with the wood of bow by tapping it or drawing it across the instrument all within a dynamic range kept largely between p and barely audible ppppp the information can be extracted through various levels of concentration in the listening process.

In the construction of 14524:GF the aim was to establish a more inclusive experience of perception, the violinist was instructed to escape from the smoothness of the violin routine to produce a rougher more ambiguous natural instrumental sound reflecting on specific details such as threading and hand weaving motion. Various techniques were used to thicken the texture and increase the sonic intensity, employing electronics addresses the sound of mechanical weaving contrasted by conventional techniques assigned to the violin produce pragmatic cross-threading tensions these all add to the sonic intensity with the use of timbre and density. The slow pace of the electronics is further slowed down by the interplay of the violin allowing the intensity of these sonorities to resonate more strongly.

In the construction 1736:GF for solo violin, data collected originated from images of manual weaving patterns (colour, vector alignment, positioning, size). The practice of conventional weaving, scored for violin, was to sonically weave fragmented/disjointed sections of the puzzle together, the idea of opening up the work gives equal opportunities to colour and vector positioning linearly. In this tapestry of sound, the past and present became a vehicle of future reflection.



Crape weave *Twill weave* *Dice weave* *Basketweave*

Fig 2: Weave types

Data: *fabric parameter recognition software linked to Matlab*

Software developed fabric parameter recognition.

Microscopic images obtained from woven fabric are introduced to the software set to analyze.

- Pattern recognition, estimation of basic fabric parameters.
- Spacing, threads per unit length (fabrics having different numeric values).
- Colour representation of images.

Results were imported in Matlab to be analyzed, using several mathematical algorithmic processes a) Making non-deterministic computational tasks with reference to Gaussian probability density functions, pitch analysis in selecting, separating and isolating data. b) Euclidean geometry applied to a two-dimensional space.

1. Graphic images of vectors (like, unlike, coinitial. collinear, coplanar status) are created to guide the positioning of notation. These were derived from two-dimensional matrix surfaces from weaving patterns with various magnitudes and directions.

2. Image fabric colours are assigned to pitch values within the frequency allocation range of violin G, D, A, E. Colour representation of a fragment calculated by the image recognition software determines colour distribution between the open notes. Extended techniques for violin, as well as natural, artificial harmonics, are applied to establish variations in colour within parameters (G_2 - B_4) of notated range.

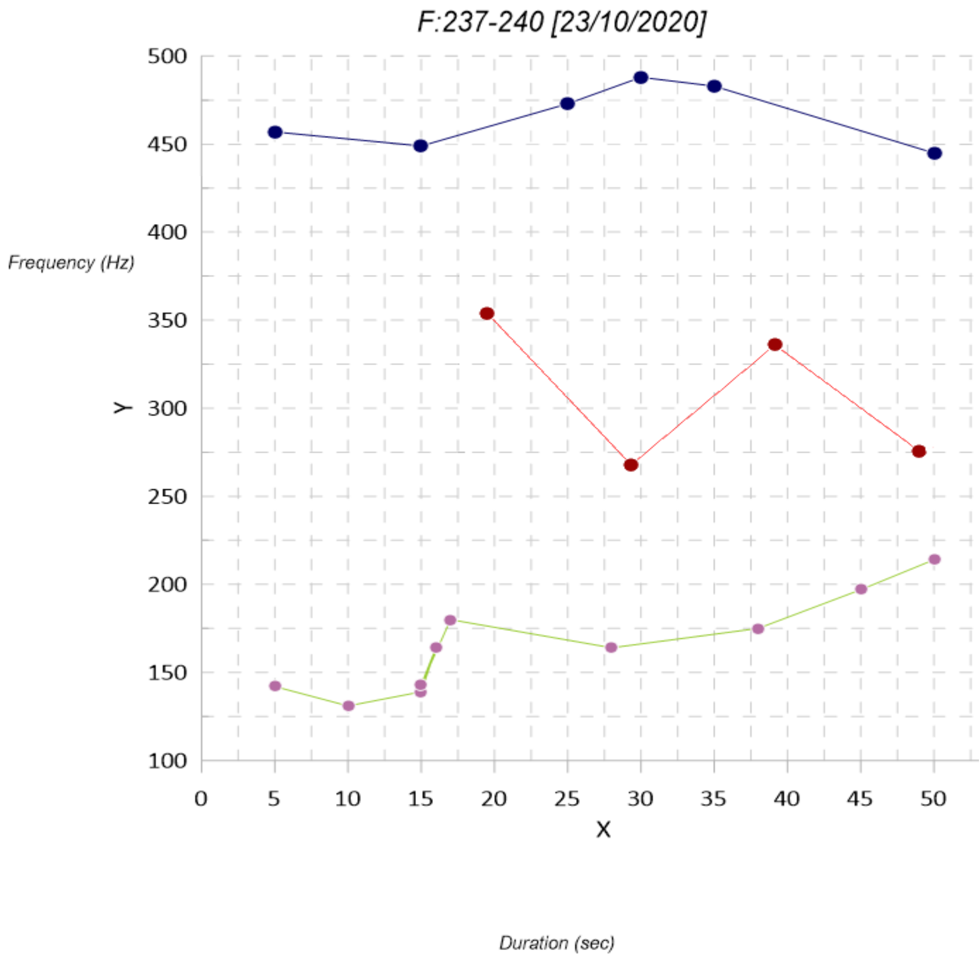


Fig3: Determining colour representation and pitch allocation for (fragment 237-240), establishing notation parameters for violin in Panta Rhei 1736GF

Probability calculations determined selection, separation, isolation and positioning suggestions (a stochastic fragmentation model developed by Beznea et al. (2015) describes the fragmentation phenomenon for an infinite particle system). A partitioning algorithm used determines the sequence of repetitions resulting in various orders of selective positioning of sound file segments that had similarities in velocity and duration, but different in density and pitch. This strategy produced 16260 isolated fragments which brought compositional order to the MIDI composition modules.

Formulas used by software to analyse fabric profiles:

Formulas used for weft and warp:

$$P(X)=\frac{1}{512}\sum_{yi=0}^{511}P(x,y_i)......P(Y)=\frac{1}{512}\sum_{xi=0}^{511}P(x_i,y)$$

Profiles P(x) and P(y) represent periodical discontinuous functions by a random value depending on the thread spacing.

$$f_t=\frac{a_0}{2}+\sum_{ji}^{\infty}a_j\cos jt+b_j\sin jt,\, t\,\varepsilon(-\pi,\pi)$$

Due to irregularity fabric surface, the initially determined profiles are then smoothed using the method of estimation by the Fourier series.

$$Px=\frac{\hat{a}_0}{2}+\sum_{1<j<l_n}\hat{a}_j cosj\left(-\pi+\frac{2(x-1)\pi}{512}+\hat{b}_j\right)sinj\left(-\pi+\frac{2(x-1)\pi}{512}\right)$$

$$\hat{a}_j=\frac{1}{\pi}\sum_{i=1}^{n}P_{(x)}\frac{2}{j}\sin\frac{2\pi j}{512}\cos\left(\frac{2_x-514}{512}\right)\pi j...............\hat{b}_j=\frac{1}{\pi}\sum_{i=1}^{n}P_{(x)}\frac{2}{j}\sin\frac{2\pi j}{512}\sin\left(\frac{2_x-514}{512}\right)$$

Parameter (ln) is an important Fourier estimator calculated:

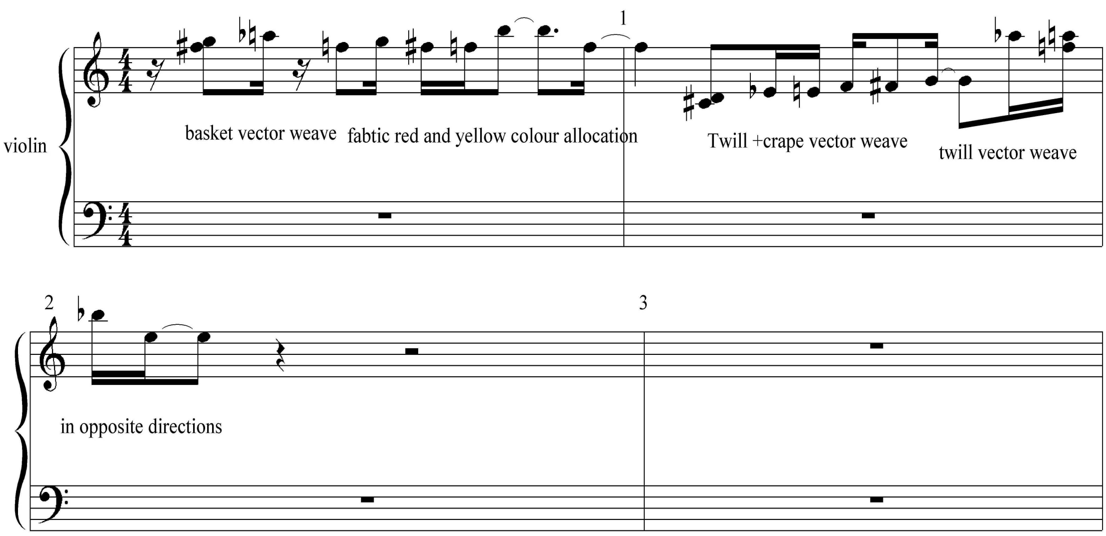
$$l_n = c\sqrt{n}$$
$$c = |f(\pi) - f(-\pi)| / 2\pi\sigma$$

Threads spacing and the number of threads per unit length

Calculate the yarn spacing, convert the value of spacing in mm, calculate the number of threads per unit length, The spacings converted to (mm/sec), are placed as pauses or silence in the composition.

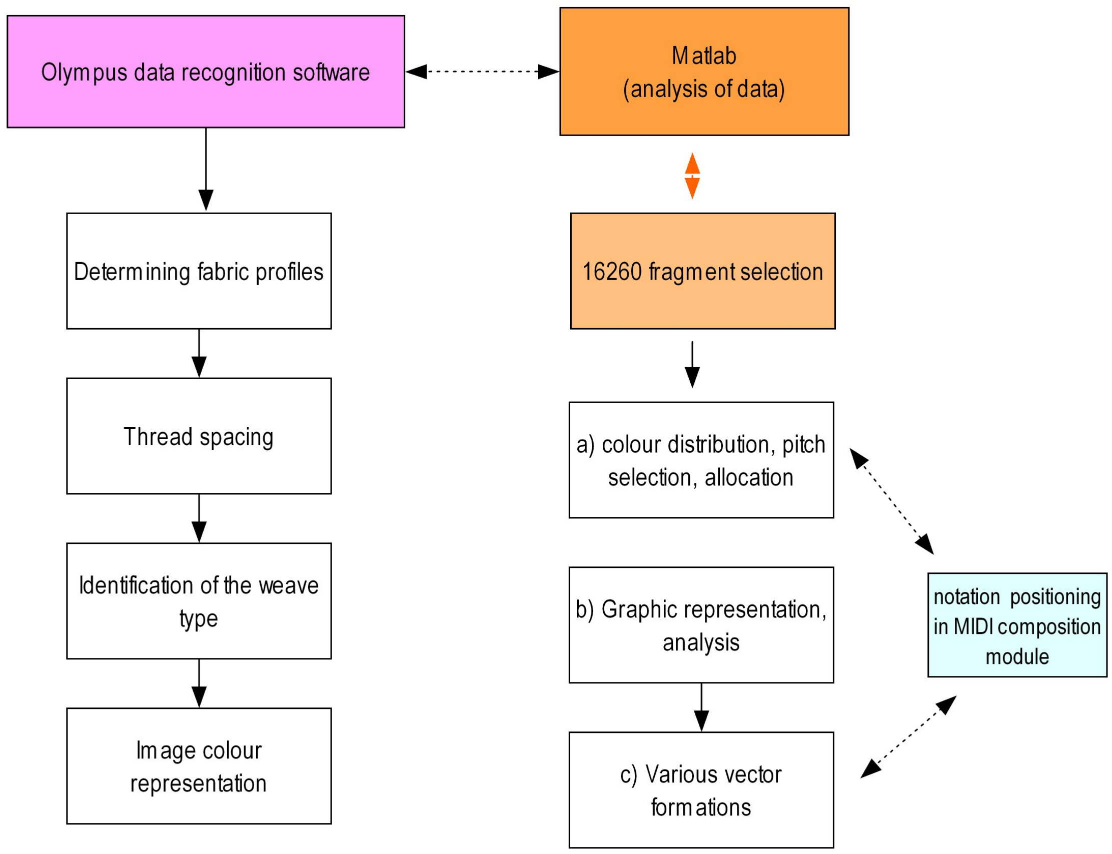
$$A^p_{oi} = minwarp_{1+l} - minwarp_i$$
$$A^p_{wi} = minweft_{1+l} - minweft_i$$

$$where: A^p_{oi} - ith\ value\ of\ yarn\ spacing\ for\ warp$$
$$A^p_{wi} - ith\ of\ yarn\ spacing\ for\ weft$$



Fragments of notation

Fig 4



Data representation in the composition module

Fig 5

NOTE	FREQ (HZ)	+40 OCT. (THZ)	WAVELENGTH (NM)	R	G	B	Colour
F♯4	370	407	737	174	0	0	dark red
G4	392	431	696	255	0	0	red
G♯4	415	457	657	255	0	0	red
A4	440	484	620	255	102	0	orange-red
B♭4	466	513	585	255	239	0	yellow
B4	494	543	552	153	255	0	chartreuse
C5	523	575	521	40	255	0	lime
C♯5	554	610	492	0	255	242	aqua
D5	587	646	464	0	122	255	sky blue
D♯5	622	684	438	5	0	255	blue
E5	659	725	414	71	0	237	purple/blue
F5	698	768	390	99	0	178	indigo

Fig 6: *Musical notes to colour variations*

Involuntary perceptions cross over between senses (tasting shapes, hearing colours, etc.) sensory triggers that consistently and predictably cause interplay between senses (e.g., every time you see the letter A, you see it in red) are common symptoms of synesthesia experienced amongst certain individuals.

The repeated aural minimalistic complexity of Panta Rhei in its sonic mass seems to move in reverse challenging time and concentration by reducing its logical existence in space thus the term "all is flux" (Heraclitus).

References:

1. Kinoshita, M., Hashimoto, Y., Akiyama, R., Uchiyama, Determination of Weave Type in Woven Fabric by Digital Image Processing, Journal of the Textile Machinery Society of Japan, Vol. 35, No. 2, 1-4, (1989) .
2. Joseph M.L., Introductory textile science, Fifth edition CBS College publishing, USA, 1986.
3. Epps H.H. and Leonas K.K., The relationship between porosity and air permeability of woven textile fabrics, Journal of testing and evaluation, JTEVA, Vol. 25, No.1, 108-113, January 1997.
4. Scheidegger, A.L., "The Physics of Flow Through Porous Media," University of Toronto Press, Toronto (1974).
5. Skinkle, J.H., "Textile Testing: Physical, Chemical and Microscopical," Chemical Publishing Co., New York (1949), pp. 90-91.
6. Hsieh, Y.L., "Liquid Transport in Fabric Structures," *Textile Research Journal,* 65 (5), 299-307 (1995).
7. Davis, N. C., "Factors Influencing the Air Permeability of Felt and Felt-Like Structures," *Textile Research Journal,* 28 (4), 318-324 (1958).
8. Beznea, L, M Deaconu & O Lupascu (2015). ‘Branching processes for the fragmentation equation.’ *Stochastic Processes and their Applications*, 125:1861–1885.
9. Kothari, V K. & A. Newton.. "The Air Permeability of Nonwoven Fabrics," *Journal of the Textile Institute,* 65 (8), 525-531 (1974).