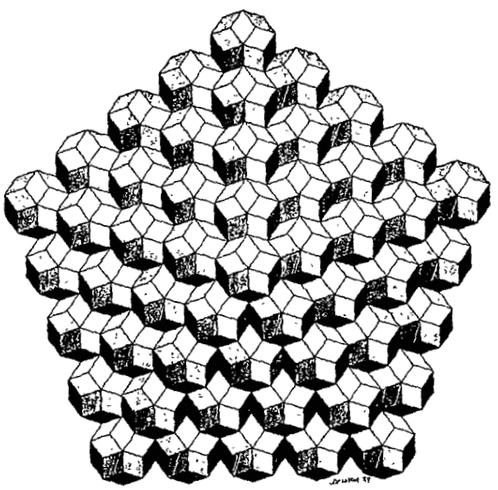
Symmetry of STRUCTURE

an interdisciplinary Symposium

Abstracts

II.



Edited by Gy. Darvas and D. Nagy

Budapest

August 13-19, 1989

hungary

Music of Colour and Form, Music of Moving Images

by Yu. Pukhnachev

"Plastic music", "music for the eye", "music of colour and form" are notions that have some history. They represent a new art operating with visible melodies thought of as the analogues of the sounding ones.

It was Aristotle who wrote that colours due to their harmony can be related like musical chords. As far back as 1734 a French monk L.Castel created a colour clavecin based on simple correspondence between the notes of the scale and the colours of the spectrum.

In 1910 A.Scryabin finishes his symphony "Prometheus". The upper line of the score is marked "Luce" meanining the part of colour. Cherishing the dream to combine music and colour the composer begins a new symphony but dies prematurely in 1915 and the work is unfinished.

In the recent years colour music becomes more popular and developed. T.Wilfred (USA), A.Laszlo (Hungary), N.Cheffer (France), N.Mc Lareen (Canada) along with the Soviet representatives K.Leontyev, M.Malkov, B.Galeyev, Yu.Pravdyuk, S.Zorin can be named among those who contributed to this development.

New books are published on colour music and practically each of them contains an unhappy statement on the absence of beautiful pieces of the art of musical colour. No masterpieces have appeared yet.

Where do new possibilities lie for overcoming the difficulties the colour music experiences at the present time? One such possibility is to find new development trends based on wide-sense interpretations of the notion of colour music.

Let us draw on the screen two coordinate axes. Our screen will be the set of points of the coordinate plane each point having an arbitrary colour and brightness. Any disagreement in colour between two neighbouring points is an element of form. This statement can easily be proved by contradiction: if the colour of the screen does not change from point to point we will see no image.

So we add the third time axis to the two we already have. To be at home with the situation we arrange the images as a vertical chain of small frames appearing on the screen at consequtive moments of time. We make a pile of those frames and then imagine the pile to stick into a compact bar.

A rising sun against the blue sky. On a film the disc of the rising sun will appear at a still greater height in each of the consecutive frames. If we then pile the frames up and stick them into a compact bar the discs will make an oblique cylinder inside the blue contents of the bar.

How is the movement represented in such models? Any disproportion in colour between two points arranged one above the other on the time axis is an element of movement. We again can prove this by contradiction: there is no movement on the screen if the colour of the screen is unchanged with time.

Such a treatment of movement is a universal generalization taking into account physical displacement, brightness and contrast variations, i.e. all the changes that take place on the screen. We assume, of course, that every point of the three-dimensional space-time model has an arbitrary colour and brightness.

We now take any other moving object and register the phases of its movement in a series of consequtive frames. Piling up the resulting flat images layer by layer we will obtain a three-dimensional body. We will call thus obtained bodies the images of movement.

When movement is treated in a generalized way rather than as a simple physical displacement general-type images are obtained (multiply-connected, with blurred boundaries, etc.).

We now define the music of colour and form, the art of plastic melodies as the skill of processing and montage of the images of movement.

What technical means can be used to create and reproduce plastic melodies?

We begin with the modern equipment for colour music. Two principal directions can be singled out.

First is to create images of colour music in any possible way and then fix them on a film by any mechanical device. Numerous effects can be achieved but improvisation while reproducing the melody is almost out of the question.

Second is to reproduce the melody directly by the player. The whole process is built on improvisation but the number of devices reacting quickly enough to the tempo of the player's music is rather limited (it can be a flexible film reflecting or refracting the light incident on the screen).

A new approach based on the understanding of movement images will,

in the author's opinion, strengthen the merits of the two directions mentioned above and diminish their demerits.

Let an image of a certain movement obtained by any means used in colour music be shown on a screen. Any light-sensitive device can read out the moving image and load it into a computer memory, the way a TV image is recorded on a video. Now the computer memory stores the information on the brightness and colour of every point of the screen in every point of the screen in every moment of time and thus stores the model, or image, of the movement reproduced on the screen.

Certain regions of the three-dimensional model will correspond to certain phases of the movement. We separate out the key movement phases and the corresponding key regions of the image. We then take in every such region a characteristic point whose shift and change of colour would cause a deformation and change of colour the whole region according to a certain program.

We must now reproduce on the screen the moving image stored. Let the computer, in accordance with the information it has on the image, control the colouring of every point on the screen in every moment of time while the player sets the shifts and changes of colour for characteristic points (and hence for key regions). Then in reproducing the image of movement we will get the same degree of improvisation the pianist enjoys when he hastens or slows down his tapping of the keys while playing from a score.

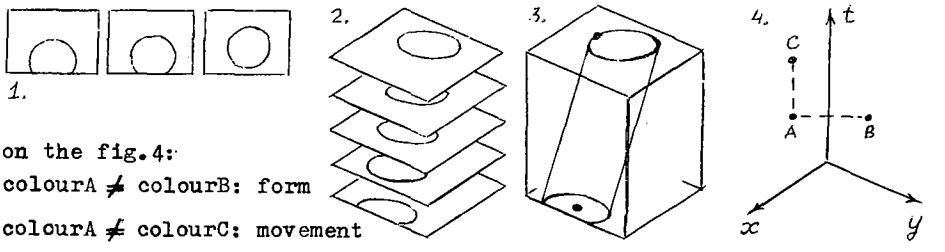
For an example we again turn to the oblique cylinder representing the movement of a rising sun. In such a simple case the configuration of the whole image (i.e. the diameter, height and inclination of the cylinder can be given by only two points. This corresponds to the mathematical description of the cylinder containing six parameters).

Let us imagine the control panel of a plastic music performer the music being considered as a body of moving images. The panel consists of a few screens allowing a lead and demonstrating what will happen on the auditorium screen in 8, 16, 24, 32 and more clock times. In order to correct in advance a certain movement image appearing on a leading screen the performer simultaneously pushes the pedal under the screen and the panel button that addresses the program processing the corresponding image. The image is reproduced in a quick tempo on the right large screen of the panel. In the key phases of the image evolution the performer strikes the key elements of the images on that screen with the fingers of his right hand. The screen is provided with sensing elements and a new position of the characteristic points de-

termining the configuration of the whole image is defined. The whole image is reconstructed by the processing program accordingly. Simultaneously striking certain points of the left large screen (indication colour and brightness) with his left hand, the player determines the new colour of the key regions under reconstruction. If there are no correcting strikes the moving image is reproduced as stored in the computer.

If the plastic melody contains a few movement images their reproduction should better be performed by separate players each having his own panel (the way different musicians of a symphony orchestra are entrusted with different musical instruments). A conductor is responsible for the synthesis of all the images into a single plastic melody.

A variety of melodic trends of plastic music makes the performers play in harmony or even makes them compete when improvising (the competition being the more fascinating since its rules are defined by the conductor and are not entirely clear to the competitors). Such music is related to the traditional symphonic music, to a sports competition and to a scientific experiment. Developing and perfecting it could become a rich and colourful art.



on the fig.4:
colourA ≠ colourB: form
colourA ≠ colourC: movement

Separate frames showing sunrise (1) are piled up (2) and stuck into a compact cylinder (3). The resulting oblique cylinder is the image of the sun movement. Its dimensions and inclination can be given by only two characteristic points (marked fat). It is convenient to view movement images as three-dimensional bodies in space the x- and y-coordinates lying in the plane of the screen with time as the third coordinate (4).

Literature:

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