TRAMA: BUILDING RHYTHMIC LAYERS OF TIMBRE

Felipe Otondo
Music Research Centre
Department of Music
University of York
fo500@york.ac.uk

ABSTRACT

The purpose of this text is to expose the main musical ideas and electronic processes used for the realisation of the piece for clarinet and live-electronics *Trama*. The following text presents the motivation of the piece, the rhythmic ideas behind the musical structures developed through the piece, the real-time processes used for the transformation of the timbre of the clarinet, and, finally, the use of space in connection with the transformations of timbre.

1. INTRODUCTION

Trama is a piece for clarinet and live-electronics consisting of two parts, a gradual expansion and contraction of the performing registers of the instrument in relation to timbral changes developed in rhythmic structures by means of electronic processes.

The main purpose of the piece was to work with the sound of the clarinet using electronic transformations as a way to enlarge the timbre of the instrument in its different registers. For this purpose rhythmic structures were developed in the piece as textures that can integrate and dissociate the changes of timbre of the instrument through the registers. Figure 1 shows a chart of reciprocal interactions, illustrating the motivation of the piece.

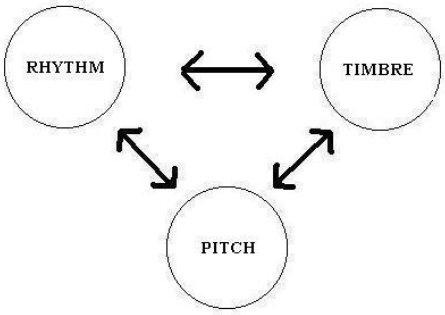

Figure 1. Reciprocal interactions between rhythm, timbre and pitch used as a motivation for the piece.

2. LAYERS AND CONVERGENCE OF RHYTHMS

The initial idea of the piece was to create rhythmic textures that could help to perceive the timbral expansion of the register of the clarinet and be used as a structural basis for the evolution of the piece. For this purpose textures of three rhythms that converge to a single voice were built by overlapping events. As the performing register of the instrument expands in the three registers (chalemau, throat with clarino and high-tones), the rhythms of each of the layers change continuously in form and tempo relating more distinctively to each of the registers. In this way, as the expansion takes place, the associations of the particular rhythms of each layer of the texture with each of the registers become more clear with rhythm 1 in the chalemau register, rhythm 2 in the throat with clarino register, and rhythm 3 with the high tones. The basis for the individual rhythms used for each of the layers of the overall texture was obtained by overlapping rhythmic motives from a table of Hindu talas [1]. Each rhythmic layer of the texture was created by means of alternating cells of talas motives in repetition, as the texture evolves in form. The durations of the units of the motives were modified as a way to produce asymmetrical changes in the global perception of tempo in each of the layers that fuse into the final rhythm sequence played by the clarinet without changing the performer's tempo of the piece. Figure 2 shows the beginning of the piece and the way in which the rhythmic sequence played by the clarinet (upper voice) is created as a rhythmic superposition of units from the three different rhythms of the texture associated with the three registers mentioned before. The figure also shows the three different types of rhythmic motives used for each layer of the rhythmic texture, each one with a specific number below each line, and the units used for each of the motives. Table 1 shows a summary of the rhythmic motives used in the piece and table 2 shows the use of these motives throughout the piece for each of the rhythmic voices of the texture with their particular changes in units duration.

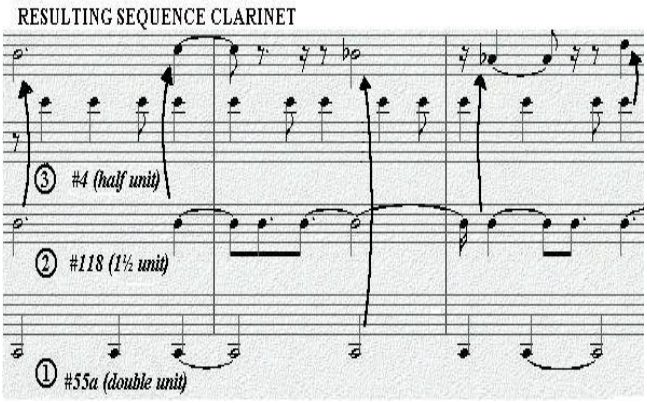

Figure 2. Creation of the rhythmic sequence played by the clarinet (upper staff) as a superposition of the three layers of changing rhythms in the texture with different talas numbers and durations of units.

Number Tala	Notation	Number Tala	Notation
3		90	
4		101	
6		112	
55a		116	
87		118	
88			

Table 1. Types of rhythmic motives used in the piece obtained from the catalogue of talas of Sharngadera [1].

Layer	Evolution of motives and units' durations						
1	4	87	87	3	112		
	½	1	1/2	1	1		
2	118	118	88	116	118		
	1 ½	1/2	1	1/2	1		
3	55a	112	101	90	6	87	55a
	2	1	1	1/2	1/2	1	1
	TIME						

Table 2. Rhythmic layers of the network with numbers of talas motives used throughout the piece with the durations of the units for changes in the perceived tempo.

3. ELECTRONIC TRANSFORMATIONS OF CLARINET' S TIMBRE

The live-electronics of the piece was used as a way to develop electronic processes and transformations, allowing integration or contrast of the original sound of the instrument with related and non related sonorities. For this purpose an algorithm was built, using as a basis the convolution of the original sound with samples of the same clarinet or other wind instruments [2]. The idea was to create two parallel convolution processes that could convolve the original sound of the instrument according to the relations of this sound with two samples in terms of timbre, register and pitch. It was thus intended to create the algorithm as an axis of interactions of timbre, pitch and registers that changes in sections as the piece evolves.

Initially the pitch of the samples used for the convolution is close to the fundamental in the central clarino register as a way to create subtle sonority nuances and to blend as much as possible the clean sound of the instrument with the processed sound. As the piece evolves, the pitch of the tones played on the instrument starts to cover the three registers of the instrument, while the pitch of the two samples is located in different dispositions, thus creating an array of harmonic and non-harmonic relations that expand and contract in the whole performing register. This creates a network of interactions parallel to the network of rhythmic ones, the two being connected by the three registers as an imaginary centre of gravity for changes.

At the beginning of the piece the samples used as a basis for the convolution are mostly sounds of a clarinet, but as the piece evolves the network of pitch interactions incorporates the sounds of other wind instruments such as bass clarinet, alto clarinet, alto saxophone and bass trombone. This was done assuming that the more similar the timbre of the samples to the one of the clarinet the better the blending that could be achieved and, vice-versa, the more different the timbres, the greater the contrast that will be created. Fig 4 shows a diagram of the evolution of the clarinet pitch with different samples used for the convolution at the beginning of the piece.

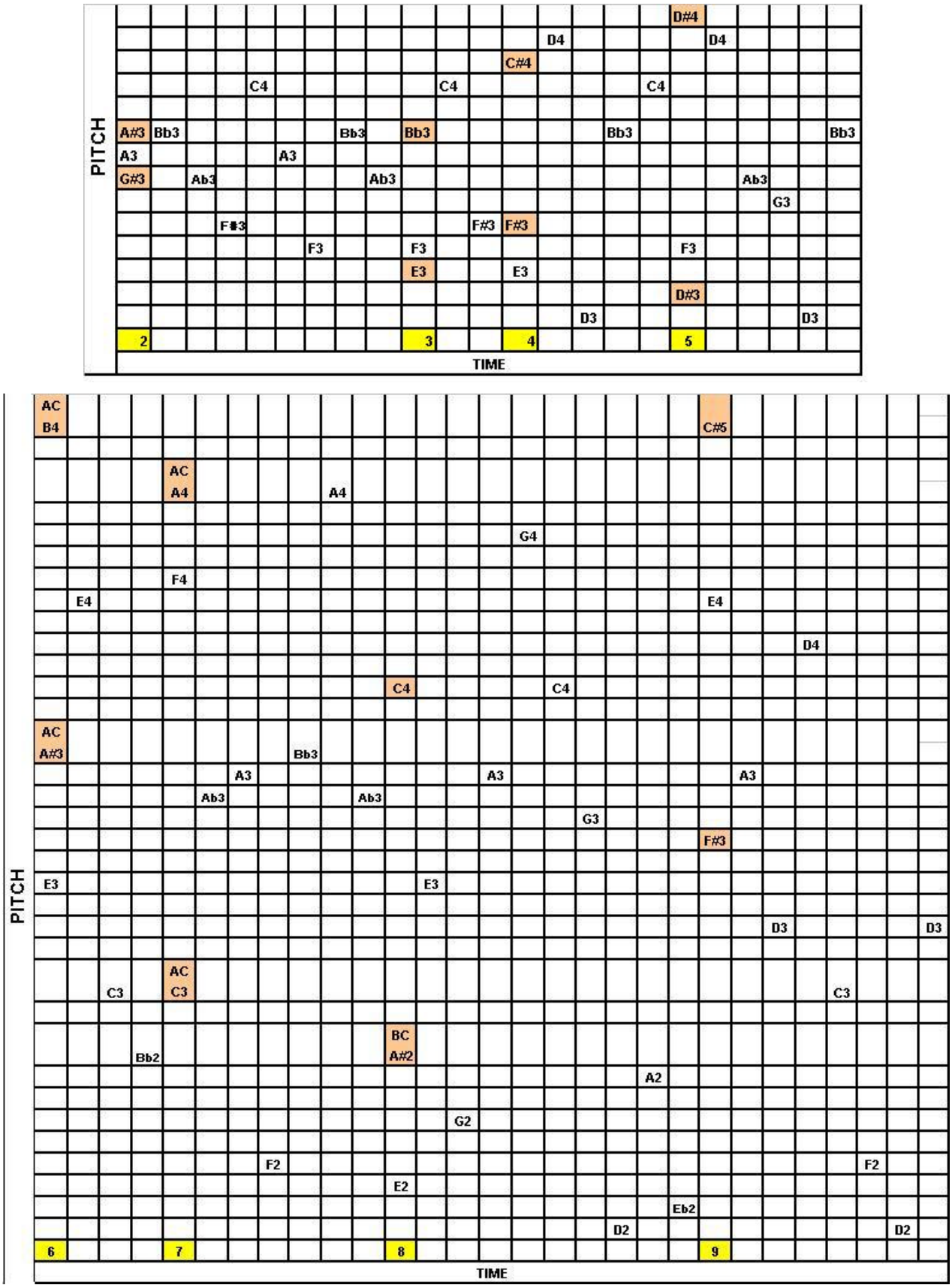

Figure 3. Evolution in time of the pitch of the clarinet and the pitch of the two samples used for the convolution at the beginning of the piece. The notes in bold are the ones played by the clarinet and the pitch of the samples is shown in shaded squares. The numbers at the bottom show changes in the samples in terms or timbre. The notes with the inscription AC and BC correspond to samples of tones from an alto and a bass clarinet.

As shown in the figure, the pitch of the samples changes in the different sections of the piece. As the pitch of the clarinet changes, the pitch of the samples changes, too, being over or below the pitch of the clarinet, mostly as way to relate to the high and low registers associated with the rhythmic layers mentioned before. These types of associations are not strict and it can happen that the two pitches of the samples group over or below the note played, creating tonal relationships in the high or low registers. It can also be seen that as the piece evolves, the pitch of the samples changes more dramatically and samples of other instruments such as bass and alto clarinets are used to create timbral contrasts.

4. TIMBRE AND SPACE

The use of space in the piece was inspired by the idea of timbre development and expansion in the registers of the instrument explained in the previous sections. As the pitch of the instrument expands and different rhythmic fragmentation cells start to associate with the particular registers, space starts to open in terms of localisation of sound events between loudspeakers. The clean sound of the instrument (without electronic transformations) was chosen as a spatial reference in the centre of the loudspeakers so as to allow the greatest spatial integration of the radiated sound of the instrument and the transformed sound radiated through loudspeakers. An extra loudspeaker is recommended in front of the performer in order to reinforce this integration in the performance.

The spatialisation of the piece was designed in such a way that transformed sounds related to the two sound samples used for the convolution would be located in different positions within the loudspeakers array throughout the piece, according to the pitch performed and the expansion of the register of the instrument. For this purpose a spatialisation model was designed considering the variation of two parameters that change in the different sections of the piece: openness and spatialisation oscillation frequency. The model is based on combinations of sinusoidal oscillations that control the position of the transformed sound within the two loudspeakers, changing the wideness of the oscillation and its frequency in the different parts of the piece according to the different rhythmic and tonal relationships mentioned before. Basically, the oscillation frequency has been related to the duration and density of the performed tones and the openness of the oscillation has been related to the openness of the register. That is how in the initial part of the piece, where the tones are long in the central register, the frequency is very low and the openness is minimal, focusing in the centre of the loudspeakers where the clean sound of the instrument is located as a way to reinforce the timbral integration in space. As the piece develops and the three registers of the clarinet become active following the rhythmic patterns, the space unfolds with short impulsive sounds distributed throughout the performing pitch range of the clarinet. In this evolution the oscillation frequency is high and the openness maximum, facilitating contrast and fragmentation of sounds in relation to rhythms. Figure 4 shows the basic idea of the expansion of the spatialisation model at three different points in the piece following an increment in openness and oscillation frequency.

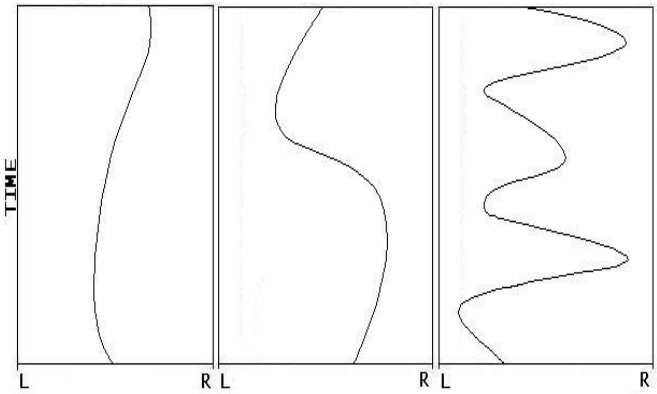

Figure 4. Example of the evolution of the stereo spatialisation in three different parts of the piece for similar time duration. The vertical axis of the figure corresponds to time that is related to the oscillation frequency and in the horizontal axis the distribution of sound within the left (L) and right (R) loudspeakers related to the openness of sound events.

5. CONCLUSIONS

Rhythmic textures of layers of changing rhythms can be effectively used as structures to build simple and complex compound rhythms to be played by a single instrument.

Electronic processes can be used to expand the timbral diversities of the sound of the clarinet and combined with rhythmic structures can generate interesting possibilities for fusion and contrasts in sonority and spatialisation.

6. REFERENCES

[1] Johnson, R. S. *Messiaen*. J.M. Dent & Sons, London, 1975 **(**appendix II**).**

[2] Otondo, F. and Soto, J. "Using the convolution the convolution to blend brass timbres", Journal of Music and Meaning (online journal), 1, 4, Fall, 2003. http://www.musicandmeaning.net/issues/showArticle.php?artID=1.4