Norman McLaren's Animated Film *Rythmetic* as Temporal Art

KURIHARA Utako
Seinan Gakuin University, Fukuoka

1. Introduction

Norman McLaren (1914–1987) was a Scottish-born Canadian experimental animator and film director known for his work in the National Film Board (Office National du Film) where he played a commanding role from 1941 to 1982.

Besides filming without a camera or microphone and using his scratch sound system, McLaren's aesthetic belief in animation is legendary: "What happens between each frame is more important than what happens on each frame"[1] and "How it moved is more important than what moved"[2]. The animated art, which he defined as "the art of manipulating the invisible interstices that lie between the frames"[3], was not a spatial subject but a temporal one for McLaren. Such notions are reflected in his own compositions for his animated films *Neighbours* (1952), *Rythmetic* (1955), and *Synchromy* (1970). In particular, the titles of the last two works suggest his intention to explore beyond the traditional notion of film art by combing words like rhythm and arithmetic (to form "rythmetic") or synchronicity and chrome (to form "synchromy"). However, the artistic dimension of *Rythmetic*, on which he collaborated with Evelyn Lambart (1914–1999), has not been fully evaluated unlike that of *Synchromy*, which is always refered as his representative work. For instance, in a special issue of *Séquence* for McLaren in 1975, *Rythmetic* was classified as a film not for "aesthetic pleasure" but for "information and education"[4] and Collins depicted this work as an arithmetic lecture or communicative stress management through image:

> Following on the heels of a teaching assignment in India for UNESCO, this amusing non-verbal lecture on the subject of mathematics reveals McLaren's feelings about the inadequacies of communication between peoples of different cultures and languages. After toying with several different ideas for making a truly international films, he settled on Arabic numerals as probably the most understood method of communication, far more so than any other alphabet. [5]

However, if an average to above-average animator comes to grips with practical purposes such as arithmetic education as a delegate of UNESCO, would he choose a simple presentation of redundant calculation as "1 – 1 = 0 = 0 = 0" for over 8 minutes?

In *Rythmetic*, we see mechanical actions and anthropomorphic gestures made by figures and symbols of arithmetic operations, and we hear rhythmic music with clicks or scratching sounds made by ink directly painted on the soundtrack. As far as the aspect of "what moved" is

concerned, it is certain that the image of bright figures against a dark background effectively brings to mind the blackboard in the classroom, and that the process of filling the blackboard with calculative figures is reminiscent of an arithmetic lecture. We could be struck with wonder at the well-regulated placement of the figures and symbols and numerous calculations on the wall-to-wall screen, in addition to the continuously moving and changing nature of the animation. Moreover, the order of mathematical expressions and the disorder created by the clashing and clanging of the figures and symbols are also noteworthy. But how did such an educational—say, mediocre—movie could win seven awards at international film festivals?[6] In addition, the 8-minute 40-second-long *Rythmetic* is among McLaren's longest animated works[7].

Now, we consider the aspect of "how it moved" in order to see how the redundant actions in *Rythmetic* would be regarded as the imaginative manifestation of McLaren's rich originality.

2. Basis of our analysis

In order to reveal how this long movie avoids mediocrity, this paper adopts a temporal perspective to analyze McLaren's paper-cut animation in *Rythmetic*, the rhythm of the figures' appearance, and the order in which the screen is occupied. The basis of our analysis is the depiction (originally in French) on the catalogue for the Office National du Film.[8]

> It contains the crazy dance of arithmetic elements. The figures behave like clowns: they are evasive, and they shake and swing at a furious rhythm. But like the policemen, the symbols "plus," "minus," or "equal" fight the arithmetic operations in the cause of justice and order. [9]

We now focus on the description "the crazy dance of arithmetic." This expression indicates that the normativity and deviancy in *Rythmetic* are focused on arithmetic elements. However, it is not obvious from this brief description that the arithmetic elements go mad or the clown's dance is brought to order by the policemen. In the subsequent chapters, we will explore how such order and deviancy raise aesthetic contentment. How this work captivates the audience will be explained through a description of the synthetic process of dichotomy: arithmetic as the symbol of order and dance as the symbol of playful disorder.

While the length of the work, including the credit roll, is 8 minutes and 40 seconds, this paper analyzes the most important part: from 33-second mark, where the background of the title turns from red to royal blue and the arithmetic figures appear, to 8-minute 19-second mark, where the background returns from royal blue to red (henceforth abbreviated as 0:33–8:19).

3. Two aspects of the "crazy" dance

The crazy dance of figures and symbols in *Rythmetic* has two aspects: the mutation of the figures themselves and their intervention of each other.

The figures' mutation includes the expansion/contraction of figures 0, 2, and 3 and the

bending of figures 4, 5, and 7, as well as their rolling. Such mutation makes the figures resemble a human body wrenching and scratching his or her head or back. That is why the cataloger of the Office National du Film personified the figures as clowns. To display such a mutation, McLaren and Lambart manufactured a few hundred variations of each figure with white cardboard, ranging from 1.5 to 4 centimeters[10], although today, we can probably accomplish this task using computer graphics.

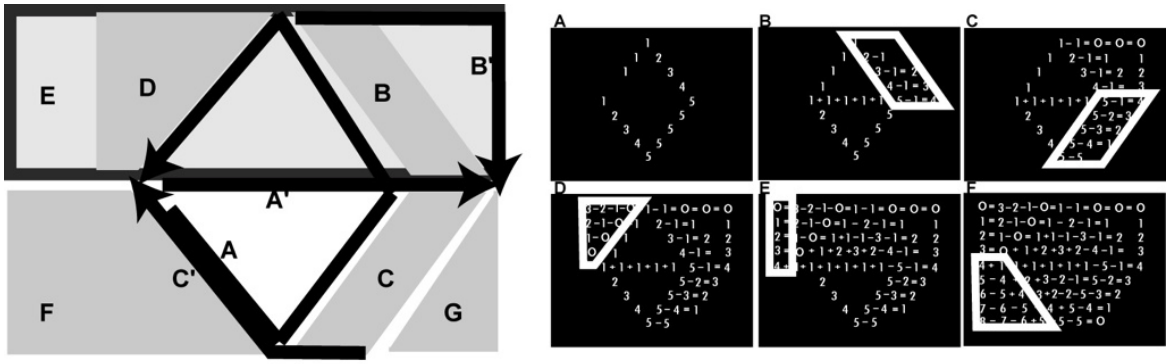
Their intervention includes the figures crashing, chasing, and jumping, and a chained emulation of the other's action. In the fledging scene (0:57–1:07), shortly after the equal mark for the equality "1 + 1 + 1 + 1 + 1 = 5," the same equal mark jumps across the formula "5 – 1" to become an equal mark for the new equality "5 – 1 = 4." In this case, the equal mark only mutates and migrates, but the viewer regards it as "edging into" the other set of figures. When the three figures of 0 on the upper right act up, and especially when the figure 0 on the rightmost larks up (3:01–3:12), the two bars of the equal mark in turn embark to skewer (3:12), to clip (3:23), and to relegate (3:24) the frolicking figure 0. Such a round trip or mutation between the order and deviation of the figures is the reason why the cataloger said, "But like the policemen, the symbols "plus," "minus," or "equal" fight the arithmetic operations in the cause of justice and order." Besides, in the middle scene (2:01–2:05), when figures 1, 2, and 3 appear taking the upper-right 0 as the starting point, the existing figure 3 on the right-hand side of the equality "4 – 1 = 3" attacks the new figure 3 to replace it. Such a clash lets us imagine that the figure 3 cries out, "Outta, outta my way!"

These appearances of the figures and symbols are chaotic; however, it can be comprehended by using an auxiliary line to divide the screen into seven sections from A to G (Fig. 1).

Furthermore, these acts are accompanied by varied sounds. According to McLaren's technical note[11], six kinds of sound materials were "painted" on the film's soundtrack after the visual production (Fig. 2). The nature of each sound depends on the size and shape of the paints. A single line sounds like a click or impulsion (Figs. 2a, 2b, 2c, and 2d), and the pitch from a set of plural lines differs according to the spacing of lines while the volume is proportional to the ratio of the width to the soundtrack (Figs. 2e and 2f). Moreover, when we classify these sound marks according to the pitch and volume (Fig. 3), we see that McLaren designed the sounds as they cover three sections with two kinds for each: loud high tone (Figs. 3a and 3e), quiet high tone (Figs. 3b and 3d), and quiet low tone (Figs. 3c and 3f), in order to make the materials that make the minimal sound the most expressive. The avoidance of the loud low tone seems appropriate to the visual subtlety that the little figures and symbols mutate and intervene on the wide screen.

4. Rhythm of motion and sound

The rhythm in *Rythmetic* has also two aspects: the visual rhythm of the motions and the auditory one of the sounds. Although the plus of the latter is fundamentally dependent on the former, since every appearance of figures and symbols is accompanied by the auditory rendition, the auditory rhythm itself is highly independent from that and more ornamental than that.



Section A-A' 0:33～1:00 (Image captured at 0:50)
Section B-B' 1:00～2:07 (Image captured at 1:24)
Section C-C' 2:08～2:40 (Image captured at 2:38)
Section D 2:41～3:27 (Image captured at 3:06)
Section E-E' 3:28～5:31 (Image captured at 5:08)
Section F 5:32～7:38 (Image captured at 6:53)
Section G 7:39～8:19 (Image captured at 8:19)

Fig. 1 The order of the fulfillment on the screen (Drawing by the author)

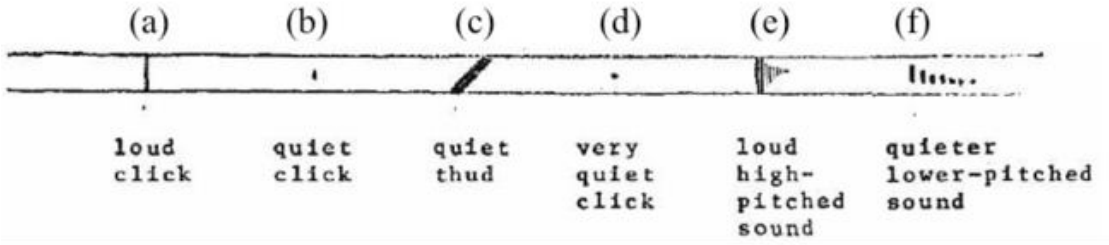


Fig. 2 Six kinds of the marks of the soundtrack on the roll of film
(Norman McLaren, *Technical notes on Rythmetic*, National Film Board, 1956/1984, p.1)

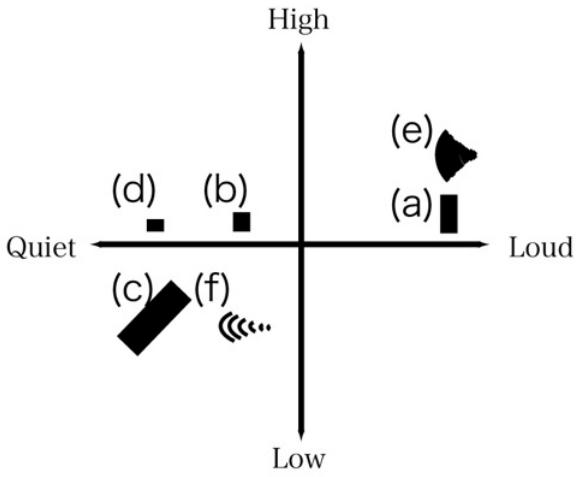


Fig. 3 The nature of the six marks on the sound
(Drawing by the author)

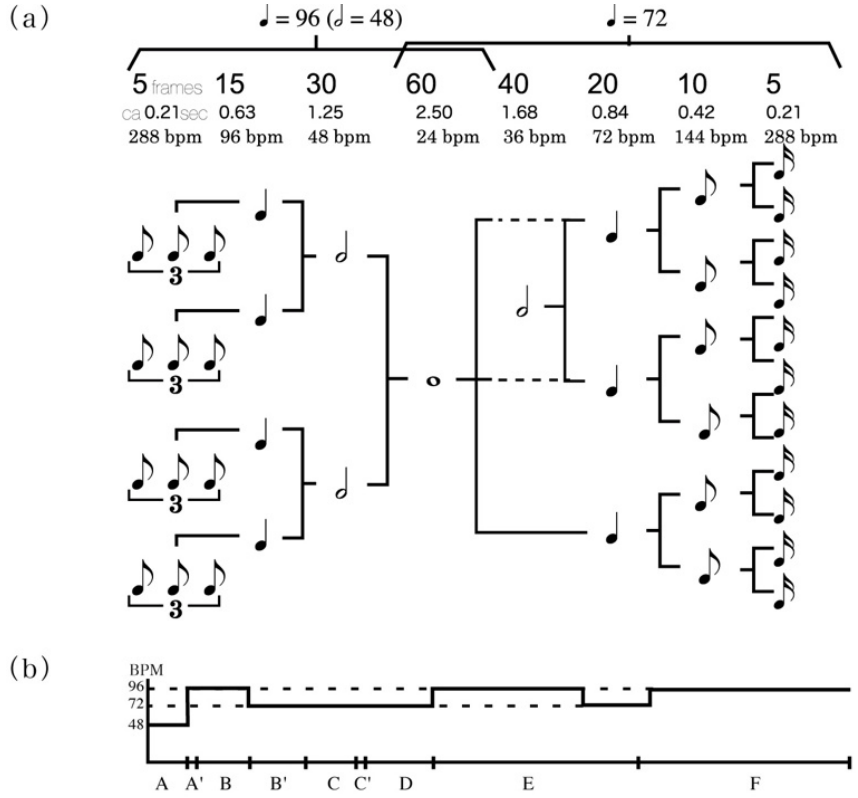


Fig. 4 Rhythm and tempo of the appearance of figures (Drawing by the author)

As for the visual rhythm, McLaren explains that "the motion of each symbol was taken as a unit of 5 frames, 10 frames, 15 frames, 20 frames, 30 frames, 40 frames, 60 frames"[12] on the general basis of 24 frames for one second in an animated film. These units, whose ratio is 1, 2, 3, 4, 6, 8, 12, will be classified as binary rhythm and ternary rhythm. The basic pulse alternates between ♩ = 96 and ♩ = 72 (Fig. 4a)—more specifically, "𝅗𝅥 = 48/♩ = 96" in sections A to B (0:33–1:35), "♩ = 72" in sections B to D (1:35–3:27), and "♩ = 96" in sections E and F, except a short span of "♩ = 72" on the 5th and 6th lines, which starts from the figures 4 and 5 (4:56–5:40) (Fig. 4b). The basic pulse is difficult to find only in section G, where the behavior of the materials is thoroughly impersonated.

In the calculation scenes, visual binary rhythm of cyclic nature is chosen. The regular blows and the iambic rhythms effectively draw our attention to the shift in the tempi and the corresponding design; the regular blow increases the speed, while the iambic rhythm alternately slows down and speeds up: the tempo in regular blows from section A (𝅗𝅥𝅗𝅥, 𝅗𝅥 = 48) to section A' (♩♩♩♩, ♩ = 96), or from section B' (♩♩♩♩, ♩ = 72) to section C' (♪♪♪♪♪♪♪♪, ♩ = 72), and to section F (♩♩♩♩, ♩ = 96); that of the iambic rhythm from section B (𝄽 𝅗𝅥 | ♩ 𝅗𝅥. | ♩ 𝅗𝅥., ♩ = 96) to section C (𝄽 𝅗𝅥 | ♩ 𝅗𝅥. | ♩ 𝅗𝅥., ♩ = 72), and its shift to section E (𝄽 𝅗𝅥 |♩ 𝅗𝅥. |♩ 𝅗𝅥., ♩ = 96). On the other hand, the visual ternary rhythm enters habitually when the calculations get off, so to speak, "dance." The triplet of 5 frames (♪♪♪), a certain type of the ternary rhythm, for the domino actions on each line of section E emphasizes its liquidity.

Meanwhile, the auditory rhythm is composed purely as musical matter in the calculation scenes; however, it is hugely dependent on visual contents in that it mimics them—called

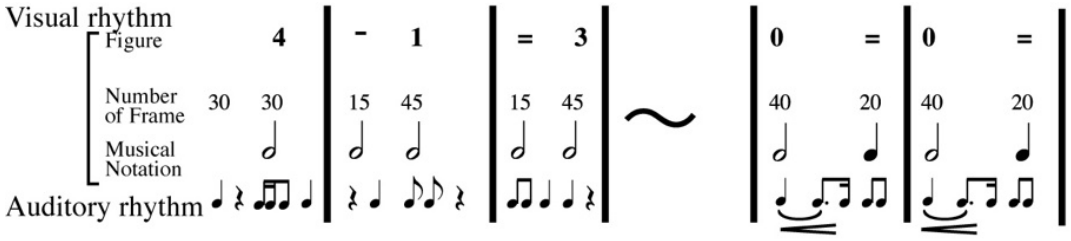


Fig. 5 Visual rhythm and auditory rhythm (Drawing by the author)

"Mickey Mousing"—in the dancing scenes. For instance, in the above scene featuring the nonsensical equality "0 = 0 = 0," we can hear mimic and nonperiodic rap, whereas in the scene featuring the general equality "4 – 1 = 3," the auditory rhythm is rich and it crescendos to mimic the transformation of the growing figure 0 (Fig. 5).

5. Creolization of calculation and dance

The lengths of elapsed time in each section vary widely and, as seen in Fig. 1, do not conform to rules. Incidentally, the average of elapsed time per one appearance of figure or symbol is obtainable by using the number of the figures or symbols appearing in each section as a denominator and the elapsed time in each section as a numerator (Fig. 6a). It indicates the length of dance per one figure or symbol, since the appearance of a figure or symbol is equivalent to the process of calculation in the sections B, C, D, E, F, and G. Consequently, its value is directly proportional to the disorder with the dance and inversely proportional to the order with calculations of the figure or symbol. Their graphic representation (Fig. 6b) shows the trend in which the calculation is emphasized in the intrados sections (A–D, 0:33–3:27) and the dance is emphasized in the extrados sections (E–G, 3:28–8:19); the latter case results in the aesthetic satisfaction, while the former case results in educational satisfaction.

(a)

Time	0:33-1:00	1:01-2:07	2:08-2:40	2:41-3:27	3:28-5:31	5:32-7:38	7:39-8:19
	27	67	32	46	123	126	40
Field	A	B-B'-B"	C-C'	D	E-E'	F	G
	framework	intrados			extrados		
Number of the appeared figures	25	28	16	19	25	27	10
Time / Number of the figures	1.08	2.35	2.00	2.42	4.92	4.67	4.00

(b)

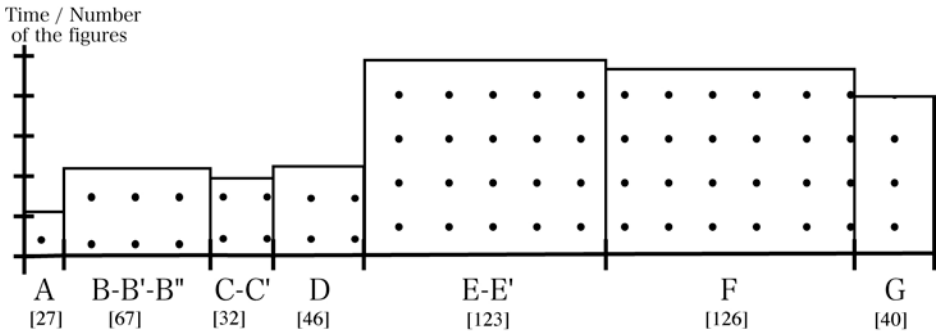


Fig. 6 The average elapsed time for each appearance of the figure or symbol (Drawing by the author)

Our process observation in each section from A to G will be refined below by a description of the calculation in the form of equality and a description of the salient features of dance (Fig. 7).

In section A, 16 figures are arrayed in argyle from lower left hem, lower right hem, upper right hem, and upper left hem. At an instant, they are the visual framework of the work and the base of calculation; therefore, this paper henceforth converts them to the form of A_n, where the subscript n is the ordinal number. In section A' and on each line of section B, the figure of A_n is reduced by one to form 4, 3, 2, 1. In section B', the figures and symbols of the repeated meaningless equality "0 = 0" are dancing. In section C, where all of the A_n values are 5, as the subtracted values increase from 2 to 5, the calculated values decrease from 3 to 0, while the calculated values shake from side to side and we see the chain-rolling of $A_5 \rightarrow A_4 \rightarrow A_3 \rightarrow A_2 \rightarrow A_1$ in section C'. The calculations in section D, where all of the A_n values are 1, are slightly elaborated: the subtractions of 1 are operated to derive the A_n values, once on A_{15}, twice on A_{14}, and thrice on A_{13}, followed by the dancing of the figures and symbols, including the existing ones at section B'—the shaking of the figure 0 and the skewering of 0 by the equal mark as have beendescribed above.

In each line of section E, the operations go over the existing equalities in sections A, B, and D, adding 1 from the upper-left 0. While each formula definitely reaches equality, it has almost no regularity as compared to the unexpected appearances and the decorative actions, such as domino and joint bending, so that the calculative order and the dancing disorder seem to blend

Field A

Location	Figure	Compute of the Figure
Left Below	1, 2, 3, 4, 5	$A_1=1,\ A_2=2,\ A_3=3,\ A_4=4$
Right Below	5, 5, 5, 5, 5	$A_5=5,\ A_6=5,\ A_7=5,\ A_8=5$
Upper Right	5, 4, 3, 2, 1	$A_9=5,\ A_{10}=4,\ A_{11}=3,\ A_{12}=2$
Upper Left	1, 1, 1, 1, 1	$A_{13}=1,\ A_{14}=1,\ A_{15}=1,\ A_{16}=1$

Field A' $A_1 + 1 + 1 + 1 + 1 = A_9$

Field B
$A_9 - 1 = 4\ [= A_{10}]$
$A_{10} - 1 = 3\ [= A_{11}]$
$A_{11} - 1 = 2\ [= A_{12}]$
$A_{12} - 1$

Field C
$A_8 - 2 = 3$
$A_7 - 3 = 2$
$A_6 - 4 = 1$
$A_5 - 5 = 0$

Field D
$1 - 0 = 1\ [= A_{13}]$
$2 - 1 - 0 = 1\ [= A_{14}]$
$3 - 2 - 1 - 0 = 1\ [= A_{15}]$

Field E
$0 = 3 - 2 - 1 - 0 = A_{13} = 1 - 1 = 0 = 0 = 0$
$1 = 2 - 1 - 0 = A_{14} = 2 - A_{12} - 1 = 1 = 1$
$2 = 1 - 0 + A_{15} + 1 - 1 = A_{11} - 1 = 2 = 2$
$3 = 0 + A_{16} + 2 + 3 + 2 - 4 - A_{10} = 3$

Field F
$4 + 1 + 1 + A_1 + 1 + 1 + 1 - A_9 - 1 = 4$
$5 - 4 + A_2 + 3 - 2 - 1 = A_8 - 2 = 3$
$6 - 5 + 4 - A_3 + 2 - 2 = A_7 - 3 = 2$
$7 - 6 - 5 - A_4 + A_6 - 4 = 1$
$8 - 7 - 6 + 5 = A_5 - 5 = 0$

Fig. 7 The calculation on each section (Drawing by the author)

together. Although one might argue about going over the existing sections A, B, and D as a review function of the arithmetic lesson, it is not as detailed as that in *Séquence* and by Collins. The calculation and the dancing blend together—in that, they are creolized—in section F as well. There are certain things in common, such as the review of signs, the addition of irregular (unexpected) operations, and domino actions at the end of each line, also with three dissimilar points to hold someone's attention. First, the unheard of appearance of the figures 5, 6, 7, and 8 at the start of each line impresses a sense of extensity. Second, the hastening of appearances of the figures and symbols deprives the audience of the allowance to make a prediction of what happens next. Third, the interference between signs forges ahead of other lines: figure 5 in the bottom-center bends its upper arm as if scrabbling at its heart and back, and it jumps to clash with the minus symbol in the above line, and yet, its serif walks around to replace the serif of figure 1 in the above line.

Section G, where there occurs almost no calculation, focuses entirely on dance. After the addition of the redundant equality "= 0 = 0" to the equality "8 – 7 – 6 + 5 = 5 – 5 = 0"[13] on the bottom line, the figure 0 jumps to the right of figure 1 at the end of the line A_4/A_6 and of figure 2 at the end of line A_3/A_7, to build "10," "20," and "2000," and then, the symbols "plus," "minus," and "equal" unite to fight and push away the figure 0. After the letters E, N, D, and figure 0 fight over their places, the letters T, H, and E end the movie with a display of "THE END."

Here is temporal concision of each section in a small compass to elucidate the ingenious plan of *Rythmetic* (Fig. 8). Section A, which is, at an instant, the base of calculation and the base of visual design of the screen, is well ordered. The format of sections B, C, and D is the calculating first half and the dancing second half (B', C', and D'). Meanwhile, sections E and F are created by a harmonious combination of calculation and dance. Eventually, section G is full of dance.

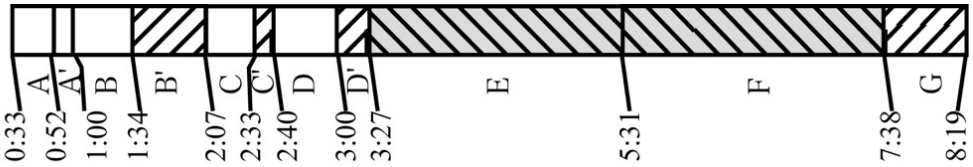


Fig. 8 The calculation and the dance on each section (Drawing by the author)

6. Conclusion

While *Rythmetic* has been assumed simply as "an animated film for education" and "the crazy dance of arithmetic", we have scrutinized the designation of the arithmetic and the dance, focusing on both the rhythm of motion and that of sounds. Our observation of their blending process along the spreading of the figures and symbols has elucidated that the arithmetic and the dance are differentiated in the intrados sections from A to D while they are fused together in the extrados sections from E to G. In *Rythmetic*, the orderly enchantment and the ornamental one are organized from confrontation to integration.

Appropriate to the name *Rythmetic*, the movie is embellished with a pattern-oriented

manipulation of frames on film's roll to achieve a visual rhythm, in keeping with a musical interpretation on the soundtrack of the film's roll to achieve an auditory rhythm. The visual pattern was a blow or iambic for the calculating scenes, and a mimic sound rendition was made for the playful dancing scenes. The auditory rhythm is musically composed freely from the visual contents, but accompanies them in the playful dancing scenes. Thereupon, we hear cyclic-patterned rhythm and playfully mimic rhythm separately in the first half of the work, while confused in the second half.

Rythmetic is an invitation to the aesthetic confusion of order and disorder by figures and symbols; and besides, it is a temporally designed artwork both in the visual and auditory aspects, more so than an educational film or arithmetic lecture.

Notes

[1] Giannalberto Bendazzi, *Le Film d'animation*. Pensée sauvage, 1985, p. 178.
[2] Donald McWilliams, "Norman McLaren: Hands-on Animation," http://www.nfb.ca/playlists/donald_mcwilliams/mclaren/, 2010.9.28.
[3] Maureen Furniss, *Art in Motion: Animation Aesthetics*, Libbey, 2004, p. 5.
[4] Originally written 'plaisir esthétique' and 'information et enseignement,' in "But des 53 films," *Séquence*, numéro special du Norman McLaren, 1975, p.138.
[5] Maynard Collins, *Norman McLaren*, Canadian Film Institute,1976, p. 47.
[6] First Prize of Abstract Films at Rapallo International Film Festival 1957; Diploma of Honour at International Review of Specialized Cinematography Rome 1957; Silver Reel Award of Avant-Garde and Experimental at Annual Golden Reel Film Festival (Film Council of America) 1957; First Prize at Festival of Contemporary Arts (University of Illinois) 1957; Certificate of Merit at International Film Festival Durban 1956; Certificate of Merit at International Film Festival Johannesburg 1956; Diploma of Merit at International Film Festival Edinburgh 1956; Silver Bear Prize of Short Films at International Film Festival Berlin 1956.
[7] It is the second longest; the first is *A Chairy Tale*, collaborated with Ravi Shankar (1920-), a famous Indian musician and composer who plays the plucked string instrument sitar, and Claude Jutra (1930-1986), a Canadian actor and film director, in 1957.
[8] The English and French authors of the collection do not seem to be the same, since the English depiction is totally different. "An animated film by Norman McLaren and Evelyn Lambart that endows arithmetic with lively humor. The screen becomes a numerical free-for-all as digits meet in playful encounter, add and subtract, jostle, attack, and elude one another." 'Rythmetic,' "Our Collection" of National Film Board of Canada, http://www.onf-nfb.gc.ca/eng/collection/film/?id=10570, 2010.9.28.
[9] The author's translation originally written: "C'est la ronde folle de l'arithmétique. Les chiffres se conduisent ici comme des clowns, se fuient, se bousculent, s'évitent, à un rythme endiablé. Mais, comme des policiers, les signes « plus », « moins » ou « égal » veillent au bon ordre et à la justesse des opérations d'arithmétique." 'Rythmetic,' "Notre Collection" of Office national du film du Canada, http://www.onf-nfb.gc.ca/fra/collection/film/?id=1247, 2010.9.28.
[10] A carton of cardboards is kept safe in La Cinémathèque québécoise in Montréal.
[11] Norman McLaren, *Technical notes on Rythmetic*, typed but unpublished, National Film Board, 1956/1984, p.1.
[12] *Ibid.*, p. 2.
[13] The second figure 5 among three fives is A_5.