Si I

FOR CELLO QUARTET

(2011)

Xavier Shuang Xu

Introduction to the work

This piece is based on the electron energies in silicon calculated in *Phys. Rev.* 142 **2** (1966), M. Cardona and F. H. Pollak. Shown in Fig. 1 is the diagram of the energy bands.

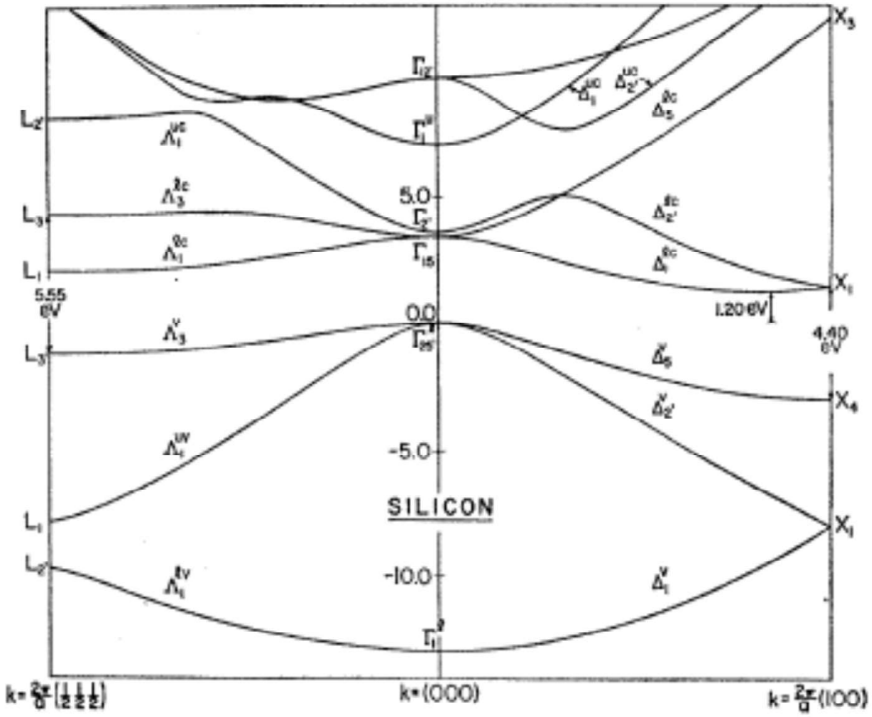


Fig. 1. Energy bands of silicon calculated by the **k·p** method

in the [111] and [100] directions of **k** space. Adapted from the original paper.

There are eight bands, numbered 1-8 from top to bottom.

Four sequences are defined by permutations of the energy bands:

1: 1 2 3 4 5 6 7 8

2: 3 6 5 4 2 7 8 1

3: 6 3 4 5 7 2 1 8

4: 8 7 6 5 4 3 2 1

The piece is in four parts. In each part, the musical parameters are determined by permutations of the sequences in the scheme shown in the following table.

Parts: ABCD	I	II	III	IV
Pitch	1234	2341	3412	4123
Dynamics	1432	1234	4123	2143
Bow position	2143	4123	1234	1432
Finger position	4123	3412	2341	1234

Notes to the score

The piece is scored for four string instruments, ideally four cellos. Each plays on one single string.

For four cellos, the staves are assigned as follows: Cello I plays on C, Cello II on G, Cello III on D and Cello IV on A. The same order applies when same instruments are used, *e.g.* four basses, four violas or four violins. Namely, Stave I-IV correspond to strings from low to high. This work could be performed by a standard string quartet as well. My recommended arrangement would be: I-Violin on D, II-Violin on G, III-Viola on C, IV-Cello on A. Performers have the liberty to explore different sounds using other combinations and/or arrangements.

The “clef” is a geometrically shrunk string area of a real instrument, illustrated in Fig. 2.

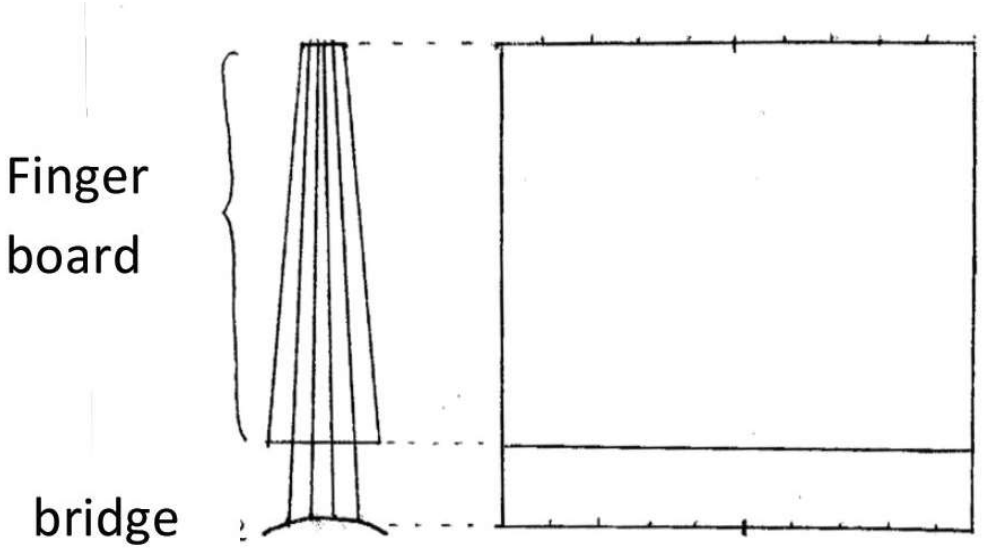


Fig. 2

Each box in the score (as a measure) has a duration of 10 seconds, with assistant ticks of 1 second. No conductor is needed. However, I encourage the use of a digital timer that iterates 10 seconds and displays before the performers, such that all performers can know where they are by watching the timer and be as accurate as possible.

Finger techniques

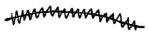
The position of the finger is geometrically notated by black lines (finger lines) on the staves. Finger lines start and end with a short, vertical tick or a stem. Space between ticks is rest. Along a continuous line the technique is always like *portamento*. Slide the finger along the string according to the noted finger position and speed. The style of the line indicates the finger pressure on the string:

Very slight touch,	Medium pressure,	Solid press,
as playing harmonics	press half way towards finger board	as playing normal notes

Fig. 3

A wave line on a stem represents fast finger pressure changes (like *vibrato*) centering around the noted finger pressure.

A note should be stressed with an accent where a stem appears, effectively as . The flag of the stem indicates the finger pressure that may be different from the context, as shown in Fig. 3.

Fingernail scratch is noted by a saw line added to a finger line:  , where the performer shall use a fingernail (thumbnail for cello) to press and scratch the string with the pressure defined in the same way as in Fig.3.

Bow techniques

The position of the bow is geometrically notated by red lines (bow lines), which represent the move of the bow parallel to the string (like the finger). The speed of normal bowing (perpendicular to the string) should be constant through the whole piece, except when a note needs to be stressed. Suggested speed is that of playing a normal note in a moderate dynamic, *i.e.* about 5 seconds every up/down bow. Please note that dynamic signs on the score are NOT realized in a conventional way by changing the bowing speed. Instead, they indicate the pressure of the bow on the string (the force, NOT the volume), with the scale from ***ppp*** (very light contact) to ***fff*** (extremely heavy press).

Conventional bow *tremolo* is notated by the familiar strokes , where the length of the “flag” indicates the duration.

Other

If a line crosses the rightmost bar line in a page, it means the sound/move continues onto the next page. Accordingly, you will find the line coming through the leftmost bar line in the next page. This way of notation serves as a reminder of continuity. On the other hand, if a line ends precisely on the rightmost bar line in a page, it means a stop and there should be a rest at the beginning of the next page.

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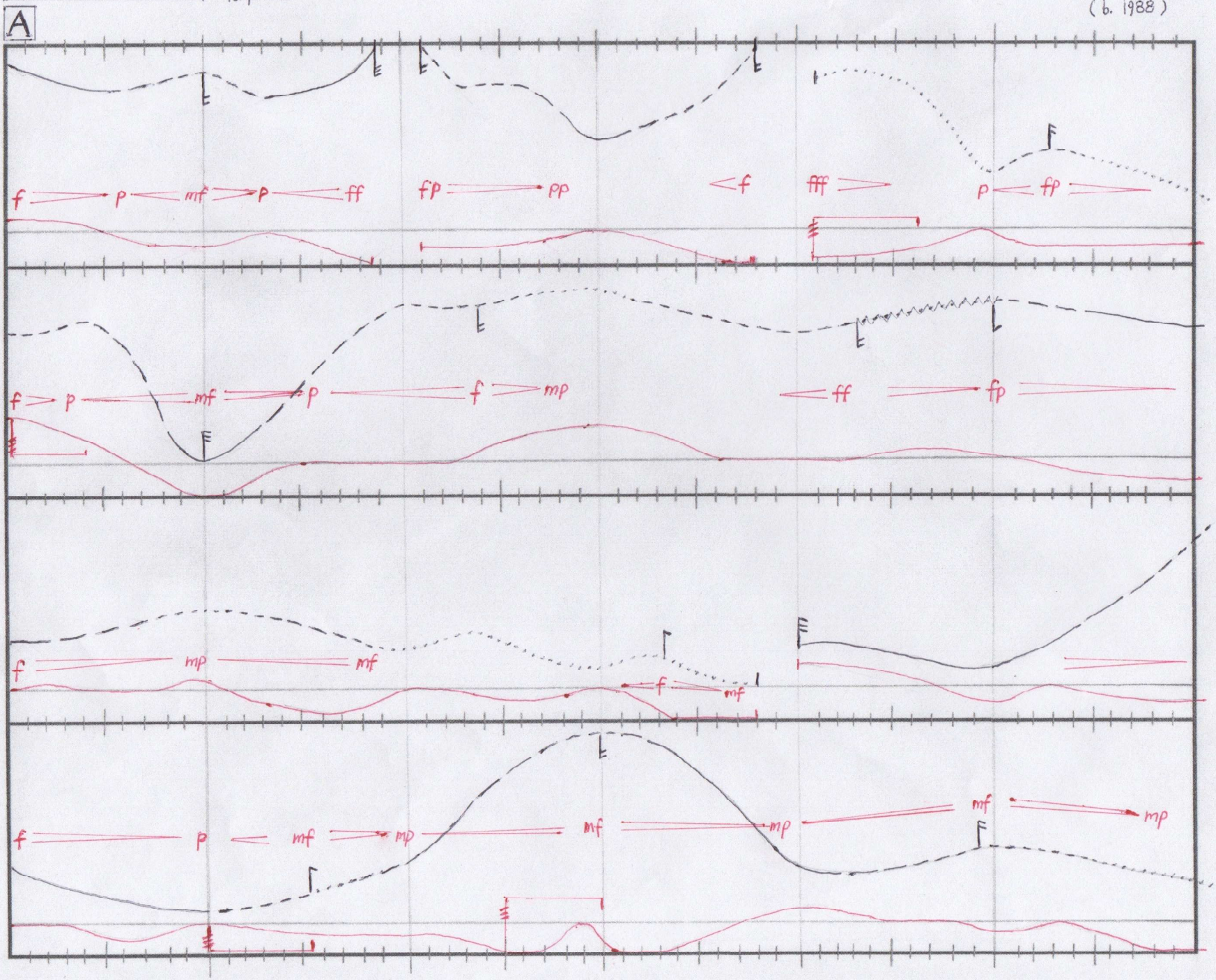
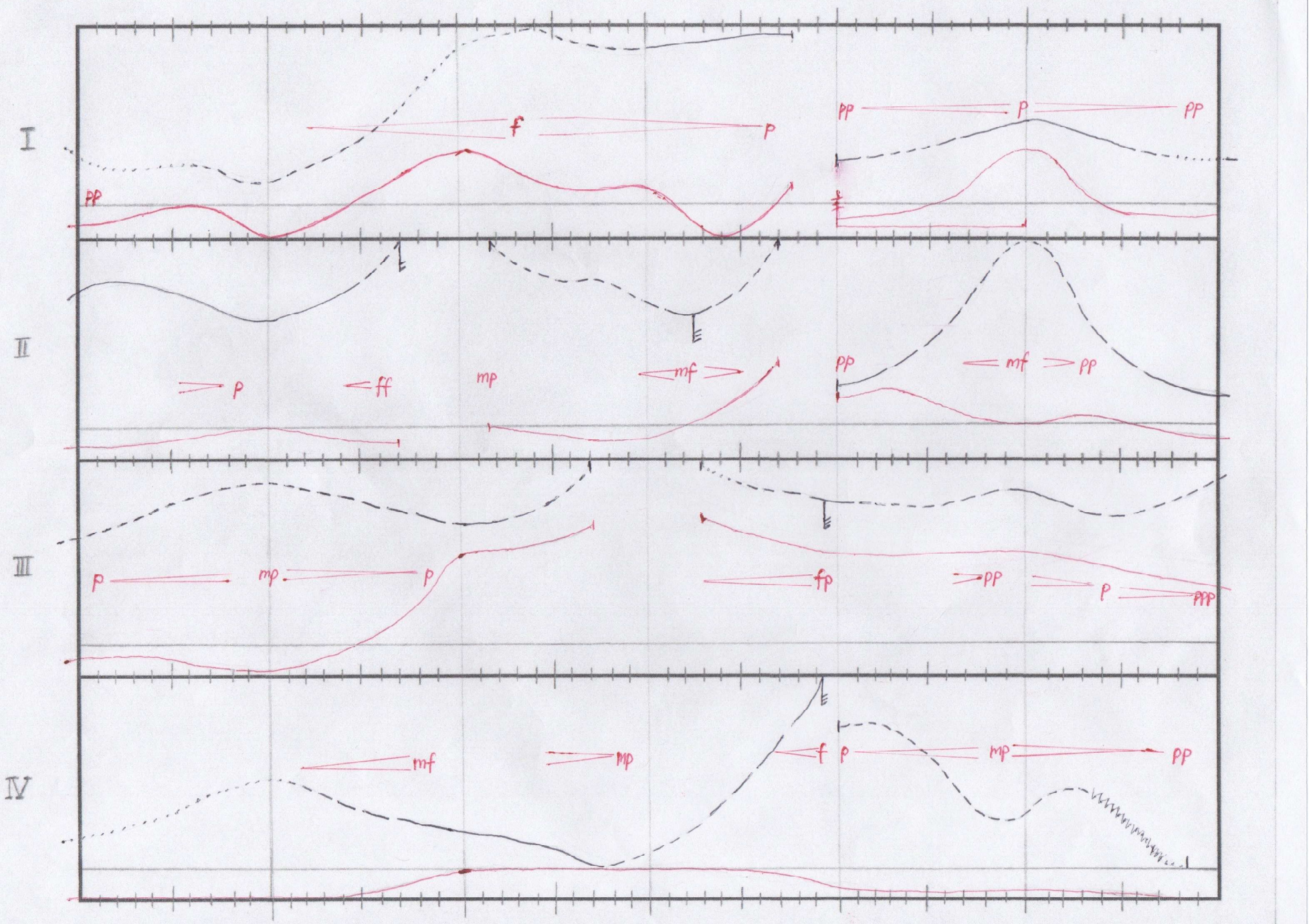
Xavier Shuang Xu
(b. 1988)

1" — 10" Tempo Scale

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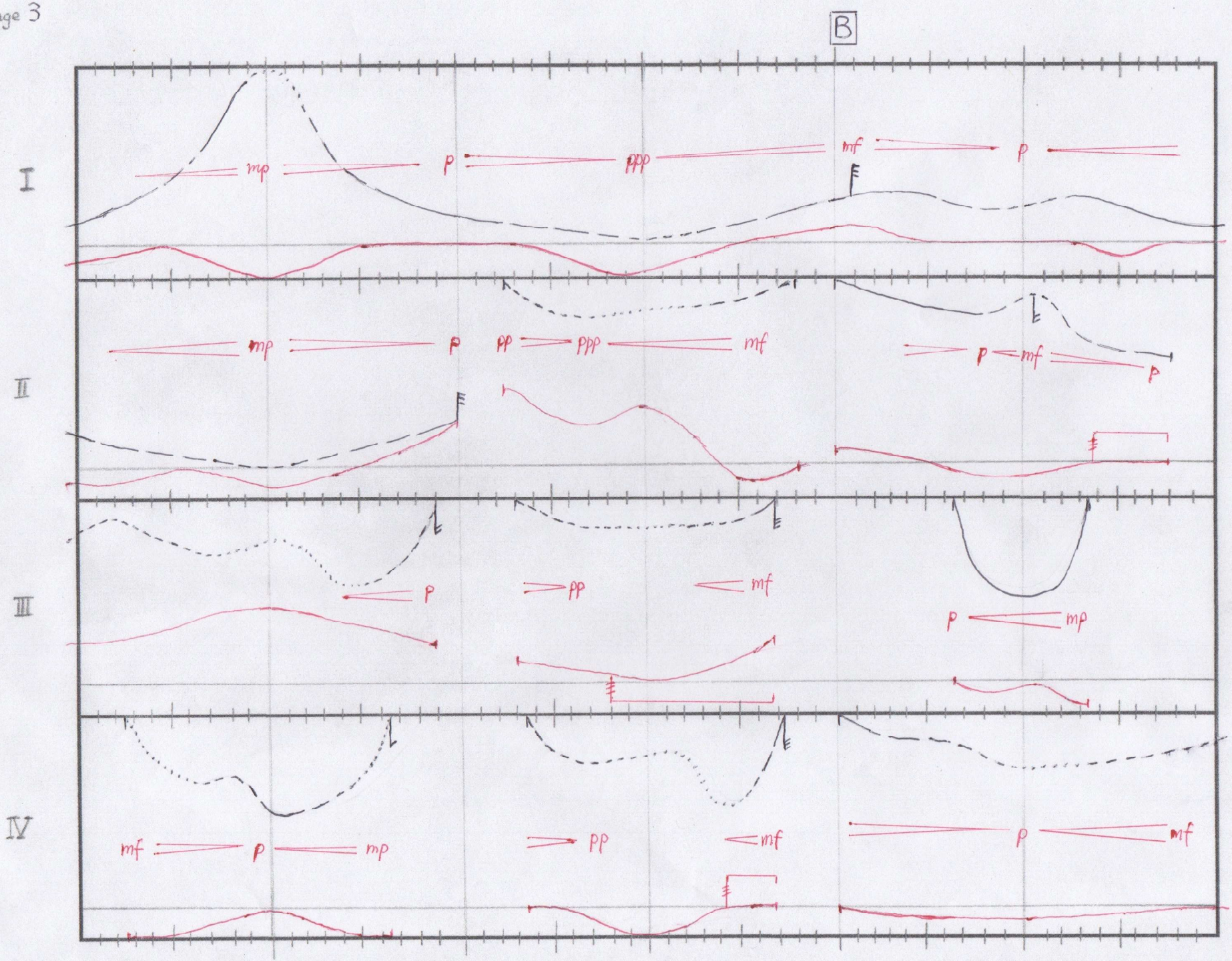
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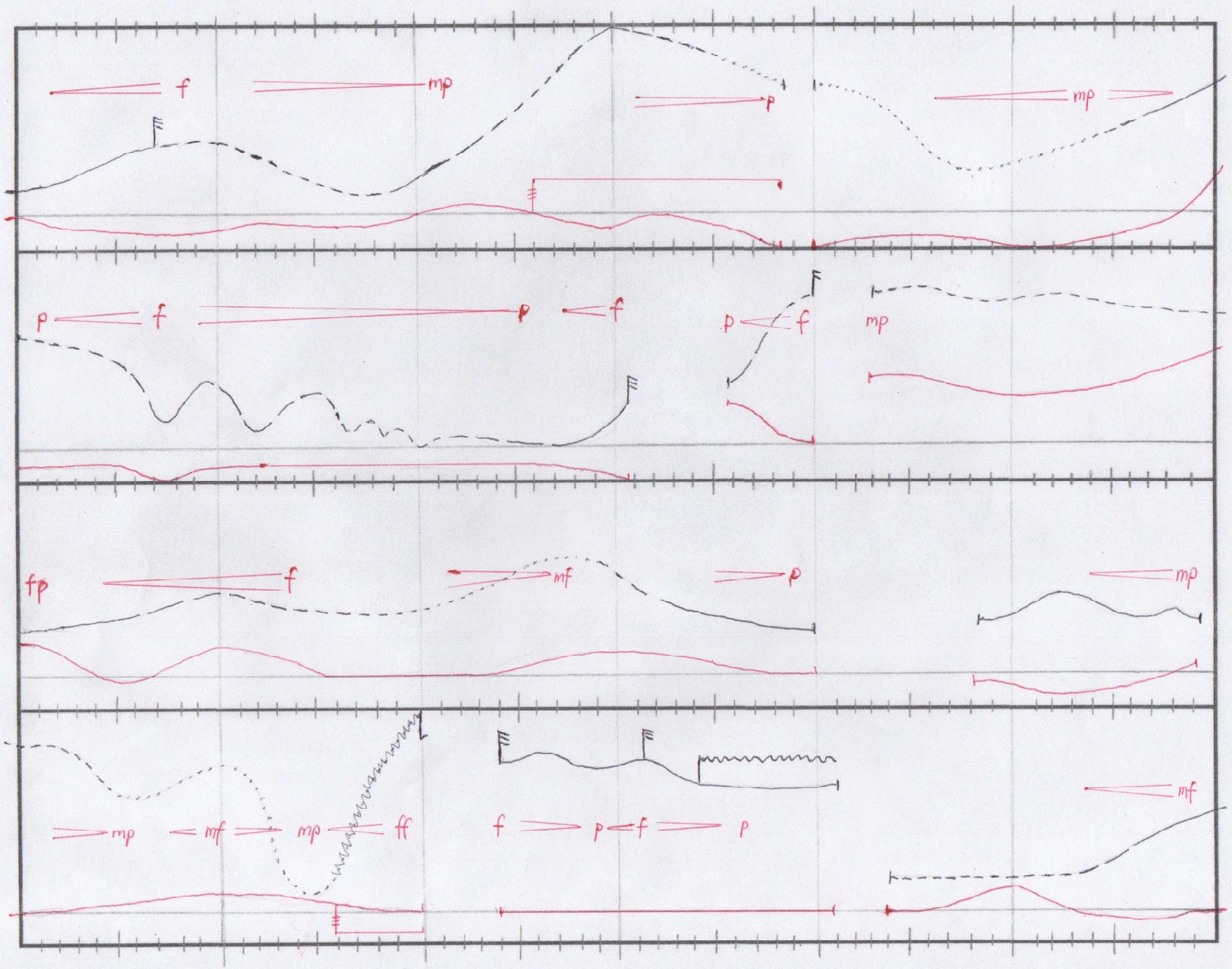
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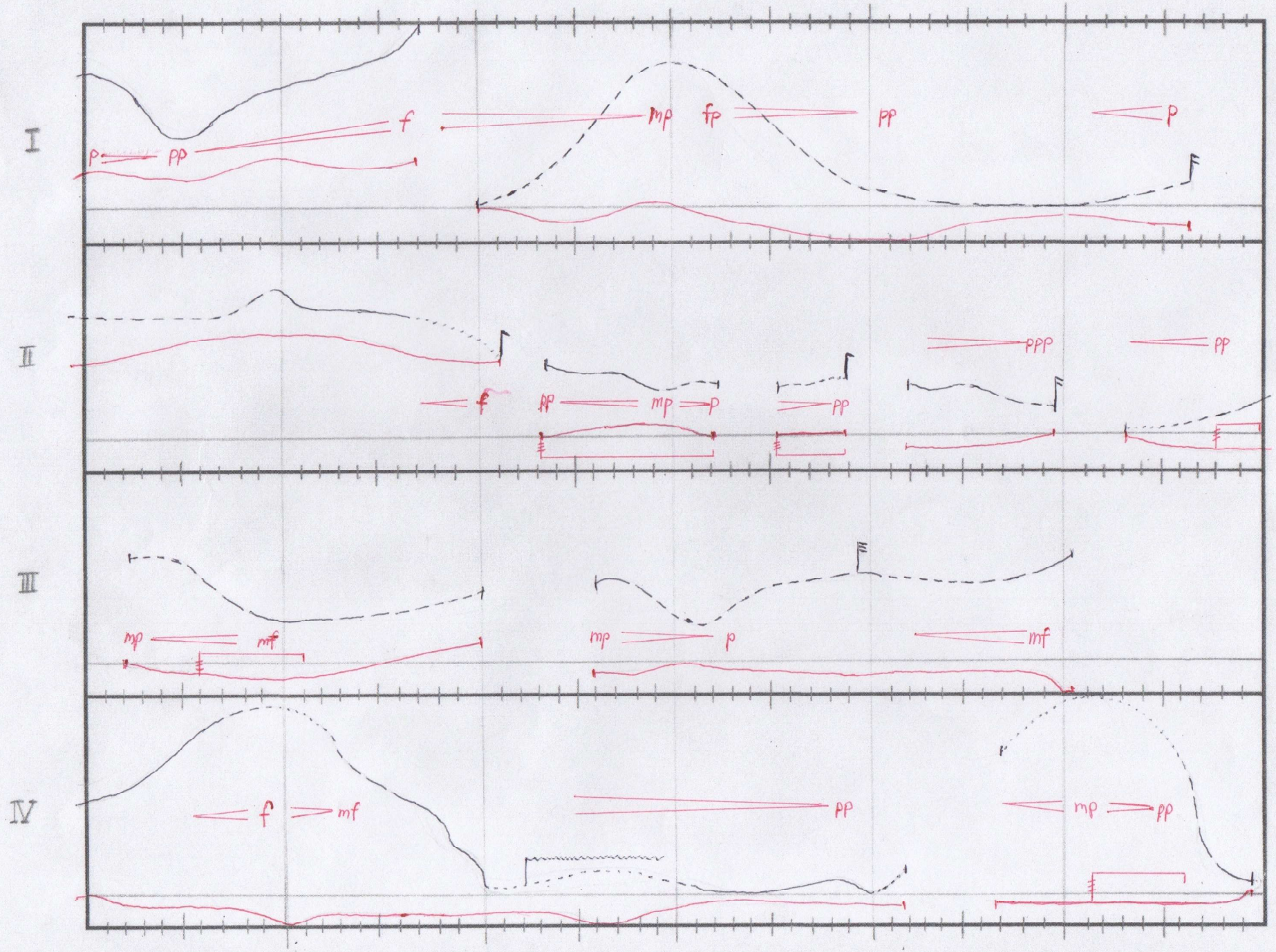
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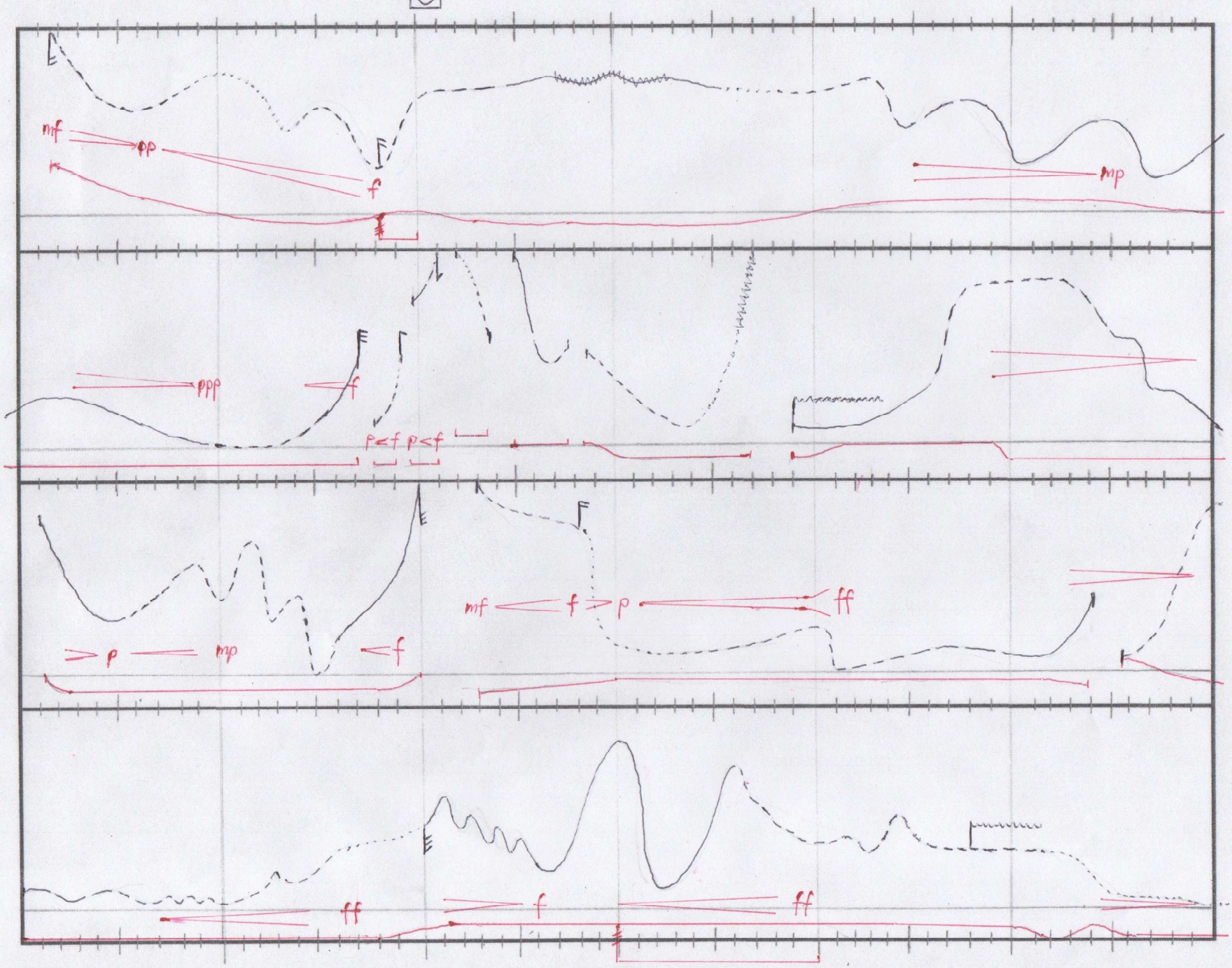

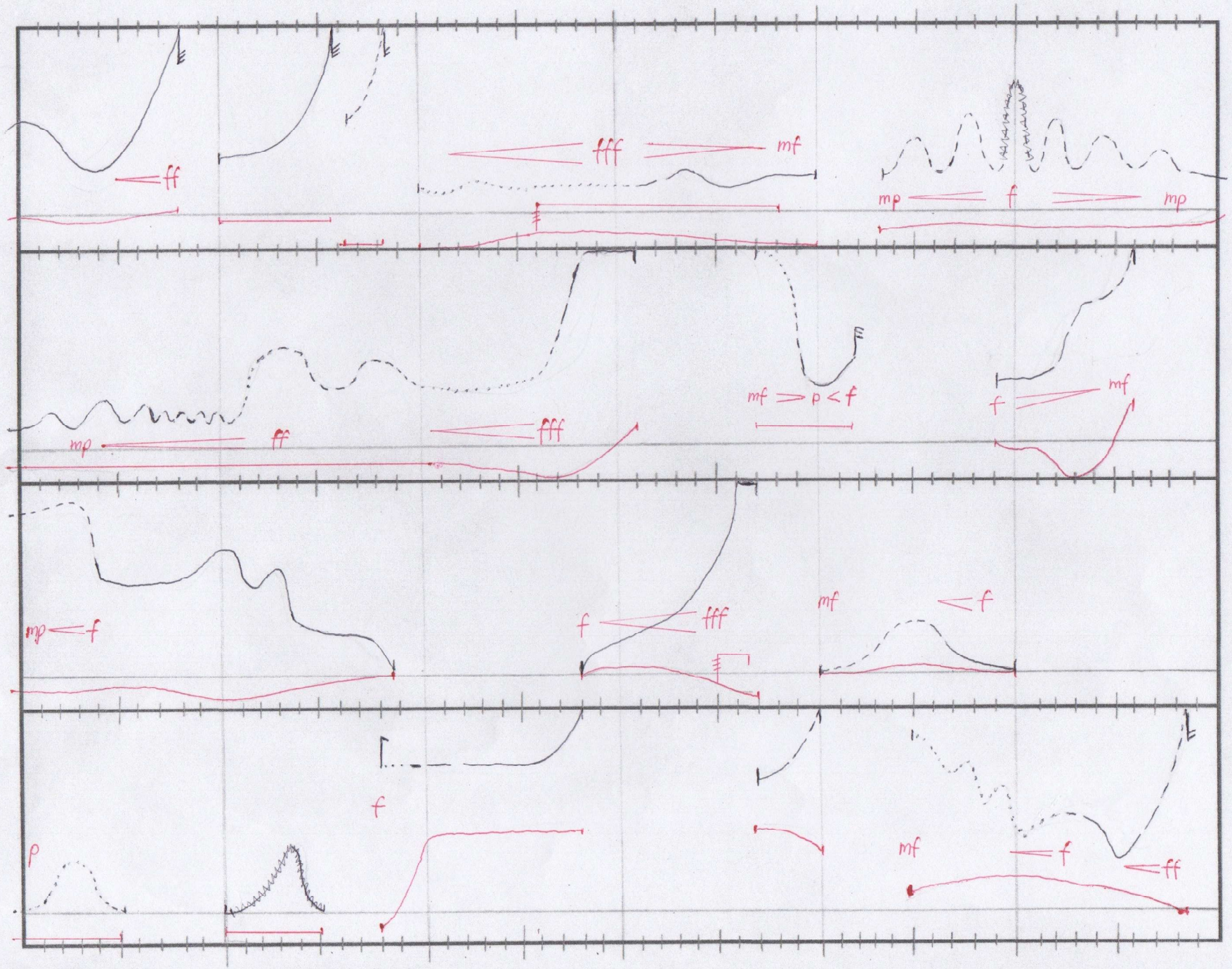
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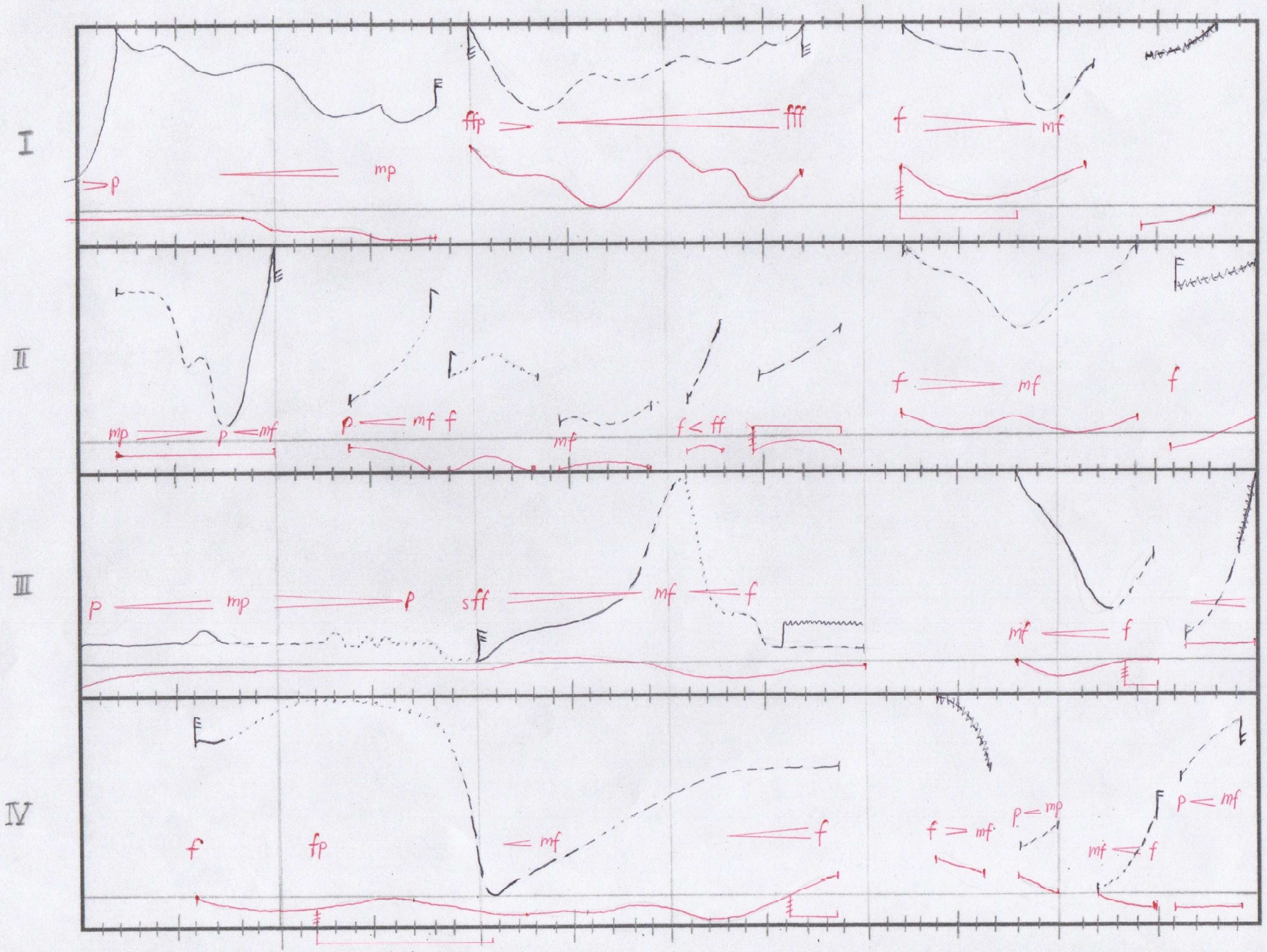
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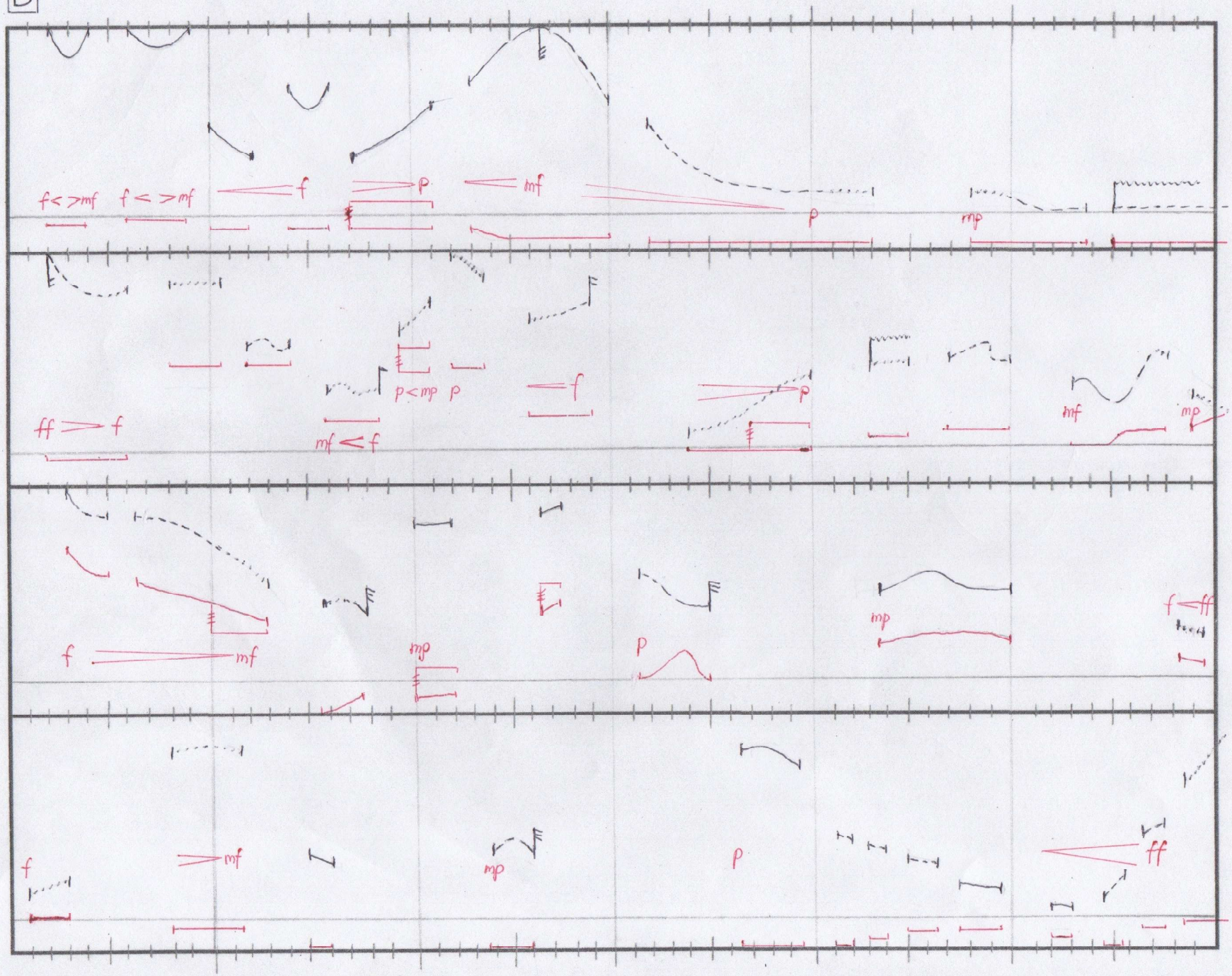
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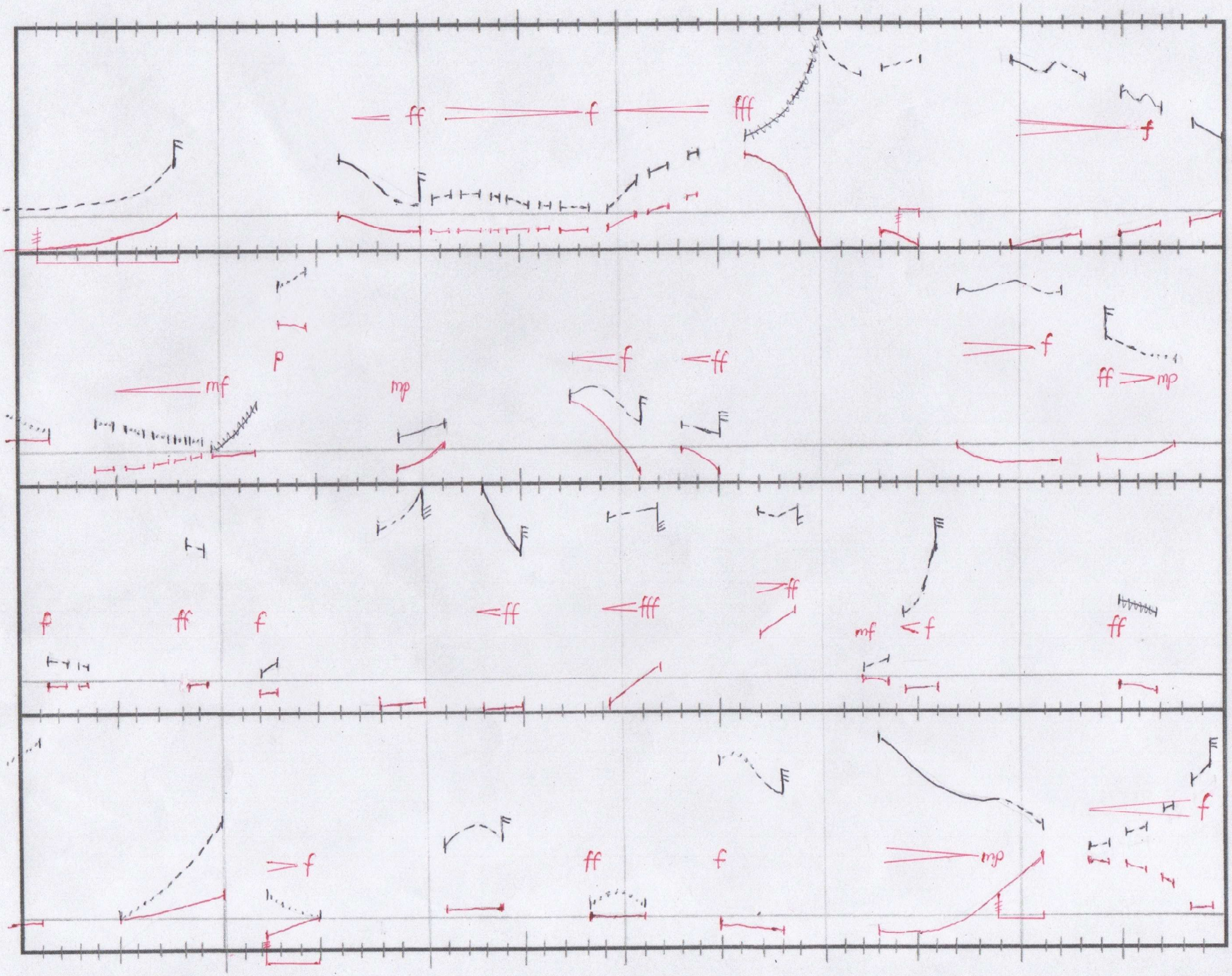
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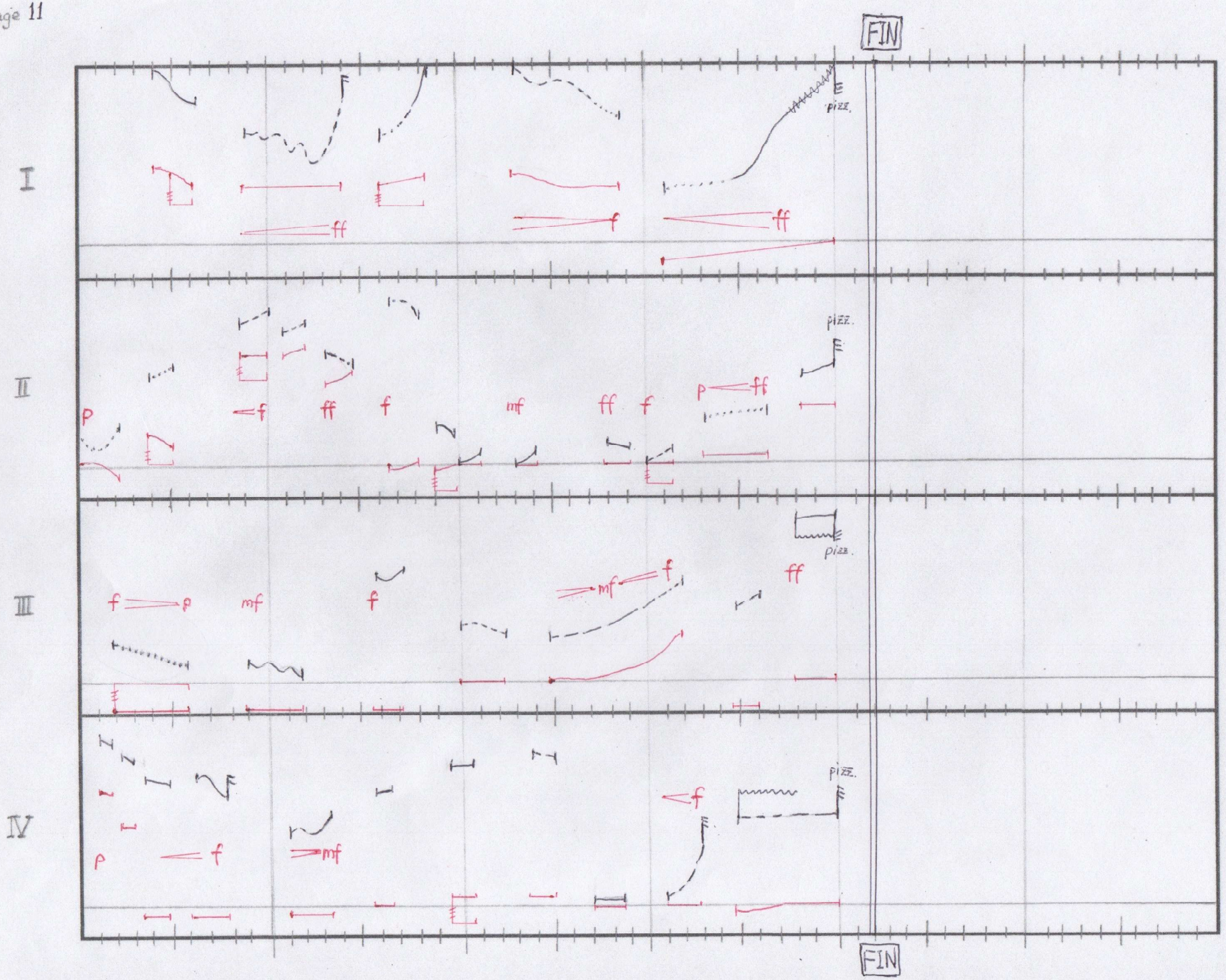
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