Visual comparison and analysis of the speed and strength of different versions of Beethoven piano sonata no. 8 (op. 13no.1), 1st movement based on Vmus.net

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Abstract. This paper is based on Vmus.net platform, using music visualization analysis technology. Through three experiments, combined with the relevant music background information of Beethoven piano sonata no. 8 (op. 13no.1), 1st movement the audio of four pianists were selected as the research content, and the elastic expansion and strength fluctuation of music speed were compared and analyzed from different perspectives of micro and macro. In this way, we can understand the characteristics of personalized processing and performance of Beethoven piano sonata no. 8 (op. 13no.1), 1st movement by different players in different periods.

1. Introduction

For the analysis and understanding of musical works, in the past traditional mode, most of them adopt the relatively subjective way such as oral and mental teaching. In contrast to the traditional research method of using words to express and compare the differences between different versions after repeated listening,[1] Through the experiment based on Vmus.net platform using music visual analysis technology to analyze the data this method appears more objective and scientific. Through the analysis of the experimental data, the detailed changes in music performance, from the big changes in the speed and strength of the whole piece to the elastic performance of the whole piece, to the small fluctuations in the speed of the notes in the lehui, can be comprehensively shown in the figure.

Based on the Vmus.net platform, this paper conducts visual analysis through three experiments to comprehensively study the speed and strength of Beethoven's Piano Sonata No. 8 (Op.13 No.1), 1st movement. So as to achieve the goal of application in the field of piano performance, piano education and music research. In the field of piano performance, the understanding of the first movement of Beethoven's Piano Sonata No. 8 (Op.13 No.1) should be enhanced to analyze and interpret the work more objectively and comprehensively. In the field of piano education, it provides more objective and rational reference basis for teaching and makes teaching more scientific. In the field of music research, we should analyze and broaden the research channels of piano sonata so as to make the study of piano sonata more objective and scientific.
2. Data sources and experimental methods

2.1. Data Source
There are many audio recordings of Beethoven's Piano Sonata NO. 8, OP13.No1. Hundreds of pianists have recorded and released Beethoven's complete piano sonatas. After screening, considering the recording time and the influence of the pianist and other factors, the following representative versions are selected as the research objects. The list is as follows:

| Performer       | Date of Birth | Nationality | Recording Time | Recording Label   |
|-----------------|---------------|-------------|----------------|-------------------|
| Wilhelm Kempff  | 1895          | Germany     | 1954           | DG                |
| Friedrich Gulda | 1930          | Austria     | 1979           | SWR Classica      |
| Jerome Rose     | 1938          | America     | 1994           | VOX               |
| Llyr Williams   | 1982          | Britain     | 2018           | Signum Classics   |

Wilhelm Kempff: German pianist, composer, born in 1895 in Terberger, Germany. He was recognized as one of the most important players of Beethoven and Schubert piano music in the 20th century.

Friedrich Gulda: Austrian pianist, born in Vienna in 1930. His performance not only cherishes the tradition of classical music in Vienna, but also is full of the spirit of The Times.

Jerome Rose: American pianist, born in San Francisco in 1938. As one of the most outstanding American pianists, Rose is known as "the last contemporary Master of Romanticism".

Llyr Williams: Welsh pianist, born in Wales in 1982. He is widely praised for his deep musical wisdom, as well as the expressive and communicative nature of his interpretation. He is a famous performer of Beethoven.

2.2. Experimental Methods
The flow chart is as follows:

![Experimental flow chart](image)

FIG. 1 Experimental flow chart

3. Experimental Analysis

3.1. Analysis of velocity and strength curve
As can be seen in Figure 2, Wilhelmm. The kempf tops at 120BPM (Beat Per Minute), the slowest is around 5BPM. The beginning of the piece is the slowest beat in the whole piece. Each part of the speed of the elastic change is not big, basically unified, no exaggerated playing techniques. The performance is rigorous and natural.
FIG. 2 An analysis of the velocity - dynamics curve of Beethoven piano sonata no. 8 (op. 13no.1), 1st movement (Wilhelem Kempf, recording 1954)

It can be seen from Figure 3 that Friedrich Gulda's fastest beat is only over 100BPM and its lowest beat is 5BPM. Friedrich Gulda valued Vienna's classical music tradition, and the fluctuation of speed in each structural unit is very similar. The velocity curve is in an arch structure, and the first part and the second part even form a symmetry. At the same time, it is worth noting that his average speed reached 80BPM, showing his own unique personal style and unique creativity, which provides a reference for future generations to learn playing.

FIG. 3 An analysis of the velocity - dynamics curve of Beethoven piano sonata no. 8 (op. 13no.1), 1st movement (Friedrich Gulda, recording 1979)

It can be seen from Figure 4 that Jerome Ross's fluctuation speed changes on each structural unit are more exaggerated than other versions. The treatment of the work is more dramatic, the internal tension is more obvious. He is also the only pianist among the four players analyzed here who studied in an American school. He plays fast and has the greatest elasticity of his playing speed. Although the instantaneous speed difference of notes is very large, other parts are generally stable and have good stability.

FIG. 4 An analysis of the velocity - dynamics curve of Beethoven piano sonata no. 8 (op. 13no.1), 1st movement (Jerome Rose, recording 1994)
It can be seen from Figure 5 that Llyr Williams' playing speed is relatively flat, and his playing time is also the longest, and the speed elasticity is small, so it is the version closest to the original speed. What is interesting is that the lowest number of beats in his whole song appears in the reproduction section, and the end part ends with a sharp drop in speed.

FIG. 5 An analysis of the velocity - dynamics curve of Beethoven piano sonata no. 8 (op. 13no.1), 1st movement (Llyr Williams, recording 2018)

If the mood of Jerome Rose playing this sonata is like a strong personality, stubborn radical person telling his own "pathos". Llyr Williams is more likely to be associated with this low-key, less forceful personality talking about. According to the velocity - force graph, in the performance of the four pianists, the exaggerated elastic fluctuation of the speed is all at the beginning of the exposition, development and reproduction parts. With the exception of William Kempf, the other three players all experienced large fluctuations in velocity elasticity when entering the reproduction section. [2] After the speed was accelerated, the overall fluctuation entered a relatively stable state. With the exception of a few low points, Friedrich Gulda and Llyr Williams played with a similar number of low points in each unit structure and a similar speed graph. This shows that the performance of the predecessors has a strong demonstration effect on the performance of the successors. One can not help but question whether this is due to the different aesthetic treatment of the works made by the players themselves, or whether it is due to the different playing schools that the players have learned from.

3.2. Worm performance diagram analysis of the main theme of the speed change and strength fluctuations

The author obtains the following four worm analysis diagrams through experiments, and analyzes the details of the main theme performance from both macro and micro aspects.

As a whole, the worm analysis diagrams of William Kempf and Friedrich Gulda are very similar in shape. Analyzing its details, Friedrich Gulda's overall performance speed is faster than William's, and he has made some special processing in some details. These performance characteristics are inseparable from Friedrich Gulda's life experience. Because Gulda was influenced by jazz music after middle age, he played classical music with a certain style in addition to improvising.

FIG. 6 Worm analysis of Beethoven piano sonata no. 8 (op. 13no.1), 1st movement (Wilhelem Kempf, recording 1954)

FIG. 7 Worm analysis of Beethoven piano sonata no. 8 (op. 13no.1), 1st movement (Friedrich Gulda, recording 1979)
Comparing Figure 8 with Figure 9, James Ross’s worm analysis diagram is particularly special. As mentioned in the previous article, the artistic conception of James Rose playing this sonata is like a person with distinctive personality, stubborn and radical telling his “pathos”, so the worm analysis chart generated shows great ups and downs and more twists and turns. Llyr Williams, on the other hand, is a very simple curve, without much design, played strictly by example.

3.3. Analysis of detail performance processing with IOI deviation curve

IOI is the interval of time between the start of one note and the start of the next note. The IOI deviation index is a proportional relationship. The decrease of IOI index can be understood as local gradual increase, and the increase of IOI index can be understood as local gradual decrease. The detail processing of the music can better reflect the understanding consciousness and personalized interpretation of the music. By observing and analyzing the velocity elasticity of the internal structure of the music in a visual way, we can see more clearly the different treatments of different performers for the same part. The secondary has two themes. The first theme (bars 51-88) is in E-flat minor, with a light staccato showing a “sigh”. Lively and lyrical theme in the bass area and the high area of the chorus, dance music accompaniment texture, embellish notes with two notes and other factors of the organic combination, make this theme full of life, the expression of people's yearning for happiness and joy of reverie. The author chooses the first sentence of the first theme of the sub-section as the research object to explore the differences between the performances of the four performers.

From the following figure 10, 11, 12 and 13, it can be seen that the performance speed variation trend of the four performers is roughly the same, but there are great differences in small details. For example, in the processing of the first note, Jerome Rose's processing is the most special (see Figure 11). The speed is from fast to slow, which forms a strong contrast with the previous, and connects to the secondary theme. Not only the starting note, but also the last note of this sentence, Jerome Rose's processing is more exaggerated than the other four performers. On the ninth note, Llyr Williams (see Figure 12) also has a special treatment, which makes a relatively large speed stretch on this note.
FIG. 11 Diagram of IOI deviation analysis of Beethoven piano sonata no. 8 (op. 13no.1), 1st movement (Friedrich Gulda, recording 1979)

FIG. 12 Diagram of IOI deviation analysis of Beethoven piano sonata no. 8 (op. 13no.1), 1st movement (Jerome Rose, recording 1994)

FIG. 13 Diagram of IOI deviation analysis of Beethoven piano sonata no. 8 (op. 13no.1), 1st movement (Llyr Williams, recording 2018)

4. Conclusion

4.1. Experimental Conclusion
It can be seen from experiment 1 and Experiment 2 that the different environment, educational resources and national culture that the performers received when growing up are different. [3]Different experiences have created different personalities, and the school of piano he studied has also created different views on the treatment of works. As can be seen from Experiment 3, Of the four versions, William played at the slowest speed and was closest to the speed required by the spectral surface. There
is an inseparable relationship between speed and strength, which is generally reflected in the gradual increase of speed, and the gradual decrease of speed, and the gradual decrease of strength. It is obvious that IOI deviates from the analysis diagram. For example, in bar 54 and 55, the sharp and strong notes are accompanied by a rise in speed. In the analysis chart of IOI deviation, a significant increase in deviation degree can also be seen.[4] In performance, the factors of speed and strength cannot be ignored, and they are both important artistic techniques to express the image of musical works, which plays an extremely important role in what kind of artistic image the performer wants to present.

4.2. Prospects for future development
Summary to see through the experiment, from the middle of the 20th century, the middle and lower leaves of the 20th century to the early 21st century to recording compare, in recent years in various speed elastic scale expansion, is increasingly tender, speed of elastic telescopic tend to be restricted, and the structure of the music is from figure is also more and more obvious. When performing the music, the performer's self-emotional output appears to be more introverted, and his performance is more and more focused on the original music. For the spectrum of the rules and the grasp of the details are more and more accurate, self emotional expression is also more and more restraint.

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