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How the Rhythm is Actually Performed in the First Movement of the Beethoven's Seventh Symphony

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ABSTRACT

The first movement of Beethoven's Seventh Symphony uses a characteristic rhythm pattern throughout its main section. We analyzed 62 recordings of this movement by semi-manual method aided by audio signal processing to examine how accurately this rhythm pattern was performed in selected excerpts. The result showed that only few recordings performed this rhythm accurately as it is notated. In most of the cases, the rhythm was not accurate and its characteristic as a compound meter was diluted. We found that the rhythmic accuracy was mainly varied by musical texture of excerpts. Some conductors like Karajan, C. Kleiber, and Gardiner performed the rhythm more accurately than the others in most of the excerpts. The analysis result says that the recordings of American orchestras showed lower rhythmic accuracy than Austro-German orchestras or early music orchestras.

I. INTRODUCTION

Despite that few scholars like Nicolas Cook (Cook, 1999) and José Antonio Bowen (Bowen, 1996) argued the importance of music performance analysis, there was not enough research on music performance analysis in the musicology area. One of the reason is that there is no quantitative representation of the performance. In case of music analysis, scholars analyze and debate about the music using the score, which consists of quantitative and objective information. But there is no proper standard way to measure the characteristic of each performance. The question of measuring still lies on the performance analysis.

Unlike other musical characteristics, the rhythm is a relatively easy feature to measure from an audio recording. By detecting note onsets from a recording, one can analyze the rhythmic characteristic of the performance. Recent research applied an onset detection algorithm for estimating swing ratios in jazz recordings (Dittmar, 2015). The research analyzed the swing ratio of professional jazz drummers based on the onset timing of ride cymbal. This approach can be also applied to classical music, if rhythmic ratio is an important factor of performance.

Beethoven's Seventh symphony is well known for its constant use of characteristic rhythmic pattern. Each of the movements, especially the first, second, and fourth movement, repeats the characteristic rhythmic patterns obsessively. The main *vivace* section of the first movement is in six-eight time, and starts with the specific rhythm pattern as below, also known as an "Amsterdam rhythm". This rhythm is a variation of a crotchet followed by a quaver, which is a typical rhythm pattern in six-eight time.

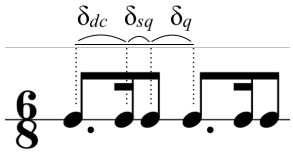

Figure 1. "Amsterdam" rhythm

Though this rhythm seems relatively easy to play, some conductors pointed out that the rhythm can be easily distorted if the musicians do not pay enough attention in this symphony. Gunther Schuller introduced his own classification of various recordings according to rhythmic accuracy. He insisted that only Carlos Kleiber and Jeffrey Tate's recording achieved the rhythmic precision constantly through the whole movement (Schuller, 1997). This analysis is a surprise considering that the Seventh symphony is frequently performed all around the world and has been recorded for numerous times. Normal del Mar also mentioned that there is a danger of "degeneration" of the Amsterdam rhythm especially in the measure 195 to 200, where the strings play this rhythm repeatedly (Norman, 2002).

The difficulty of playing the Amsterdam rhythm causes a characteristic difference in the performances and thus provides interesting examples for studying rhythm performance in orchestra music. Also, this movement contains a lot of homorhythmic texture, which make the onset detection much easier and more correct. Furthermore, the Amsterdam rhythm appears in different instrumentation and articulation throughout the movement. Therefore, we can survey several factors that effect on rhythm performance by analyzing recordings of this piece.

Please note that the goal of this research is not evaluating the artistic value of performances. We do not want to argue that the rhythm should be always performed strictly as it is notated. In this research, we use the term "rhythmic accuracy" only in a mathematical context, not in an aesthetic context.

II. METHODS

Our first approach was applying automatic onset detection algorithms that was introduced by Duxbury, Sandler, and Davies (2002), and Dittmar, Pfleiderer, and Müller (2015). The first one suggested an onset function based on subband decomposition of spectral energy. The research also proposed a smoothing scheme for calculating the transient difference of spectral energy. The second research employed spectral energy difference for detecting onsets. The goal of this research was estimating swing ratios of jazz drummers, and the authors proposed two methods to calculate a swing ratio:

calculating based on onset detection, and employing log-lag auto-correlation function.

We have applied these algorithms to recordings of the Beethoven's symphony, but the results were not enough reliable because of two reasons. First, the onsets of orchestral sound are not sharp enough to determine exact onset time. The orchestral instruments have softer attacks compare to a piano or a drum set. Also, though orchestra musicians are trained to play the music in synchronous way, it is physically impossible for all players to play notes at the exactly same moment. During the analysis, we found some cases that show a separation of an onset played in tutti. Second, because of the fast tempo, an onset interval is too short to be detected separately. Dull onset peaks and short onset intervals make the log-lag autocorrelation function impossible to distinguish an onset of semiquaver and quaver. Above all, detecting every onset with perfect precision and accuracy in fully-automatic way is unachievable even with the state-of-art algorithm.

Therefore, based on the onset detection functions, we found every onset in semi-manual way. We used temporal difference of spectral energy within certain frequency range, as same with the research of Dittmar (2015) for the onset detection function. First, we calculate the short-time Fourier transform (STFT) of selected audio clip, which can be represented as $\mathcal{X}(m,k)$, where m and k denotes index of time window and frequency bin respectively. Then, we derive log-STFT like $\mathcal{Y}(m,k) \coloneqq \log(1+\gamma\cdot|\mathcal{X}(m,k)|)$, with a proper constant $\gamma \geq 1$. The transient sound in onset part can be estimated from the difference between time frames in this log-STFT. Instead of using the difference between only adjacent frames, we also consider the difference be following the previous research (Duxbury, Sandler & Davies, 2002). The onset detection function $ons(m)$ can be represented as below:

$$ons(m) = \sum_{k=1}^{K}\left(\mathcal{Y}(m,k) - \sum_{a=1}^{A}\frac{\mathcal{Y}(m-a,k)}{a}\right).$$

We plot this onset detection function of the audio clip, then estimate the onset positions on the graph. After marking the onsets, we listen to the audio-clip with tick sounds at the marker positions in slow playback speed so that we can refine the onset position. This procedure is repeated until we consider that the onset positions are well synchronized with the actual audio clip. Then we measure the length of each note, and calculated rhythm ratio $r \coloneqq (\delta_{dc}+\delta_{sq})/\delta_q$ from each set of three notes that form the Amsterdam rhythm (Figure 1). If the music is performed exactly as notated in the score, the rhythm ratio r becomes 2.

III. EXPERIMENT

Among the first movement of the Seventh Symphony, we selected eleven different excerpts that contain the Amsterdam rhythm, so that we can examine the difference in rhythm performance according to the instrumentation and rhythm pattern. There are three different types of rhythm, which can be represent as Figure 2.

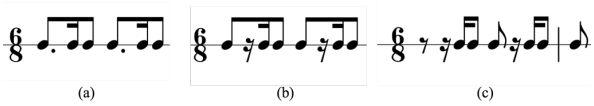

Figure 2. Three different types of Amsterdam Rhythm in the first movement of Beethoven's Seventh Symphony

The selected excerpts are explained in below. The score reduction was done by the first author based on Bärenreiter edition of the score.

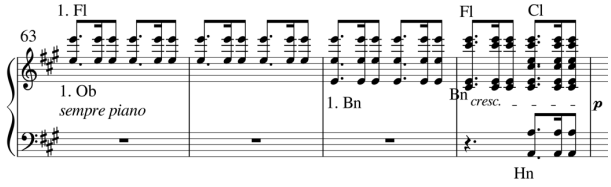

Figure 3. Excerpt (i)

The excerpt (i) is the beginning of *Vivace*, which is from measure 63 to 66, and the very first part that plays this rhythmic pattern. In this excerpt, only the flute and oboe solo plays the rhythm at the beginning and other woodwind instruments join later. We omitted last three notes because many recordings include tempo rubato in this section.

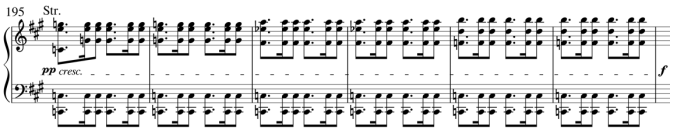

Figure 4. Excerpt (ii)

The excerpt (ii) is from measure 195 to 200, which is the beginning development section. Only the strings play the Amsterdam rhythm with the repeated pitch.

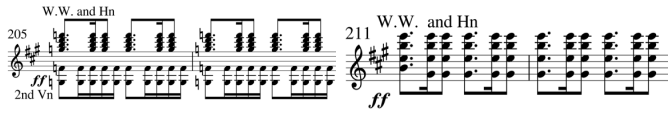

Figure 5. Excerpt (iii) and (iv)

The excerpt (iii) is from measure 205 to 206. In this excerpt, the entire woodwind instruments and horns play the Amsterdam rhythm, while the second violin plays another accompaniment rhythm.

The excerpt (iv) is from measure 211 to 212, which is almost same with the third excerpt except that there is no accompaniment by the second violins and the wind instruments play the different pitch.

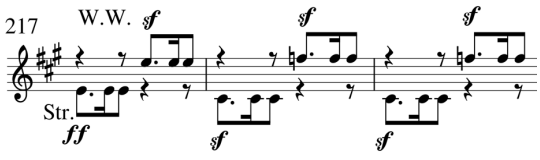

Figure 6. Excerpt (v)

The excerpt (v) is from measure 217 to 219. Here, the strings and woodwinds play the rhythm (a) alternately.

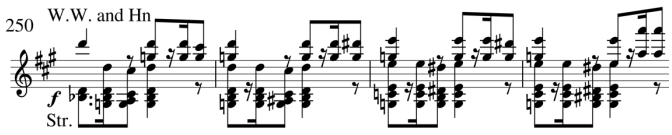

Figure 7. Excerpt (vi)

The excerpt (vi) is from measure 250 to 253. In this excerpt, the strings and the woodwinds with horns play the rhythm B alternately.

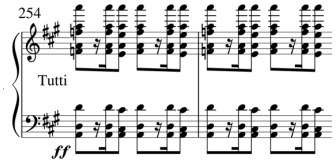

Figure 8. Excerpt (vii)

The excerpt (vii) is from 254 to 255, in which the whole orchestra plays the rhythm (b) simultaneously.

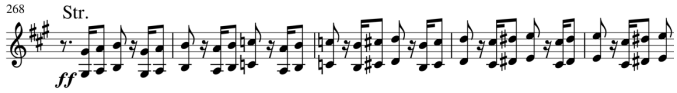

Figure 9. Excerpt (viii)

The excerpt (viii) is from 268 to 271, where the whole strings play the rhythm B in different pitch.

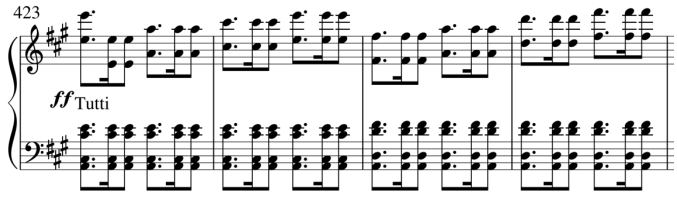

Figure 10. Excerpt (ix)

The excerpt (ix) is from measure 423 to 426, where the entire orchestra plays rhythm A simultaneously.

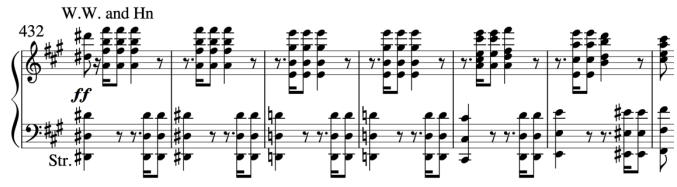

Figure 11, Excerpt (x)

The excerpt (x) is from 432 to 437. Here, strings and woodwinds with horns play the rhythm (c) alternatively.

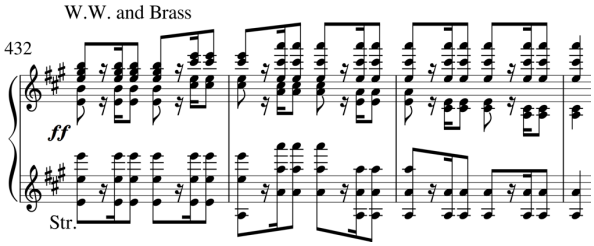

Figure 12. Excerpt (xi)

The last one, excerpt (xi) is from 445 to 447, which is the ending part of the movement and also the very last part that plays the Amsterdam rhythm.

We have selected 62 recordings, which include 44 conductors and 34 orchestras. To examine the influence of a conductor or an orchestra on the rhythm performance, we included multiple recordings by the same conductor or orchestras. The selected recordings are listed at the end of the paper. We have implemented an audio-to-audio alignment algorithm by Ewert, Müller and Grosche (2009) to automatically find the playing position of each excerpt in each recording.

IV. RESULT AND DISCUSSION

A. Influence of musical characteristics on the rhythm ratio

We calculated the rhythm ratio and compared them according to the excerpts. The box plot on the Figure 13 shows the average rhythm ratio r of selected recordings for each excerpt. The performed rhythm ratio was lower than ideal value 2 for most of the recording in every excerpt. As we expected, the rhythm ratios were clearly different according to the musical characteristics of the excerpts.

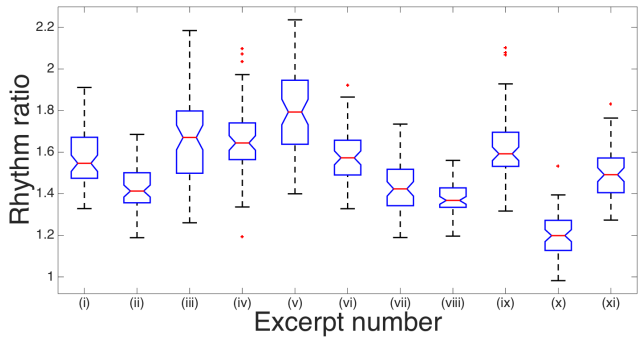

Figure 13. Box plot of measured rhythm ratio of 62 recordings according to the excerpts. Most of the recordings showed lower rhythm ratio than it is notated. Also, there are clear differences of rhythm ratios between each excerpt.

The most accurately performed excerpt was the excerpt (v), in which the strings and woodwinds play the rhythm (a) alternately, so that none of the orchestra plays the rhythm continuously. Compare to the other excerpts that contains repetitive rhythm (a) played by strings or woodwinds (e.g. excerpt (ii), (iii), (iv)), the excerpt (v) was performed more accurately. The similar results with the rhythm (b) can be examined by comparing the result of excerpt (vi) and (vii). This result suggests that orchestra musicians may play this

rhythm more accurately if they do not play it repetitively without rest.

On the other hand, the most inaccurate part was the excerpt (x), where the strings and woodwinds play the rhythm alternately, but in rhythm (c) that starts from the upbeat. This upbeat characteristic is the main difference between the excerpt (v) and (x), except that the (x) includes horns. We found in the excerpt (x) that the most of the recordings play this upbeat quaver much longer than it is notated, so that the length of the quaver is almost half of the beat, rather than third of it. This suggests that the musicians had a certain tendency to play this upbeat pattern in $\frac{2}{4}$, instead of $\frac{6}{8}$. Though this kind of tendency exists throughout the whole $\frac{6}{8}$ section, it is most definite in this upbeat pattern.

We found that musicians tend to perform rhythm (a) more accurately than rhythm (b) by comparing three tutti excerpts, (vii), (ix), and (xi). In these excerpts, every instrument in orchestra plays the rhythm (b) in the (vii) and (xi), and the rhythm (a) in the (ix). The rhythm ratios of excerpt (vii) and (xi) are similar by and large. But the ratio of (ix) is higher than the other two. In rhythm (a), the first note is dotted quaver, while it is separated into a quaver followed by a semiquaver rest in rhythm (b). Therefore, many conductors and orchestras tends to play rhythm (a) tenuto, and rhythm (b) staccato. The result of rhythm ratio indicates that this subtle change in articulation can have an effect on the timing of following notes, the semiquaver and the quaver; the musicians tended to play the third note of the rhythm set bit earlier than it is notated when the first note of set is played staccato.

This tendency can be also verified by comparing excerpt (v) and (vi). Though there are other different factors that there are additional horns or each rhythm pattern is followed by additional crotchet on the next beat in excerpt (vi), we can still assume that the difference in articulation is an important factor to explain this result.

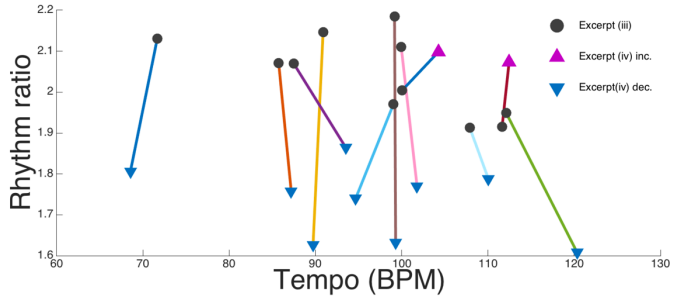

Figure 14. Rhythm ratio difference between the excerpt (iii) and (iv). The excerpt (iii) is marked with circles and the excerpt (iv) is marked with triangles.

The difference caused by musical texture can be observed by comparing the result of excerpt (iii) and excerpt (iv) as shown in Figure 14. We can infer the effect of the string accompaniment on the rhythmic accuracy of woodwind instruments from this comparison. The most of the recordings that performed excerpt (iii) with a high rhythmic ratio (r > 1.9) showed a ratio decrease about 0.2 or more at excerpt (iv). This indicates that their high rhythmic accuracy at the excerpt (d) was largely derived from the accompaniment of the second violins, which divide the rhythm with semiquavers. There were two recordings (Salonen and Pletnev) that showed higher rhythm ratio in the excerpt (iv), but these performances added additional string accompaniment pattern of excerpt (iii) into the excerpt (iv), so that there were no differences in musical text except the pitch.

The result also shows that the excerpt only performed by the strings (excerpt (ii) and (viii)) showed a lower rhythmic accuracy compared to the excerpt performed by the woodwinds (excerpt (i), (iii), and (iv)) or the entire orchestra (excerpt (f), (i)). This result implies that string players have more difficulties in playing the Amsterdam rhythm repeatedly. In addition, the excerpt (viii) showed the lowest deviation of rhythm ratio between the recordings. The deviation of rhythm ratio may indicate how much a conductor or an orchestra can make an effect on performing the rhythm. The large deviation in the result of excerpt (iii) implies that the rhythm ratio in this excerpt can be affected by whether a conductor or an orchestra is aware and conscious of this rhythm issue. On the other hand, the low deviation of rhythm ratio at the excerpt (g) may suggest that a conductor or an orchestra has a tendency of not being aware of the rhythm issue at this part, or an orchestra has a difficulty on playing this rhythm accurately regardless of their awareness and effort to play rhythm correctly.

B. Influence of musicians on the rhythm ratio

We made two hypotheses about musician's influence on the rhythm ratio. The first hypothesis is that an overall rhythm ratio throughout this movement is a musician's own characteristic. If the hypothesis is correct, the multiple recordings of a conductor or an orchestra will show similar rhythm ratio to each other. The second hypothesis is that some conductors or orchestras pay more attention on performing the rhythm so that they can play it more accurately than the others in the most of selected excerpt. If this hypothesis is reasonable, we would find a statistically meaningful difference between the result of a certain musician and the others.

Influence of conductors. Figure 15. shows the distribution of mean BPM and rhythm ratio across the eleven excerpts of each recording. Each data point denotes a single recording. We highlighted a few of the conductors included in our test set more than once. As shown in the figure, the recordings of Gardiner, Celibidache, Böhm, Furtwängler, Abbado, and Szell showed the similar rhythm ratio for both times. We have included four recordings of Karajan, Kleiber and Rattle respectively, and their standard deviation of rhythm ratio (0.0497, 0.0443, 0.0457) was smaller than the deviation of the entire recording set (0.0720). On the other hand, Thielemann's two recordings made standard deviation of 0.0781, which is larger than the entire recording set.

We verified the heteroscedasticity in mean rhythm ratio of recordings by same conductor compare to recordings by other conductors using Levene's test, which is less sensitive to departure from normality. Since there are too few samples per conductor, we failed to find statistically meaningful ($p < 0.05$) difference in variance of mean rhythm ratio. If we lower the standard ($p < 0.2$), there are three conductors (Böhm, Furtwängler, Gardiner) whose two recordings had smaller variance compare to variance of the other recordings. To determine whether this hypothesis is reasonable, we need more recordings by the same conductor.

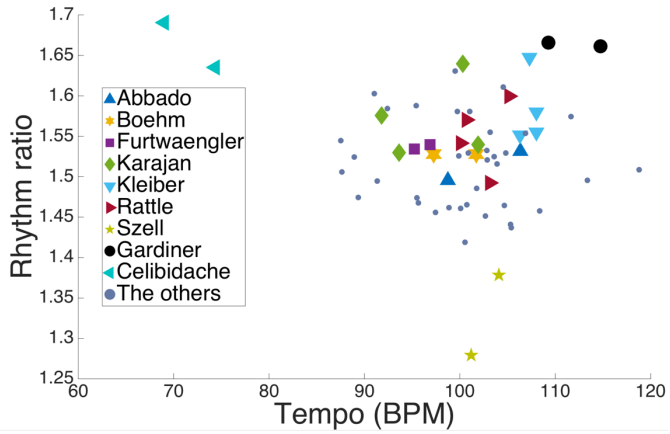

Figure 15. Scatter plot of analysis result of the recordings using mean value of rhythm ratio and tempo across the excerpts. Each data point indicates a single recording.

We examined the second hypothesis, that some conductors perform the Amsterdam rhythm more accurately than others in most of the excerpts, by using a Wilcoxon rank sum test. We used a recording's ranking of rhythm ratio in each excerpt compare to the other recordings, instead of absolute value of rhythm ratio. This assumes that some conductors will rank high in most of the excerpts. We avoided using absolute value of the ratio because the ratio varies greatly depending on the excerpt, so that the within-group variance becomes similar to the between-group variance when comparing the result of each recording. We checked every conductor whether they show meaningful difference in ratio rankings by the one-vs-rest method.

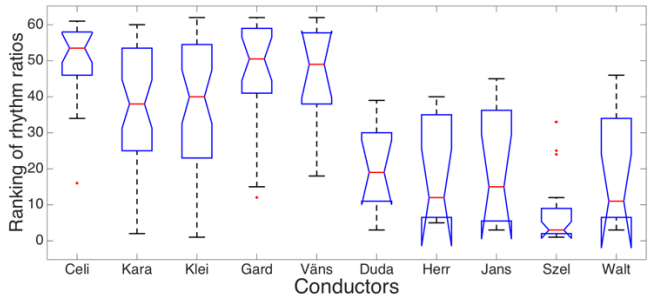

Figure 16. Box plot of Ranking of rhythm ratios from excerpts according to conductors. 10 conductors that showed meaningful difference with the other recordings are presented. High numeric value of ranking denotes high rank.

There were ten conductors who showed statically meaningful difference in the ratio ranking; Celibidache, Karajan, Kleiber, Gardiner, and Vänskä ranked high while Dudamel, Herreweghe, Jansons, Szell, and Walter ranked low for the most cases. Therefore, we can conclude that the second hypothesis is reasonable in case of conductors.

1) Influence of orchestras. To examine the influence of an orchestra on the rhythm ratio, we compared some recordings of the Vienna Philharmonic Orchestra (VPO) to the recordings of other orchestras, but conducted by the same conductor. We analyzed eight conductors who recorded the Seventh Symphony with several orchestras including the Vienna Philharmonic Orchestra.

The result is shown in Figure 17. Here we could not find clear correlation between the orchestra and the rhythm ratio. The recording with the VPO showed higher rhythm ratio than the Berlin Philharmonic Orchestra (BPO) or the Philharmonia Orchestra (PO) under Karajan's baton, but also showed lower rhythm ratio than the BPO with Abbado, and the PO with Thielemann. The recordings of Böhm and Furtwängler showed almost same average rhythm ratio regardless of the orchestra. One of the possible reasons for this irregularity is that there are about 30 years of gap between Karajan and Abbado or Thielemann's recordings.

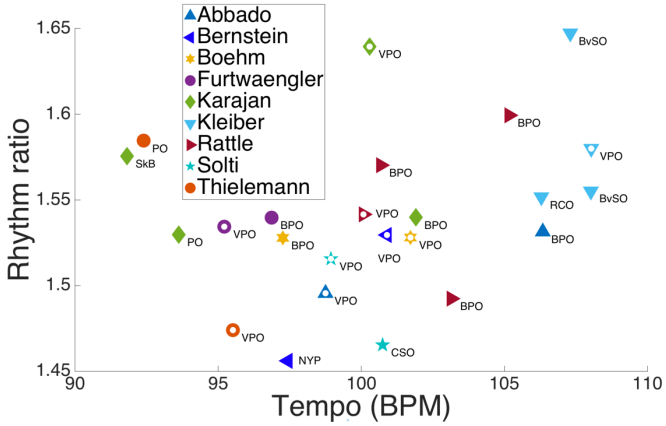

Figure 17. Scatter plot of recordings of the selected conductors, whose recording with VPO was included in our experiment set.

But in statistical analysis, we could find a certain level of heteroscedasticity ($p<0.15$) in mean rhythm ratio of VPO and BPO's recordings compare to the other recordings. This indicates that within-group variance of VPO or BPO is lower than variance of the entire recording sets, which is same with the argument of the first hypothesis. For more confident result, we need additional recordings of the same orchestra.

We can apply the same Wilcoxon rank sum test to verify the second hypothesis on orchestras. But the problem is that orchestra and conductor variables were severely entangled so that we cannot separate them each other. For example, the Orchestre Révolutionnaire et Romantique is only conducted by Gardiner, and also Gardiner conducted only this orchestra in our training set. There are same relations in Jansons and Bavarian Radio Symphony Orchestra, and Vänskä and Minnesota Orchestra.

Hence, we tried a combination of orchestra to compare each other. We made five orchestra groups as the Table 1.

Table 1. Classification of orchestra groups. Refer the end of the paper for the abbreviations.

Groups	Orchestras	Number of Recordings
Austro-German	BPO, BRSO, BvSO, LGO, MPO, NDR, SkB, SkD, VPO	30
USA	CO, CSO, LAP, NBC, NYP, MO, PdO, PSO	12
UK	LSO, MC, PO, RPO,	5
Early Music	AAM, AE, AoE, ORR	5
The Others	The rests	10

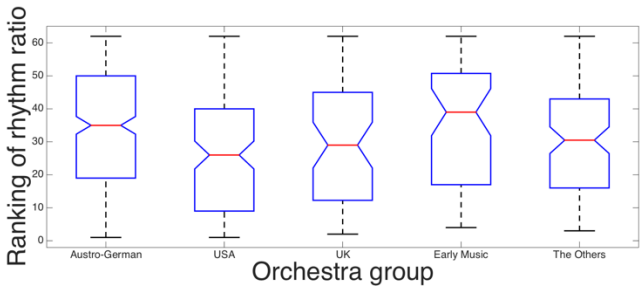

Figure 18. Box plot of ranking of rhythm ratio according to the orchestra group. There was statically meaningful difference between the Austro-German group and USA group or Early Music group and USA group.

We compared the distribution of ratio rankings in each excerpt by the orchestra groups. The box plot of the result is presented in Figure 18.

The result of Wilcoxon rank sum test showed that there are statistically meaningful ($p < 0.05$) differences between the orchestras in the USA and Austro-German orchestras, the early music orchestras orchestras, or the Others group. The p-value of difference between the Austro-German groups and the Others was 0.0548. The early music orchestra group also showed certain level of difference with the Others group ($p = 0.0654$).

The entanglement of conductors and orchestras on recordings still existed in this group classification. The conductors of Austro-German orchestras and orchestras from the USA were clearly separated. There were only two conductors, Bernstein and Solti, who made recordings with both Austro-German orchestra and American orchestra. But if we consider the orchestra's selection of conductor as a characteristic of the orchestra, this analysis gives a meaningful result. American orchestras tended to play the Amsterdam rhythm less accurately than the other orchestras, especially the Austro-German orchestras, whether it comes from natural characteristic of musicians in American orchestras, or their tendency to perform with the conductors who usually perform this rhythm less accurately. To establish a exact reason for this difference, we need more recordings of different orchestra group conducted by a same conductor.

V. CONCLUSION

We analyzed 69 recordings of the first movement of Beethoven's Seventh Symphony, and analyzed how the specific rhythm pattern called "Amsterdam" rhythm was actually performed in the eleven selected excerpts. The result showed that the rhythm was performed quite differently from as it is notated so that its characteristic as a compound meter is diluted. The performance of the Amsterdam rhythm varied largely depending on the musical texture of the excerpt. Musicians tended to play this rhythm less accurately when they repeat this rhythm continuously. Playing the first note of the rhythm pattern tenuto instead of staccato made the rhythm more accurately. Also, the result showed that the strings are less probable to play the rhythm accurately. By analyzing the result according to conductors and orchestras, we founded that some conductors performed this rhythm more accurately than others. Another interesting analysis was that recordings by orchestras in America showed low accuracy compared to Austro-German orchestras or early music orchestras.

However, there were clear limitations caused by limited recording set. We need to analyze more recordings to clearly verify the influence of a conductor or an orchestra on performing the Amsterdam rhythm. Another limitation was that our research was only focused on numerical length ratio of notes, and did not consider other factors that might affect human perception of the rhythm, like an articulation or dynamics of each note of the performance. We hope our research can be further improved with future research.

REFERENCES

Beethoven, L. (2000). *Symphony No. 7 in A major op. 92*, Kassel, Germany: Bärenreiter

Cook, N. (1999). Analysing performance and performing analysis. In N. Cook and M. Everist (Eds.), *Rethinking music* (pp. 239-61), Oxford: Oxford University Press.

Dittmar, C., Pfleiderer, M., & Müller, M. (2015). Automated Estimation of Ride Cymbal Swing Ratios in Jazz Recordings. *In Proceeding of International Society of Music Information Retrieval (ISMIR)* (pp. 271-277).

Del Mar, N. (2002). Conducting Beethoven Volume 1 The Symphonies. New York: Oxford University Press Inc.

Duxbury, C., Sandler, M., & Davies, M. (2002, September). A hybrid approach to musical note onset detection. *In Proceding of Digital Audio Effects Conference (DAFX,'02)* (pp. 33-38).

Ewert, S., Müller, M., & Grosche, P. (2009). High resolution audio synchronization using chroma onset features. *In Proceeding of IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)* (pp. 1869-1872). IEEE.

Schuller, G. (1997). The Compleat Conductor. New York: Oxford University Press Inc.

Bowen, J. A. (1996). Tempo, duration, and flexibility: Techniques in the analysis of performance. *Journal of Musicological Research*, 16(2), 111-156.

List of Recordings used in the experiments
Conductor, Orchestra (Abbreviation) [Label Recording_year]
(Kleiber denotes Carlos Kleiber, not Erich Kleiber)

Abbado, Berlin Philharmonic Orchestra (BPO) [DG 1999] / Abbado, Vienna Philharmonic Orchestra (VPO) [DG 1987] / Barenboim, Berlin Staatskapelle (SkB) [Warner 1999] / Bernstein, New York Philharmonic (NYP) [DG 1990] / Bernstein, VPO [DG 1978] / Blomstedt, Dresden Staatskapelle (SkD) [Brilliant Classics 1975] / Böhm, VPO [DG 1972] / Böhm, BPO [DG 1958] / Boulez, NYP [1975] / Boyd, Manchester Camerata (MC) [Avie 2007] / Brugge, Orchestra of the 18th Century (OoE) [Philips 1988] / Celibidache, Stockholm Philharmonia Orchestra [Arkadia 1969] / Celibidache, Munich Philharmonic Orchestra (MPO) [EMI] / Chailly, Leipzig Gewandhaus Orchestra (LGO) [Decca 2008] / Clutens, BPO [EMI 1960] / Dohnanyi, Cleveland Orchestra [Telarc 1987] / Dudamel, Simon Bolivar Youth Orchestra [DG 2006] / Furtwängler, BPO [DG 1943] / Furtwängler, VPO [EMI 1950] / Gardiner, Orchestré Révolutionnaire et Romantique (ORR) [DG 1992] / Gardiner, ORR [SDG 2011] / Haitink, London Symphony Orchestra (LSO) [LSO 2005] / Harnoncourt, Chamber Orchestra of Europe [Teldec 1990] / Herreweghe, Royal Flemish Philharmonic [Pentatone 2004] / Hogwood, Academy of Ancient Music (AAM) [L'oiseau-Lyre 1989] / Honeck, Pittsburgh Symphony Orchestra (PSO) [Reference Recordings 2014] / Immerseel, Anima Eterna (AE) [Zig Zag 2006] / Jansons, Bavarian Radio Symphony Orchestra (BRSO) [BR Classic 2008] / Jochum, BPO [DG 1952] / Karajan, SkB [DG 1941] / Karajan, Philharmonia Orchestra (PO) [EMI 1951] / Karajan, VPO [Decca 1959] / Karajan BPO [DG 1962] / Kleiber, VPO [DG 1975] / Kleiber, Bavaria State Orchestra (BvSO) [Orfeo 1982] / Kleiber, Amsterdam Concertgebouw Orchestra [Philips, 1983] / Kleiber, BvSO [Memories Excellence 1986] / Klemperer, PO [Documents 1966] / Krivine, Le Chamber Philharmonique [Naïve 2010] / Leibowitz, Royal Philharmonic Orchestra (RPO) [1961] / Masur, LGO [Philips 1972] / Monteux, French National Orchestra [Music & Arts 1952] / Ormandy, Philadelphia Orchestra (PdO) [1964] / Pletnev, Russian National Orchestra [DG 2006] / Rattle, VPO [EMI 2002] / Rattle, BPO [Digital Concert Hall 2008] / Rattle, BPO [Digital Concert Hall 2012] / Rattle, BPO [Digital Concert Hall 2015] / Salonen, Los Angeles Philharmonic (LAP) [DG 2006] / Scherchen, VPO [Tahra 1954] / Solti, VPO [Decca 1958] / Solti, Chicago Symphony Orchestra (CSO) [Decca 1972] / Szell, NYP [West Hill Radio Archive 1943] / Szell, CO [Sony 1959] / Tate SkD [EMI 1986] / Thielemann, PO [DG 1996] / Thilemeann, VPO [C Major 2009] / Toscanini, NBC Symphony Orchestra (NBC) [RCA] / Vänskä, Minnesota Orchestra (MO) [BIS 2008] / Walter, NYP [Music & Arts 1951] / Wand, NDR Symphony Orchestra (NDR) [RCA 1987] / Zinman, Tonhalle Orchestra Zürich [Arte Nova 1997]