AURALIZATION OF VANISHED 19th CENTURY CONCERT HALLS IN HELSINKI

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1 INTRODUCTION

The Helsinki City Museum opened an exhibition “Music! Echoes from the past of a city” on the 11th of March, 2015. The exhibition deals with the music history in Helsinki, but instead of composers and professional musicians, the main role in the exhibition is played by the history of ordinary music lovers, listeners and enthusiasts from the city. One aim of the exhibition was to provide the visitors an audible experience of concert in the concert halls from 19th century Helsinki.

The most important concert halls and other music performance spaces of the 19th century Helsinki have either vanished or been converted into other use. Such spaces are the 1st and the 2nd banquet halls of the Hotel Societetshuset, the main auditorium of the University of Helsinki and the banquet hall of the Voluntary Fire Brigade House. As these halls do not exist anymore, it is neither possible to record concerts in them nor measure their acoustics.

In our other paper of Auditorium Acoustics conference, we have presented the results of the room acoustical modelling of the four vanished concert halls. The modelling provides objective information on the room acoustics of the spaces. Usually, the modelled measures include those presented in standard ISO 3382-1[1]. The data is interesting for specialists in acoustics, but understanding a concert experience on the basis of the modelled acoustical measures requires a lot of interpretation. Providing an experience of the lost acoustics requires that the results of the computer modelling should be audible. Thus, the project included the auralization of the vanished concert halls.

The audible experience of the modelled 19th century concert halls does not depend solely on their room acoustics. The size of the orchestras and their seating arrangements also affect the auditory experience. This means that an auralization, aiming to sound as authentic as possible, also requires knowledge of historically informed performance practice. This means that the auralization of a vanished concert space becomes a multidisciplinary research project, based on architectural history, music history and acoustics. The aim of this paper is to document the phases of creating these auralizations and the means with which the acoustics of the vanished concert halls are presented in the exhibition at Helsinki City Museum.

2 ORCHESTRAS IN 19th CENTURY HELSINKI

Musical life in Helsinki in the early 19th century was limited mostly to the officers and military musicians in the Sveaborg fortress (nowadays Suomenlinna). During the years 1815–1824, Count Ludwig van Heyden, the military governor of Sveaborg, upheld a small orchestra which could perform symphonic works. In the town, among the members of the bourgeoisie there were many keen amateur musicians who played chamber music in different ensembles.[2]

In 1825 a group of 18 amateur musicians formed an orchestral society in Helsinki. After the University moved to Helsinki in 1828 after the disastrous fire of the former capital Turku, it was renamed the Musical Society of Helsinki and its orchestra had at most 30 musicians. In the same year, the university students formed the Academic Musical Society around the University Orchestra

which was disbanded in 1835, and succeeded by the Musical Society. The orchestra however, still maintained mostly the same musicians.[2,3]

In 1835 German violinist, composer and conductor Fredrik Pacius arrived in Finland, and took on the position of music instructor in the university. He conducted the University Orchestra, and organized large Easter concerts with up to 50 musicians and a 60-person mixed choir. In 1845 the Symphonic Society was formed to support Pacius' orchestra, which consisted mostly of students, a few professional musicians, and wind players from the Guards' Band. Pacius conducted most of his concerts in the University Auditorium.[2-4]

During the 1850s there was a slight recession in the musical life of Helsinki, partly due to the Crimean war. This decade also marked the end of amateur-based orchestras in Helsinki, as in 1860 the first professional orchestra was formed in the city. The Theatre Orchestra was commissioned in 1860 by the New Theatre (Nya Teatern). The original commission was for 13 musicians, but the orchestra employed 12–20 players during the 19th century. It mainly performed intermission music and accompanied musical plays in the theatre, but also held symphony concerts in the Society House Hall and the University Auditorium.[2-4]

The second professional orchestra in Helsinki was the Helsinki Concert Orchestra, founded in 1879. Instead of theatre music, its main emphasis was in symphonic concerts. The orchestra was led by Bohuslav Hrimaly and consisted of 18 musicians. Due to lack of public financial support, the orchestra ceased its operations in 1882. In 1882 the predecessor to the Helsinki Philharmonic Orchestra, the Helsinki Orchestra Foundation, was founded by conductor Robert Kajanus. At the time of its conception, the orchestra consisted of 36 persons, but was expanded to nearly 50 musicians before 1900. The orchestra held symphonic concerts in the university and occasionally in the Society House. Popular concerts were mainly held in the Society House, and also in the Voluntary Fire Brigade House.[2,5,7]

The numbers of musicians employed by different orchestras are displayed in Figure 1.[8] The chart shows orchestras in Helsinki[2,4,5,7], compared with different European orchestras at the time[9-11]. Even though the general trend of increasing orchestral size in the 19th century had already begun in central Europe, the same development did not happen in Finland until some decades later.

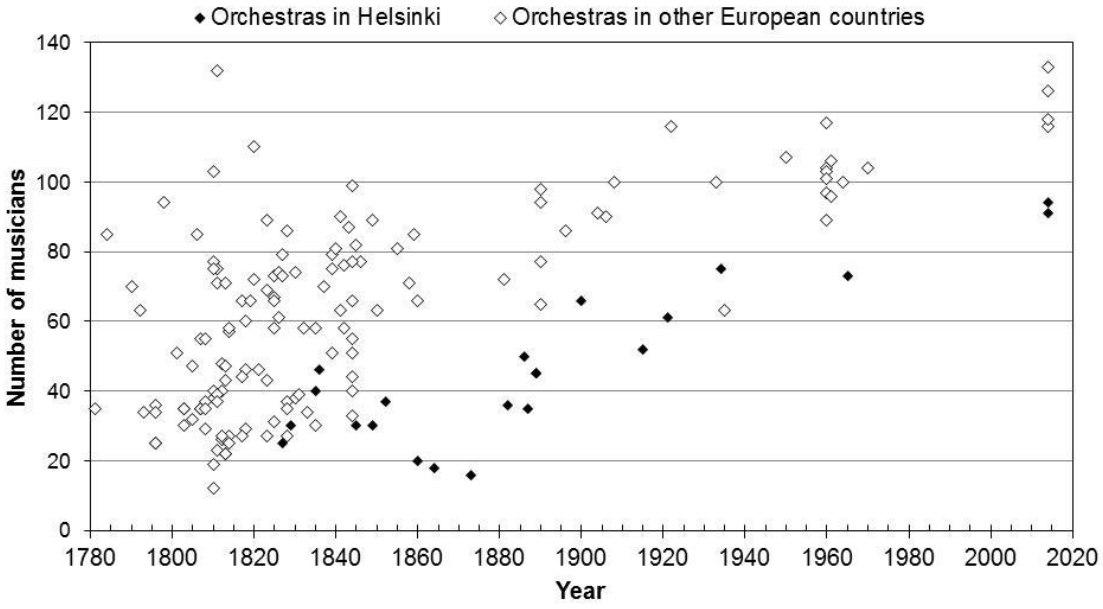

Figure 1. The number of musicians employed in major orchestras in central Europe and Helsinki in the 19th century.

3 COMPOSITION AND SEATING ARRANGEMENTS OF THE ORCHESTRAS

The objective of the research was to create auralizations, giving as authentic an experience of the vanished concert halls as possible. As the size of the orchestra and seating arrangements affect the auditory perception of music in a concert hall, the size, composition and seating arrangements of orchestras in 19th century Helsinki were studied on the basis of literature on music history.[2-5]

The orchestras used in the auralizations were composed of different amounts of musicians and instruments as follows: 50 musicians in the main auditorium of the University of Helsinki, 31 musicians in the 1st banquet hall of the Hotel Societetshuset, 29 musicians in the 2nd banquet hall of the Hotel Societetshuset and 38 musicians in the banquet hall of the Voluntary Fire Brigade Hall. The exact ensembles are given in Table 1.

Table 1. The instruments and compositions of the auralized orchestras in the studied halls.

Instrument	University	Hotel Societetshuset 1	Hotel Societetshuset 2	Fire Brigade House
Violin I	10	4	6	6
Violin II	10	4	4	6
Viola	6	4	2	2
Violoncello	6	4	2	4
Contrabass	5	2	2	3
Flute	2	2	2	2
Oboe	2	2	2	2
Clarinet	2	2	2	2
Bassoon	2	2	2	2
French Horn	2	2	2	2
Trumpet	2	2	2	2
Timpani	1	1	1	1
total	50	31	29	38

The studies on music history, however, do not give exact information about the seating arrangements. Some photographs showing the seating of orchestras were available from the main auditorium of the University of Helsinki and the banquet hall of the Voluntary Fire Brigade House (Figure 2). No photographs from the first banquet hall of the Hotel Societetshuset exist, and there are only two photographs from the second banquet hall when it was empty. In these cases, the seating arrangement were formed on the basis of knowledge about the seating of other European orchestras of the same era.[9,11]

Figure 2. Robert Kajanus conducting in the banquet hall of the Voluntary Fire Brigade Hall in 1900 (left) and in the main auditorium of the University of Helsinki in the 1890s (right).

The size, composition and seating arrangements of the orchestras in 19th century Helsinki were studied. Information about the size and composition of the orchestras was found in literature dealing with the history of music in Finland. These studies, however, do not give exact information about the seating arrangements.

Some photographs showing the seating of orchestras were available from the main auditorium of the University of Helsinki and the banquet hall of the Voluntary Fire Brigade House. No photographs from the first banquet hall of the Hotel Societetshuset exist, and there are only two photographs from the second banquet hall when it was empty. In these cases, the seating arrangement was formed on the basis of knowledge about the seating of other European orchestras of the same period.

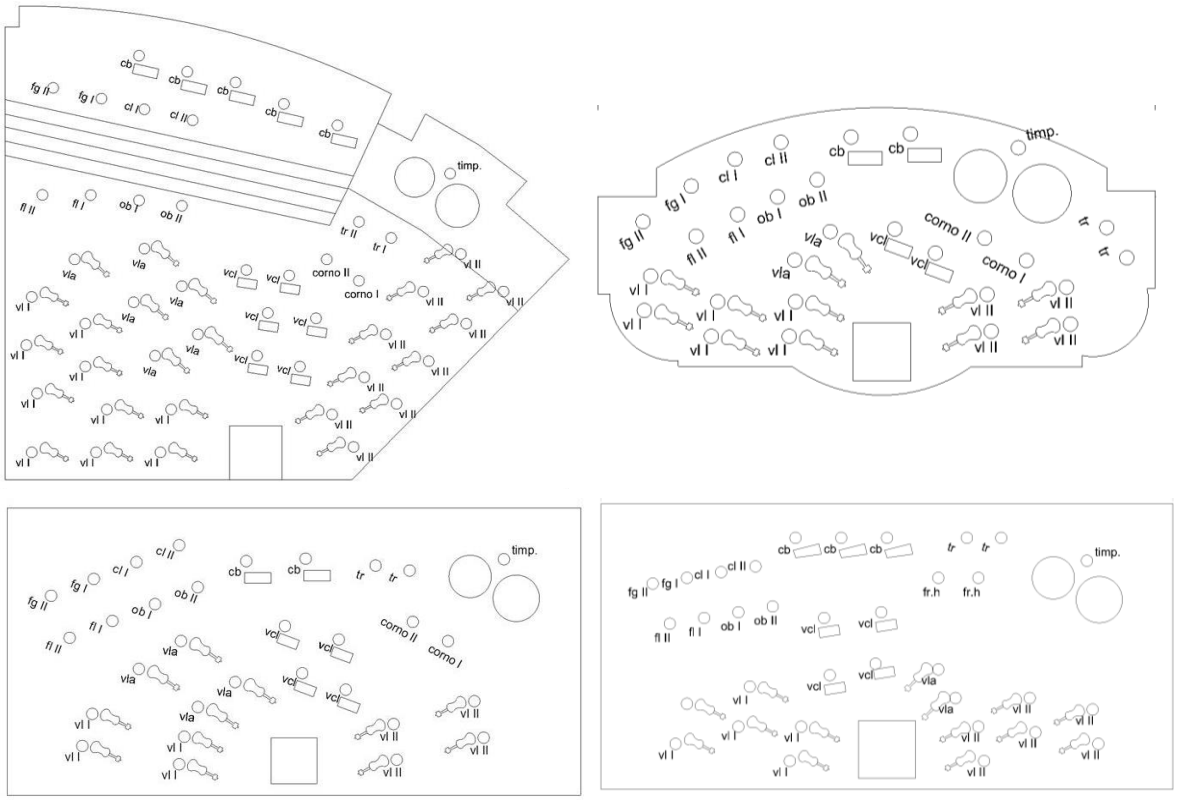

Figure 3. The seating arrangements in the studied halls: the main auditorium of the University (above left), the 1st (below left) and 2nd (above right) banquet halls of the Hotel Societetshuset and the banquet hall of the Voluntary Fire Brigade House (below right).

4 AURALIZATIONS

Room acoustical modelling is based on the calculation of the impulse response of the room in a certain position. The impulse response corresponds to the clapping of hands (impulse) and the decaying sound in a certain point in the room (response). Different room acoustical measures can be determined on the basis of the impulse response. These results have been presented in a separate paper in this conference. Auralizations are also based on the impulse response: if the impulse is replaced by an anechoic recording of some sound like speech or music, the response will then correspond to the audible decaying sound in a certain point in the room. In this case, a whole orchestra was auralized, which meant that impulse responses of each instrument at a certain receiving point had to be calculated. The sound sources in the halls have been presented in Table 1. In each hall, there were two listening points in order to demonstrate the effect of space and location on the listening experience.

To create a credible auralization, the first condition is the validity of the room acoustical modelling. Another important factor is the auralized piece. Since the project's aim is to create a valid experience of what the concert halls of Helsinki may have sounded like during the 19th century, the auralized piece should have been already composed before the oldest of the halls was finished. The auralizations therefore required publicly available anechoic orchestral recordings that fulfilled this condition.

Anechoic recordings made by Virtual Acoustics Team at Aalto University were used in this project.[12,13] The beginning of the first movement of Beethoven's Symphony No. 7 was selected as the music sample for the auralization. The symphony was composed in 1813 and the score was already available in Finland in 1822.[2] It is known that the work has been performed several times in the main auditorium of the University of Helsinki in the end of the 19th century.[5,14] The auralizations were created with the commercial modelling software Odeon Auditorium 12.

5 PRESENTATION OF AURALIZATIONS IN THE EXHIBITION

The exhibition in the Helsinki City Museum is interactive to a great extent, and the auralizations of the concert halls are also presented interactively. A multimedia presentation is provided in a large enclosure, imitating the boxes of 19th century performance spaces (Fig. 4). The exhibition visitor can browse the presentation on a touch screen. A brief history of the halls, including comments of contemporary concert visitors, photographs and visualizations is included in the presentation.

The auralizations are listened to with headphones, and the listener can change either hall or the seat inside a hall in real time. Thus allowing the visitor to hear for themselves, how different halls and different locations within a hall can affect the auditory experience.

Figure 4. The exhibition visitor can study the auralizations in an enclosure imitating 19th theatre boxes (left). The auralizations are presented so that the hall can be changed during the music is playing, so the differences in the acoustics can be heard in real time (right).

6 DISCUSSION AND LIMITATIONS

The purpose of the auralizations in the exhibition was not scientific, but rather to give visitors an idea of what a concert in 19th century Helsinki may have sounded like. Even in this case, however, there was an effort to produce as authentic audible recordings as possible.

There were several uncertainties in the interpretation of the historical sources that had to be solved in the modelling process. The models have been constructed on the basis of several historical

sources, some of them partly contradictory. In such cases photographs took precedence over drawings, as the buildings were not always realized exactly according to the building plan.
Information on the surface materials was found from archival sources, such as fire insurance certificates. The absorption and scattering coefficients have been deduced from the used materials and the roughness of each surface. The lack of precise sources for these parameters presents a wide margin of error for the results of room acoustic modelling and auralization.

In modern building projects, acoustical consultants usually measure the room acoustics of finished concert halls and validate their models on the basis of measurement results. In the case of vanished buildings this is not possible. However, contemporary opinions dealing with the acoustics the modelled concert halls can be found. Following the guidelines presented in[15], the results of room acoustical modelling were validated by comparing them with the opinions presented in newspapers by contemporary concert reviewers of 19th century.

A further limitation in the validity of the auralizations is the orchestra itself. During the last two centuries, the configuration and size of the symphony orchestra has varied. Since the time when the halls concerned here existed, orchestral timbre has also changed significantly due to changes in playing technique and modifications of the orchestral instruments.[9,10,16]

The anechoic orchestral recordings used in this study have been made with professional musicians and modern instruments.[12,13] When aiming for historically authentic auralizations, this presents a problem, as the change in orchestral timbre cannot be realized in the auralizations. Greater authenticity could be achieved with anechoic recordings using period instruments and musicians specialized in historically informed performance practice, but such anechoic recordings do not exist. Museums and historians are interested in presenting sensory effects of historical buildings and events. Several authors have already done room acoustical modelling and auralization of historical buildings.[8,17,18,19,20] Auralization provides a means of creating a sensory effect of the acoustical past, but at the moment one of the problems is the lack of suitable anechoic recordings.

It is well known, that the performance of musicians is significantly affected by the acoustic qualities of a hall.[11,21,22] The anechoic recordings have been done in an anechoic room and it is not possible to affect them afterwards. Thus, the effects of the room acoustics on the performance of the musicians cannot be reproduced in the auralizations of the different halls.

7 CONCLUSIONS

The exhibition in the Helsinki City Museum provides an experience of the acoustics of vanished concert halls from 19th century Helsinki. In addition to the room acoustical modelling presented in our other paper, auralizations of the four halls were produced. Auralization provides a possibility to popularize the research results dealing with the acoustics of vanished 19th century concert halls in Helsinki. In the exhibition, the auralizations are listened to via headphones, and the listener can change either the hall or the seat inside a hall in real time. Thus allowing the visitor to hear for themselves, how different halls and different locations within a hall can affect the auditory experience.

The aim was to create as authentic an experience of the vanished concert halls as possible. The size, composition and seating arrangements of orchestras in 19th century Helsinki were studied. Information about the size and composition of the orchestras could be found in literature dealing with the history of music in Finland. These studies, however, do not give exact information about the seating arrangements. Some photographs showing the seating of orchestras were available from the main auditorium of the University of Helsinki and the banquet hall of the Voluntary Fire Brigade House. In the cases when no exact information on seating arrangements exists, the seating arrangement was formed on the basis of knowledge about the seating of other European orchestras of the same era.

Since the time when the halls concerned here existed, orchestral timbre has changed due to developments in playing technique and modifications of the orchestral instruments. When aiming for historically authentic auralizations, this presents a problem: since only anechoic recordings of modern instruments exist, the change in orchestral timbre cannot be realized in the auralizations. Greater authenticity could be achieved with anechoic recordings using period instruments and musicians specialized in historically informed performance practice.

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