# SHAPING SOUNDS IN YORK MINSTER

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## ABSTRACT

This article describes the process of designing and performing an installation at York Minster taking as a point of departure an existing piece of electroacoustic music. The creation of a soundtrack that would relate to the location is described using an asymmetrical disposition of loudspeakers for a flexible method. Strategies for an integrated spatial and temporal evolution over a 12-channel speaker system in the hall are outlined considering a strategy for the movement of sound in relation to the movement of the audience in the hall. Some conclusions are drawn about the approach used to create the soundtrack from the original piece as well as the method used for the implementation. Finally, some suggestions are outlined for an improved version of the installation which could have a longer duration and could happen outside the context of a concert.

*Keywords* – Minster, installation, composition, music.

## 1. INTRODUCTION

The idea of an electroacoustic piece of music that would try to capture the body and clarity of the gamelan started as a project for a studio piece. As the work was being composed, the possibility arose to premiere the work as an installation at York Minster in an event where *Gamelan Sekar Petak* of the University of York would perform. This led to a change in the approach of the creative process and new goals were set. These are outlined in this article. The first goal was to devise an effective method which would allow the transition from a studio electroacoustic piece to a soundtrack for an installation in a large location as York Minster. The second goal was to find a flexible and practical way to implement the installation using the available sound-reinforcement audio system.

## 2. TRANSITION TOWARDS AN INSTALLATION

### 2.1. Introduction

The studio piece *Clangor* was conceived using sounds recorded from different components of a Javanese gamelan orchestra [1]. The piece explores the timbral possibilities of different instruments in a varying temporal framework that affects the duration and timbre of sequences of sounds [2]. Tempo variations shape the form of the piece allowing contrasts between long continuous sounds with a low tempo and rhythms with a high tempo to occur. This idea was the starting point for developing the transition from the piece of music to the soundtrack of the installation, considering on the one hand an adaptation to the acoustics of the Minster and on the other hand a sense of functionality in the context of the event where the installation would take place.

### 2.2. Relating sound to the physical space

York Minster is the largest Medieval Gothic church in Northern Europe with a volume of approximately 140000 cubic metres. The floor and walls are made of stone that gives the hall a distinctive reverberation that varies from 3.9 to 4.7 seconds in different parts of the hall [3]. Figure 1 shows the plan of the Minster with its dimensions and different sections: the nave, the south and north transept, the chapter house and the choir [4]. The lines and numbers in the figure will be explained later when the implementation will be described.

During the inspection of the hall and in order to make it work in the acoustics the space, it became clear that changes would have to be done to the original piece to create the soundtrack for the installation. Two very different types of areas in the hall in terms of acoustic materials as well as shape were identified. The first and largest area is that of the nave, the transepts, the corridors and the east end. This area, mostly made of stone and with almost no acoustical absorption, allows the public to walk and explore the architecture of the Minster freely. The second area is the choir, a separated area almost completely made of wood, with seats for the audience, separated from the rest of the hall by walls [5]. These two areas will be referred through the text as the first and second areas.

Give the size and the very particular character of the hall, the idea emerged to relate the soundtrack created to the two mentioned areas: to develop a sense of movement in the first one and to create a more static sonic experience in the second one. The aim was to emphasise the natural contrast in the acoustics with contrasts in timbre and spatialisation. Long slowly evolving sounds would be played in the first area where there is little reverberation, while rhythmic sequences of short impulsive sounds would be used in the area of the choir where the surfaces are mostly wooden and where more clarity and detail in the sound could be achieved.

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## 2.3. Creating the soundtrack from the original piece

With the above in mind, the original piece was re-mixed by enlarging some sections of the overall evolution of events in time as well as changing the approach in the spatialisation of sounds. The temporal evolutions of parts of the piece were expanded, following to some extent the original changes in tempo, allowing the material to develop in time at a slower pace than in the musical piece.

The new pace was designed by taking into account the role of the installation in the context of the event, as explained below. This installation would take place between performances of the gamelan group *Gamelan Sekar Petak* in an event called *Echoes* organised by the Music Department of the University of York. The idea was to encourage people to move from the nave of the Minster, where they would be at the time of the end of the performance of the gamelan group, to the other parts of the hall during the duration of the installation. People should be allowed to explore the hall through a sonic experience in a reasonable period of time, following a strategy that will be explained later when the use of live diffusion will be introduced.

The spatialisation of the original piece was also modified to a large extent in order to make it work for the desired purpose of the installation.

Initially all reverberation or delays were eliminated from the original piece in order to allow the acoustics of the hall to be the only reverberant field perceived by listeners. The panning of the sounds of the original piece was adapted, with a very different disposition from the symmetrical speaker array of a concert situation. Because of the large volume of the hall and the long distances between speakers that would have to be used to create a reasonable coverage of the hall, a more flexible approach to the movement of sound between speakers was adopted as used in a previous work [6]. As well multiple speaker pairs were used that could be related to the original panning in a stereo source as it is shown in figure 1 where odd number loudspeakers are related to one channel of the soundtrack and even number loudspeakers related to the other. This allowed an open and flexible approach to the spatialisation with the possibility of multiple axes of movement in the panning of sound between speakers by just controlling levels in a mixer with multiple independent stereo outputs. In this way multiple relationships in different axes of movement could be created between pairs of speakers, as shown in the figure 1 where sounds could be panned between speakers 5 and 4, 5 and 6, 3 and 4, 3 and 6, as well as 3 and 2.
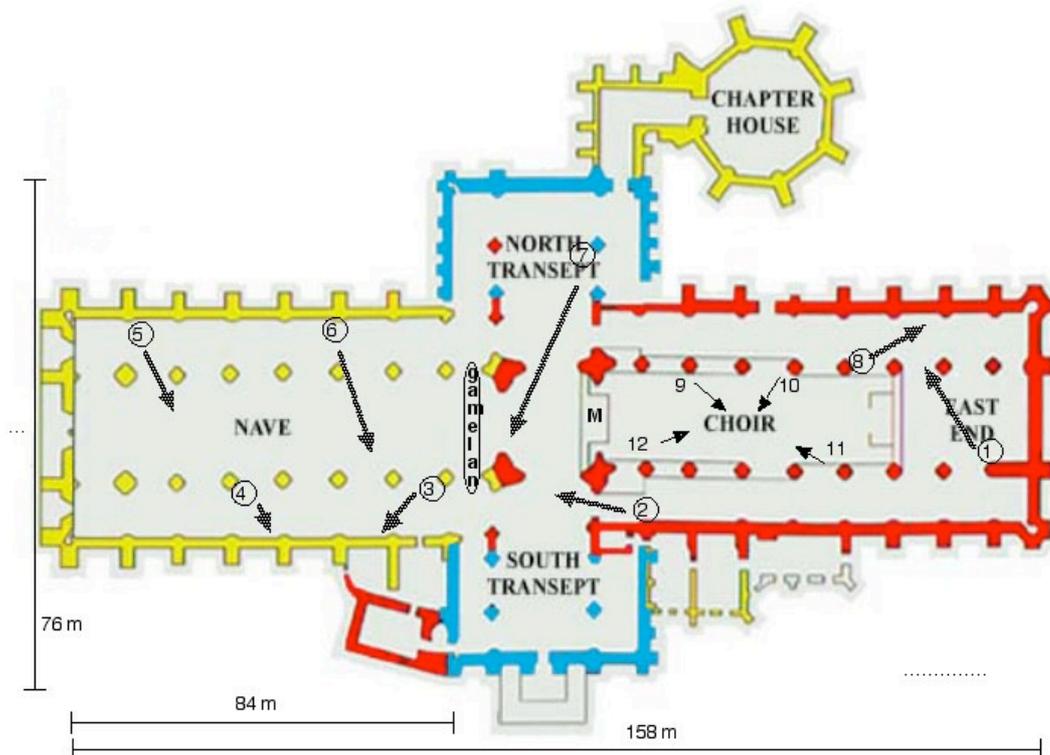


**Figure 1**. York Minster plan with loudspeakers positioning.

## 3. STRATEGIES FOR THE IMPLEMENTATION OF THE INSTALLATION

### 3.1. Introduction

A multi-speaker system playing the stereo soundtrack created for the installation had to be designed bearing in mind the shape and acoustics of the Minster as well as the idea of an audience walking in the hall. In this section some of the strategies used for the implementation of the installation will be explained as well as the response of the audience to the installation.

### 3.2. Speaker positioning

Once the soundtrack for the installation was created considering aspects of the hall and the practicalities of the event, the next step was to find the best speaker positioning that would allow an integrated performance in the hall. Two main options were considered for the location of the loudspeakers. The first was to try to cover the hall as much as possible with an available 12-speaker system. Considering the event during which the installation would take place, it became clear that it would be difficult to break the 'concert position' of the audience in the nave when the soundtrack of the installation would start after the performance of the gamelan group. Therefore the speakers were set strategically in the hall as a way to create a sense of movement among the audience and also in positions where the public could not see them but just hear the sounds coming from them. This was done assuming that sounds which originated from various speakers and changes in intensity between speakers could induce people to move and discover the hall as they were confronted with a challenging sonic experience. As shown with arrows in figure 1, the speakers were positioned and orientated in the Minster so as to create a discrete coverage of the hall, allowing the audience experience most of the time at least the sound of one speaker directly pointed at them or resonating in the near walls. Since the installation would start after the performance of the gamelan group, with the public in the nave, the speakers were orientated asymmetrically in a way that would encourage a sense of flow among the audience towards the centre of the hall. Once in the centre of the hall, the most prominent sound would be that of speaker 2 that would invite the movement of the audience into the East part of the Minster. There they would be confronted with the sound coming out of the choir area, which might again induce them to enter and sit down. Inside the choir they would be presented with the sound coming directly from a four-speaker system as a small metaphor of the installation within the installation: a created sound environment that would be independent in character and pace to the sonic environment created in the rest of the Minster.

### 3.3. The role of active diffusion

Active diffusion in the installation was conceived as a tool to adjust the individual intensity of loudspeakers in the hall as well as to increase the contrasting character of the acoustics of the choir area and the rest of the hall. Since it was not possible to make any tests in the Minster before the day of the event, it was also important to use a flexible alternative that would allow to adjust the performance to the venue. By adjusting the sound levels with active diffusion it was easy to calibrate the intensity of the soundtrack in different parts of the hall and test the possibilities of spatialisation in such a large space. A plan for the active diffusion throughout the duration of the installation was designed where the ideas mentioned above of temporal and spatial relations of the soundtrack, were linked to changes in the intensity of loudspeakers in particular areas of the hall. The intention was to generate a sense of movement of the long continuous sounds in the nave and create a transition to rhythmic layers of sounds in the chorus where the acoustic environment allowed the sound to be more detailed.

### 3.4. The use of independent sources

Active diffusion was carried out using a mixing desk with multiple independent outputs and two CD players as inputs. The mixing desk was positioned at the entrance of the choir, which allowed the people in the mixing desk to have a view of the nave and the choir and at the same time to follow the pace of the movement of the audience through the hall. The location of the mixer is shown in figure 1 with the letter 'M'.

The soundtrack created for the installation was designed to be played independently through two non-synchronised CD players as a way to add flexibility to the adjustment of the soundtrack to the venue. The first CD player would play the fifteen minute soundtrack continuously from beginning to end in the first area of the hall, creating a fixed framework for the duration of the installation. The second CD player was used to play selected excerpts of the soundtrack through the four speakers in the choir area, alternating between more rhythmic sections of the piece and gaps of silence during which the sound of the speakers in the hall could be heard in the choir area. This was done as a way to emphasise the contrast mentioned before.

### 3.5. The response of the audience

Most of the strategies devised to create a more flexible and functional approach towards the performance of the installation seemed to work The audience wandered through the hall and seemed to enjoy the idea of discovering the acoustics of the hall through the sonic experience of the installation. The non-symmetrical positioning of speakers in the hall and the idea of creating multiple axes of movement with panning showed to be an effective way to encourage the movement of the audience. The idea of creating an

internal space in the choir where people could perceive a more clear and distinctive acoustics in the hall seemed only to be appreciated by a few people who walked into this area and experienced the desired contrasting effect relating sound and the physical space. The response of the large majority of the audience seemed to be more focused on walking continuously through the open spaces of the hall rather than staying in a particular location in a situation similar to the one they experienced in the concert just before the installation. A longer duration of the installation in a less time restricting situation, outside the context of a concert would have probably benefited the installation as it would have allowed people to spend more time in different parts of the hall.

## 4. CONCLUSIONS

The result of the transition from a studio piece towards the soundtrack for an installation showed that a careful planning of the temporal evolution and the spatialisation of the soundtrack effectively helped to adapt sounds to the acoustics of York Minster. A functional spatialisation approach using a non-symmetrical positioning of speakers led to a simple and effective method of projecting sound in space by defining axes of movement between multiple pairs of speakers in the hall. The decision to use live diffusion for the implementation of the installation proved to be a functional way of adapting sounds to the shape and acoustics of the hall and adding a sense of flow that could be related to the audience.

Further developments of the strategies used for this installation could consider an extended time frame independent of the context of a concert in order to allow a more ambitious use of the possibilities of the acoustics of the hall and also a better understanding of how we can relate basic sound characteristics to the behaviour of a walking audience.

## 5. ACKNOWLEDGEMENTS

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