Novel Spatial Audio Scenes
Classical Music for Surround

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Classical Music for Surround

• Growing consumer acceptance of multichannel audio
• DVD-Audio and Super Audio CD are mainstream commercial media
• Music-only releases are taking advantage of the developments
• Classical commercial releases often maintain traditional recording practices
• Creative opportunities are often avoided
Novel Spatial Audio Scenes

• Listener opinions were sought for novel spatial audio scenes
• Series of specially made recordings
• Traditional spatial microphone arrays
• Alternative artist arrangements
• Formal listening test
Traditional Setup - Choir

- Soprano
- Tenor
- Bass
- Alto
Traditional Setup – Chamber Orchestra

- Clarinet
- Flute
- Bassoon
- Violin 2
- Violas
- Violin 1
- ‘Cellos

[Image of a chamber orchestra setup]
Traditional Setup - Quartet

Violin 1
Violin 2
Viola
‘Cello
Partial Arc Setup - Choir

- Soprano
- Tenor
- Alto
- Bass
Partial Arc Setup – Chamber Orchestra

- Flute
- Clarinet
- Violin 1
- Violin 2
- ‘Cellos
- Violas
- Bassoon
Partial Arc Setup - Quartet

- Violin 1
- Violin 2
- Viola
- 'Cello
Full Surround Setup - Choir
Full Surround Setup – Chamber Orchestra
Full Surround Setup - Quartet

- Violin 1
- Violin 2
- Viola
- ‘Cello
Listening Test

- 30 listeners (15 trained/15 naïve)
- IOSR, University of Surrey
- 5.0 loudspeaker setup
- 3 types of programme material
- 2 microphone arrays
- 3 artist arrangements (traditional, partial & full)
Listening Test

• 8 assessment attributes
• Accompanying statements and descriptions
• 9-point Likert Scale
Attributes

**Purchasing** – (disregarding the programme material)

I would like to purchase this recording to listen to at home.

**Listening Comfort** – would you feel comfortable to listen to the recording for a long period of time?

Listening to this recording is a comfortable experience.
Attributes

**Tradition** – in comparison with recordings previously experienced at home

This recording is traditional in terms of its recording concept.

**Interest**

I find elements of this recording interesting.
Attributes

*Envelopment* – do you feel surrounded by the audio?
I find this recording enveloping.

*Naturalness* – is it like being in a concert hall with the musicians? Or does it feel like an artificial experience?
I find this recording natural.
Attributes

**Instrument locatedness**

It is easy to pinpoint the location of instruments in this recording.

**Timbral Balance** – is the bass, middle and treble content well balanced? Is the frequency spectrum pleasing?

The recording has a good timbral balance.
Question Design

Listening Comfort

“Listening to this recording is a comfortable experience.”

Trial 36

A
- Strongly Agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

B
- Strongly Agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

C
- Strongly Agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree
Results

• Preliminary analysis suggested division of naïve and trained listeners

• Programme Material and Artist Arrangement:
  • Purchasability – significant interaction for naïve but not trained listeners
  • Timbral balance – significant interaction for trained but not naïve listeners
Correlation Analysis

Timbral Balance – higher correlation for Trained listeners than for naive
Factor Analysis

- Extracted components:

Conventionality and Creativity

Component Plot for Naïve Listeners

Component Plot for Trained Listeners
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Creativity
- Interest
- Envelopment

Naïve Listeners

Conventionality
- Comfort
- Naturalness
- Tradition

Trained Listeners
Forming Prediction Equations

Purchasability = 0.556 × Envelopment - 0.531

Purchasability Predictor - Naïve listeners

Purchasability = 0.742 × Locatedness + 0.534 × Naturalness + 0.576 × Timbral − 0.573

Purchasability Predictor - Trained listeners
Subjective vs. Predicted Purchasability

Naïve Listener Correlation: Subjective vs Predicted Purchasability

Trained Listener Correlation: Subjective vs Predicted Purchasability
Conclusions

• Novel recording method developed
• Listener opinions gauged for a variety of attributes
• Purchasability of recordings was related to components labelled Conventionality and Creativity
• Predictor equation formed for Purchasability for both naïve and trained listeners
Further Work

• Refinement of technique – both with regards to recording design and listening test design
• Implementation of purchasability predictor to enable shorter listening tests
• Enable establishment of the viability of unusual recording techniques within the consumer market
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