

## APPENDIX 6

### DIOTIC VS. BINAURAL STIMULI IN AUDIOVISUAL SPATIAL IMPRESSION TESTS

An audiovisual combined experiment was conducted prior to the one discussed in Chapter 5. The objective of the experiment is to explore the degree of audiovisual interaction in spatial impression. The audiovisual experiment is conducted exactly as that described in Chapter 5, with one exception, the audio stimuli presented were diotic (mono outputs in both left and right channels) instead of binaural (stereo), as discovered later. Therefore, the subjective results were deemed unusable for the current investigation, because the presented monaural stimuli would likely to render inaccurate spatial impression of the auditorium in question.

Out of curiosity, the audiovisual ratings of diotic stimuli and binaural stimuli were compared. In general, the results show a consistently higher auditory and visual ratings of audiovisual stimuli with Mono then those of Stereo. Perhaps, these results would be useful to take into considerations when conducting subjective audiovisual experiments, or studying spatial impressions in stimulated (virtual reality) audiovisual environments.

#### 6.1. Auditory Spatial Impression ratings of audiovisual stimuli:

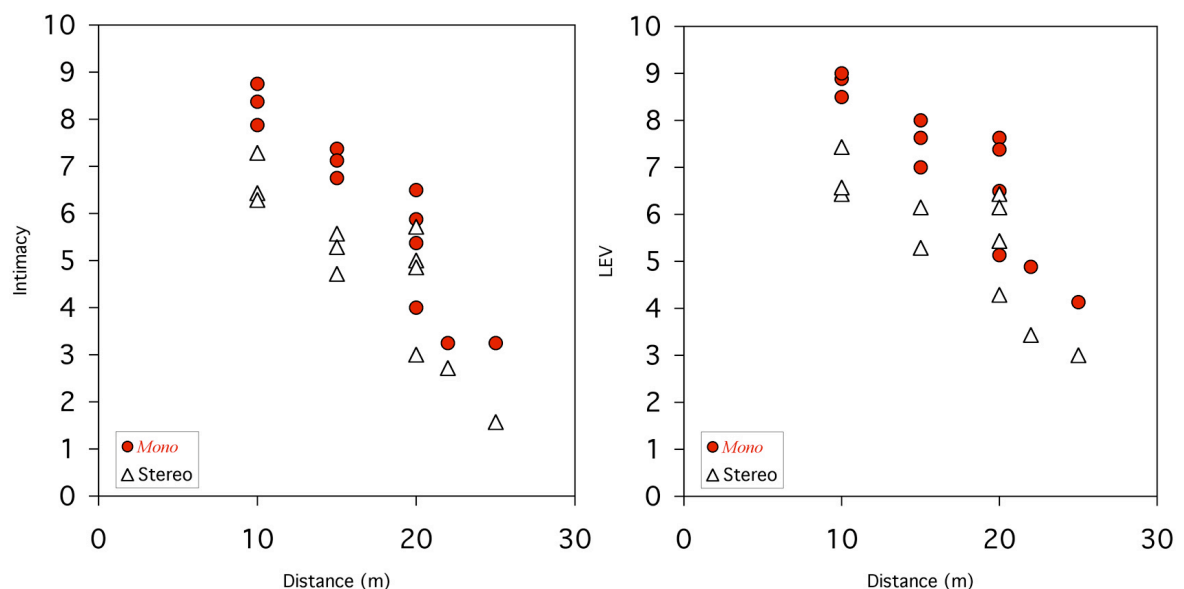


Figure A6.1: Auditory intimacy and LEV ratings of audiovisual stimuli, comparing between Mono and Stereo results.

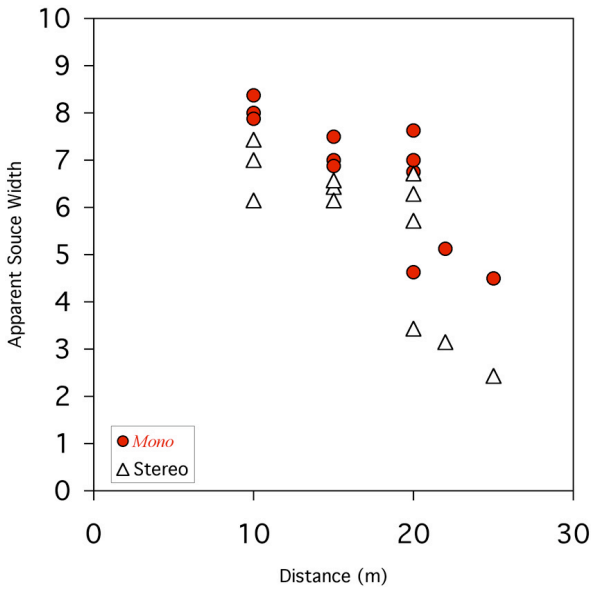


Figure A6.2: ASW ratings of audiovisual stimuli, comparing between Mono and Stereo results.

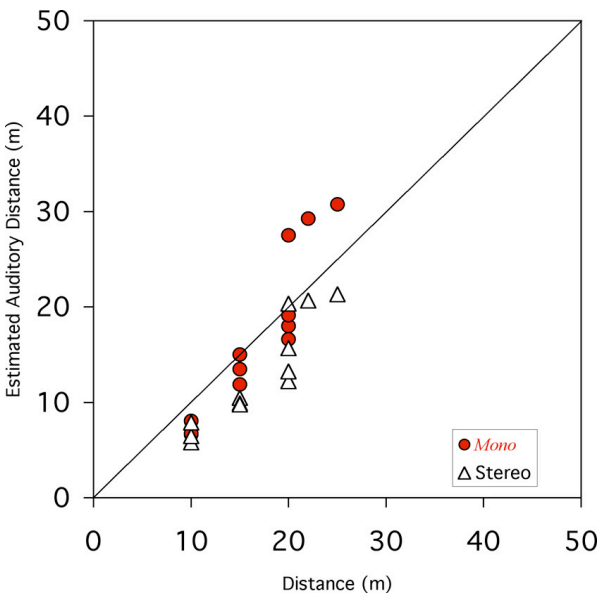


Figure A6.3: Estimated Auditory Distance of audiovisual stimuli, comparing between Mono and Stereo results.

The ratings decrease with increasing distance as similarly found in separate audio and visual experiments. However, the mono results are consistently higher than stereo ones. Mono and Stereo results of ASW seems to be closer than of LEV or Intimacy. The Mono results for the gallery seats, however, are much higher compare to those of LEV and Intimacy.

Estimated Auditory Distance of Mono and Stereo results are quite closely matched due to the present of visual stimuli rather than of the audio stimuli. However, the over estimation for the gallery seats in the Mono results is likely due to the character of the diotic stimuli.

The consistently large discrepancies in auditory spatial ratings of the gallery seats are largely due to the stimuli's SPL (possible incorrect HATS re-calibration) or the directionality of the sound source (loudspeaker type used). Chapter 5 discusses these issues to some extents.

### 6.1. Visual Spatial Impression ratings of audiovisual stimuli:

The visual spatial impression results were generally similar to those of their auditory counterparts. However, at least by visual indication from the graphs, there are two apparent rating patterns, that of Spaciousness and Envelopment, and of Intimacy and Stage Dominance.

The Mono results of Spaciousness appear to be slightly higher than those of Stereo results and remain somewhat constant relative to increasing distance. In comparison, the

Mono results of Envelopment decrease with increasing distance, whereas the stereo results of Spaciousness and Envelopment appeared to somewhat scattering about.

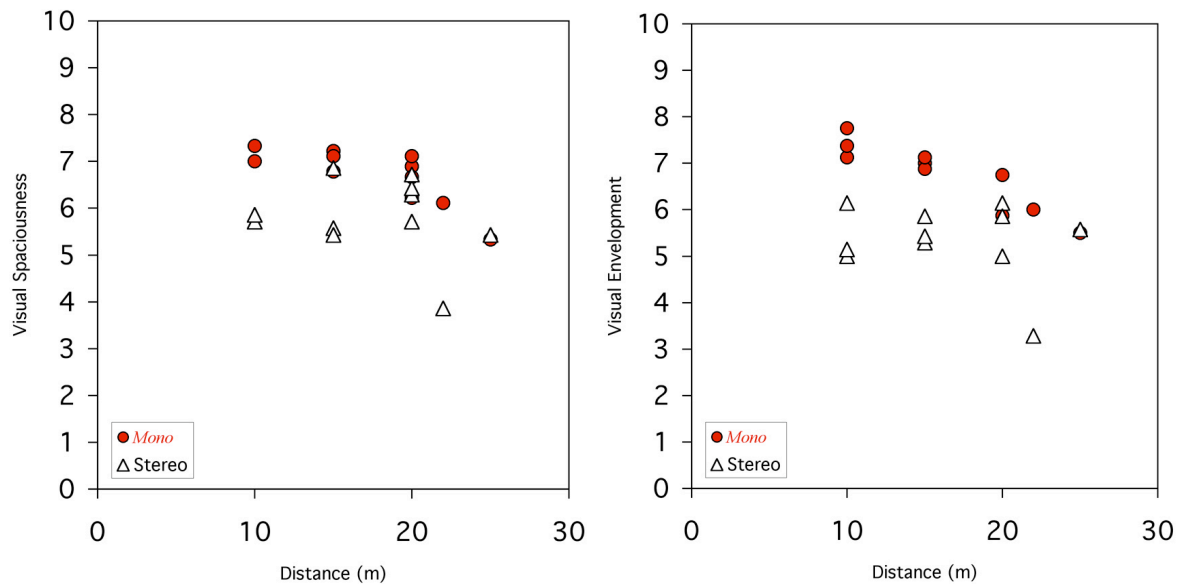


Figure A6.4: *Visual Spaciousness and Envelopment ratings of audiovisual stimuli, comparing between Mono and Stereo results.*

It appears that the subjects of both Mono and Stereo tests may have difficulties in distinguishing between the visual sense of spaciousness and envelopment, whether it was due to the effects of audio stimuli is quite unclear. In visual only experiments, Spaciousness is found to be increasing with decreasing distance, whereas Envelopment is varied between auditoria rather than within an auditorium (Chapter 3 and 4).

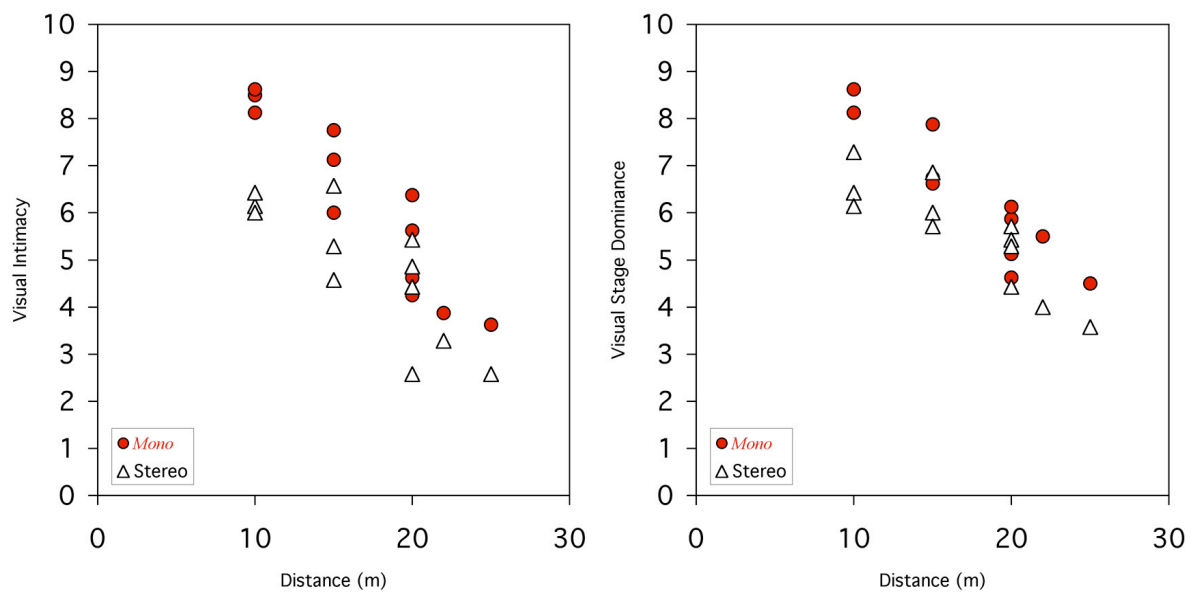


Figure A6.5: *Visual Intimacy and Stage Dominance ratings of audiovisual stimuli, comparing between Mono and Stereo results.*

These results shown above are quite similar to those of their auditory counterparts, at least from visual indication of the graphs. They appear to decrease at increasing distance. The visual Intimacy ratings of the Mono test at 10 m distance is about 2 points higher than those of the Stereo one. Visual Stage Dominance ratings in the Mono test appear to decrease more consistently compare to those in the Stereo one.

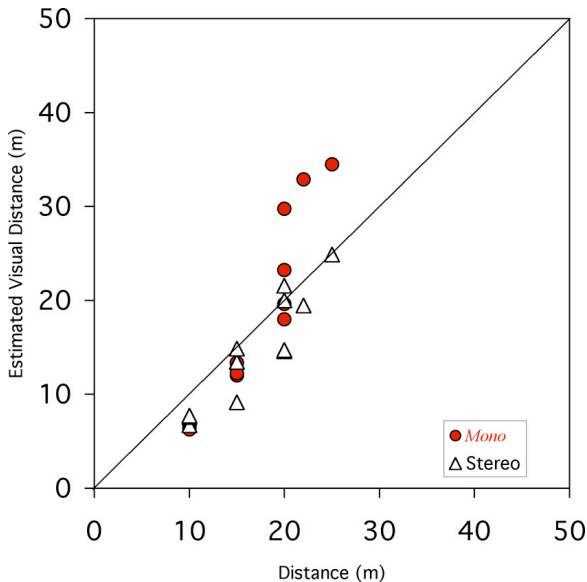


Figure A6.6: *Estimated Visual Distance of audiovisual stimuli, comparing between Mono and Stereo results.*

Visual distance estimation is relative closely matched between those of Mono and Stereo tests for stall seats between 10 m and 20 m. A significant overestimation is found for the gallery seats, at 20 m to 25 m. Again, the audio stimuli appear to be a likely influence in overestimation of visual distance.

### 6.3. Discussion:

The acoustical or auditory character of the audio stimuli (diotic vs. binaural) caused the subjective response to significantly change.

The reasons for the causes are yet to be investigated. A possible cause to this change, although somewhat speculative, is the non-spatial character of diotic stimuli. The subjects relies solely on sound level and possibly reverberation time to judge spatial impression, and they would perceived no variation of the horizontal audio images between stimuli. Because the binaural stimuli have varying IACC and because they are binaural, they subjects were able relate the auditory image to the visual image, thus enable them to accurately judge the spatial quality of the stimuli.