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## Arrangement for Auditory Display of Object's Position in Augmented Reality

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가  
(head-related transfer function: HRTF)  
(orthogonal pattern),  
(See-Through HMD)  
3D 가  
(diagonal pattern)  
, 3D  
, 가  
(primary task)  
가 가  
가  
,  
가

Keyword : Auditory Display, Augmented Reality, Ubiquitous, HRTF, Arrangement

1. (attentional cue) (feedback)  
(ubiquitous)  
(wearable computing)

가

(augmented reality)

(principle of multisensory resources)

(sensory modalities)

. 가

- , , , , -

(crossmodal link)

가

(Spence & Driver, 1994, 1996; Spence, 2004).

( & , 2005)

가

가

가

(Macaluso et al, 2000; McDonald et al, 2001; Spence, 2004).

(Head Related Transfer Function)

가

가 가

(sound source)

가

(Interaural Time Difference: ITD)

(Interaural Intensity Difference: IID),

가

가

가

가

(generalized

가

HRTF)

(navigation)

가

가

가

가 (virtual menu)

가

1

가

가

가 가

가

2

(primary

가

task)

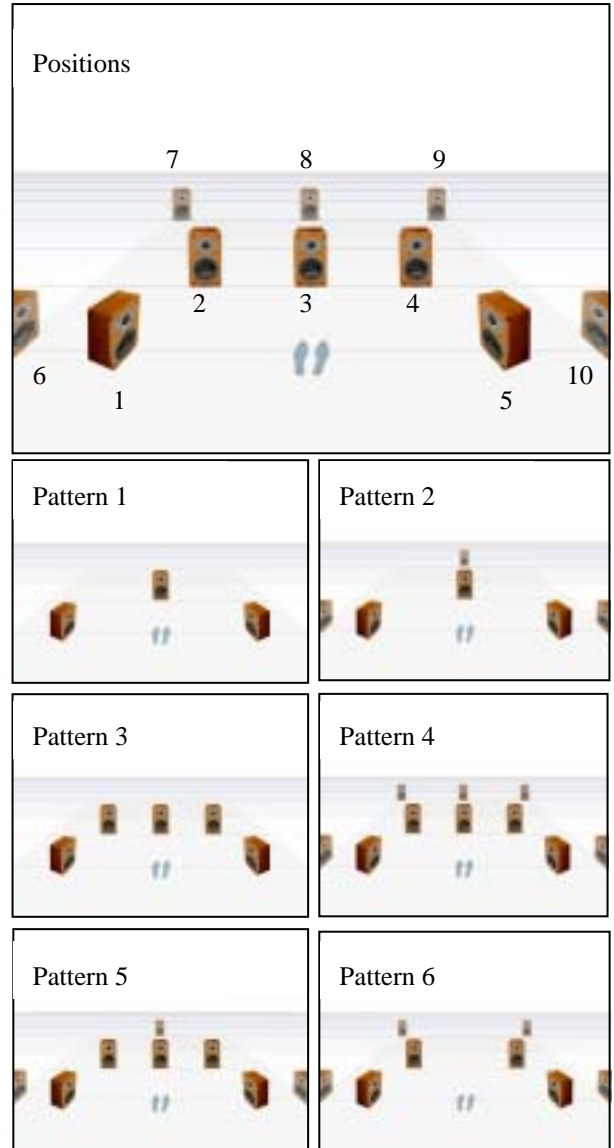
가

1  
 , 가  
 10 가 ,  
 6 가

2.  
 1 가  
 , 가  
 가

2-1.  
 2-1-1. 가  
 15 ( 12 , 3 )  
 가  
 . 가  
 ,  
 가 .

2-1-2.  
 (soundproof booth)  
 가  
 HMD(Head-  
 Mounted Display)  
 ,  
 800x600  
 50cm  
 AKG®  
 K240 DF  
 가  
 10 가  
 . 가  
 10 가 6 가  
 [ 1]. (auditory  
 target) Csound

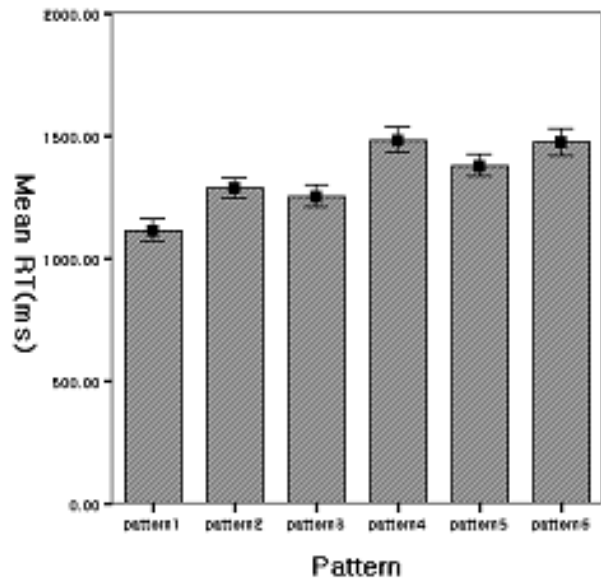
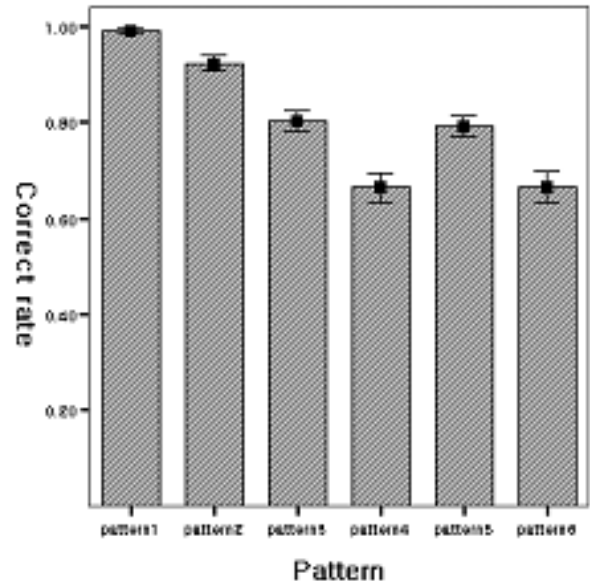


1. 1 2  
 10 가 6  
 가  
 (sine wave tone; 496Hz, 500 ms) HRTF  
 10 가 ( 2 )  
 (file type: 44,100Hz, 16-bit, Stereo, wave file)

2-1-3.  
 1  
 , 80  
 240



2.



3. 1 6 가

(ms)

1 > 2 >

3 & 5 > 4 & 6

(pattern 1's Mean = .993, SD = .020;  $F(5, 70) = 53.384$ ,  $MSe = .005$ ,  $p < .01$ ). 1 >

2 & 3 > 5 > 4 & 6

(pattern 1's Mean = 1,113ms, SD = 170;  $F(5, 70) = 79.219$ ,  $MSe = 3,810.509$ ,  $p < .01$ ). ,

1, 3, & 5 >

4, 6, 8, 9, & 10 > 2 & 7

(position 3's Mean = .960, SD = .069;  $F(9, 126) = 13.798$ ,  $MSe = .016$ ,  $p < .01$ ).

1, 3, & 5 > 2, 4, & 6 > 7, 8, 9, &

40 가 가

1

(fixation point)

6 가

가

가

가

가 가

가

가 가

2-2.

6

(ANOVA)

10

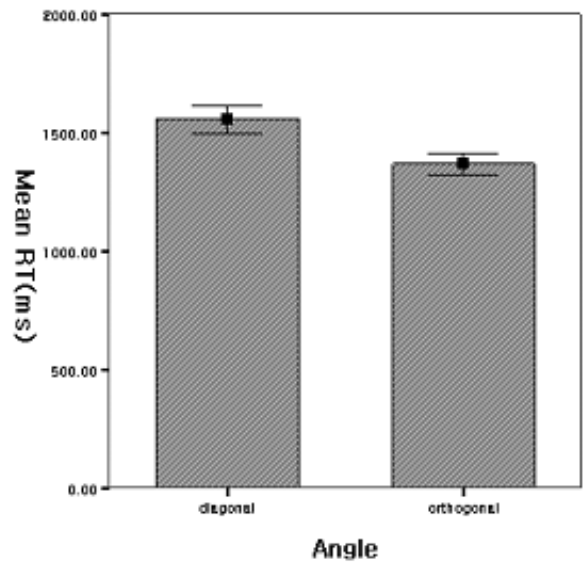
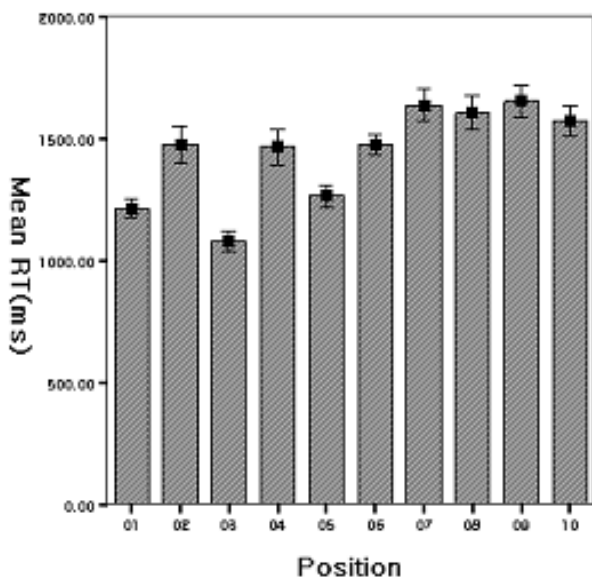
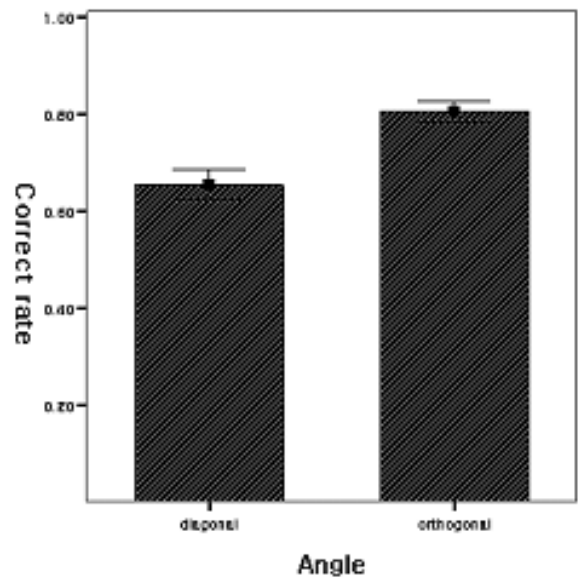
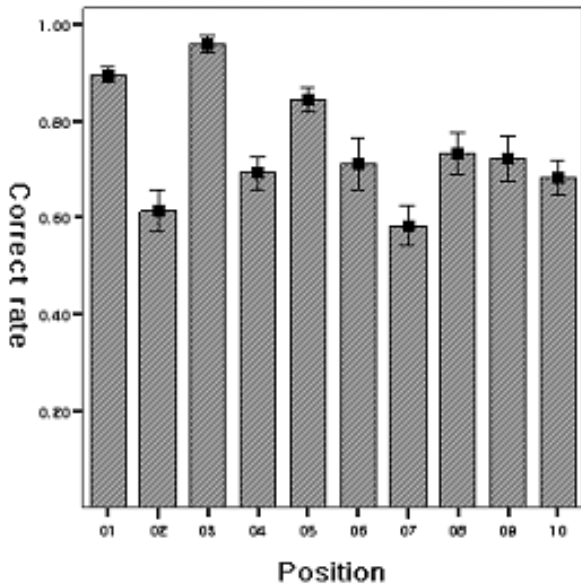
(angle)

(orthogonal)

(diagonal)

가

3



4. 1 10 가

5. 1 ( , ) (ms)

가

10 (position 3's Mean = 1,077ms, SD = 158;  $F(9, 126) = 35.062$ ,  $MSe = 16,323.123$ ,  $p < .01$ ),

(diagonal) 가 (orthogonal) 가 가

가  
[ 4].

(angle)

(orthogonal) (diagonal)

( Mean

= .804, SD = .079; Mean = .653, SD = .122;  $t(14) = 5.360$ ,  $p < .01$ ),

가

3. 2

( Mean

2 1

= 1,365ms, SD = 171; Mean = 1,556ms, SD = 229;  $t(14) = -8.589$ ,  $p < .01$ )[ 5].

가

가

3-1.

3-1-1. 가

11 ( 8 , 3 )

가

가

2 가 1 가

3-1-2.

1

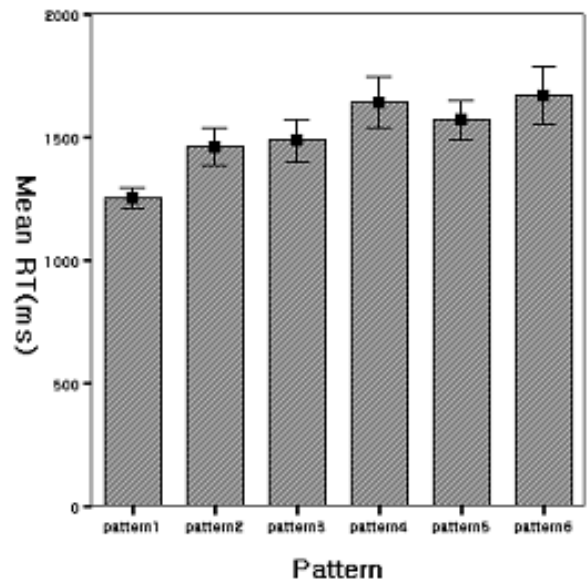
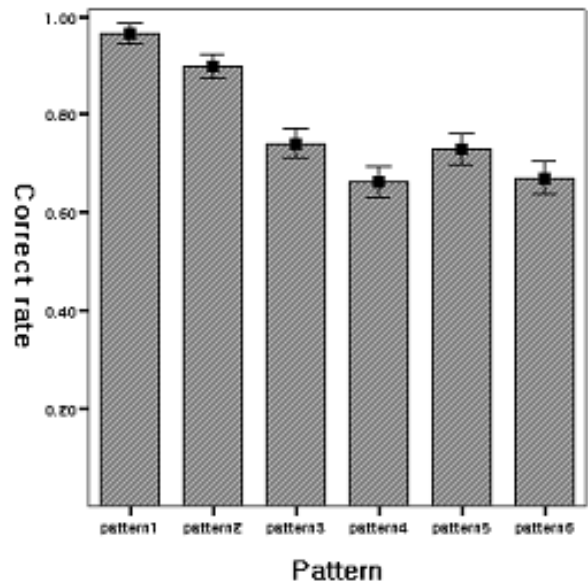
1

3-1-3.

2 1

2 1 ,

(primary task) 가



6. 2 6 가 (ms)

0 9 가

가

‘T’

가

‘T’ 1 3 (orthogonal) (diagonal) 가

500ms 4

가

3-2.

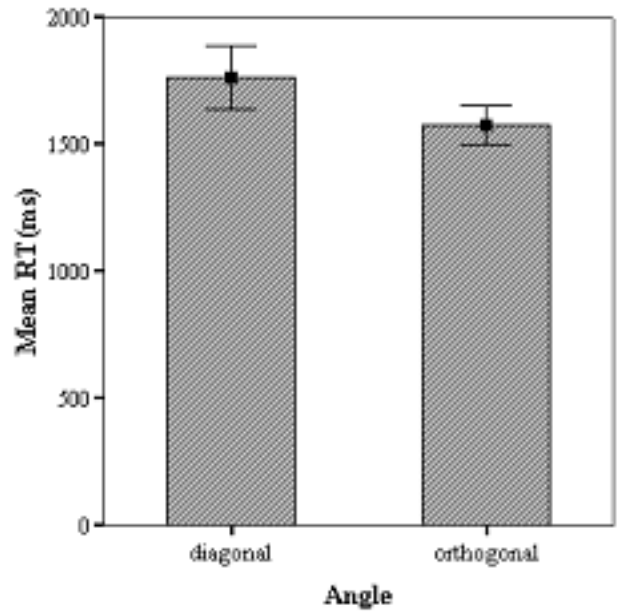
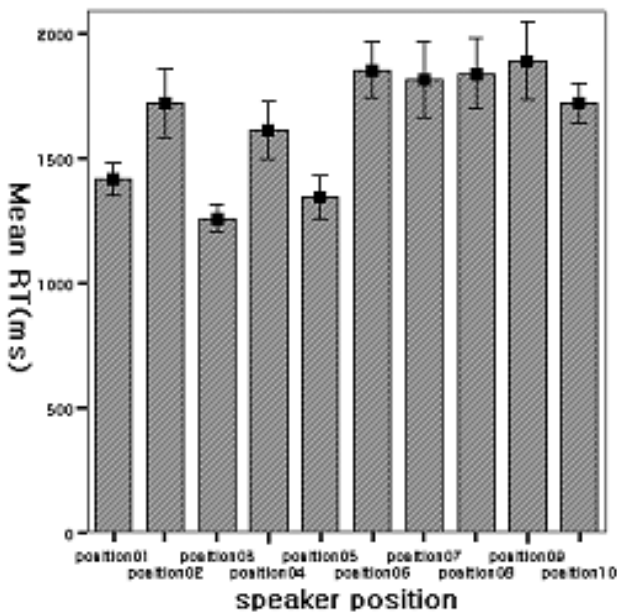
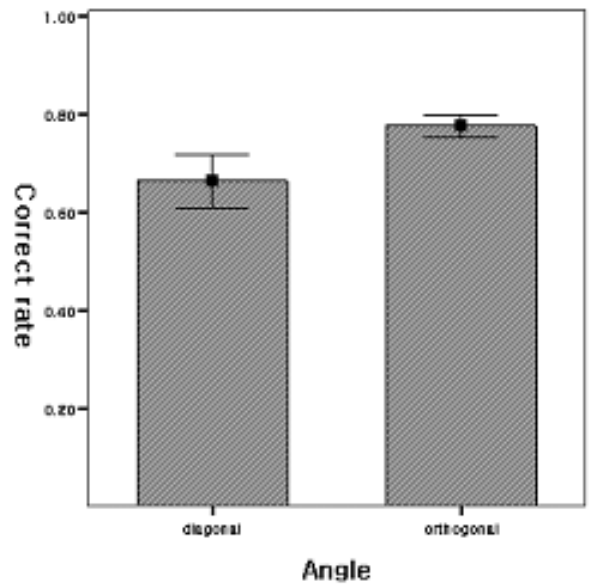
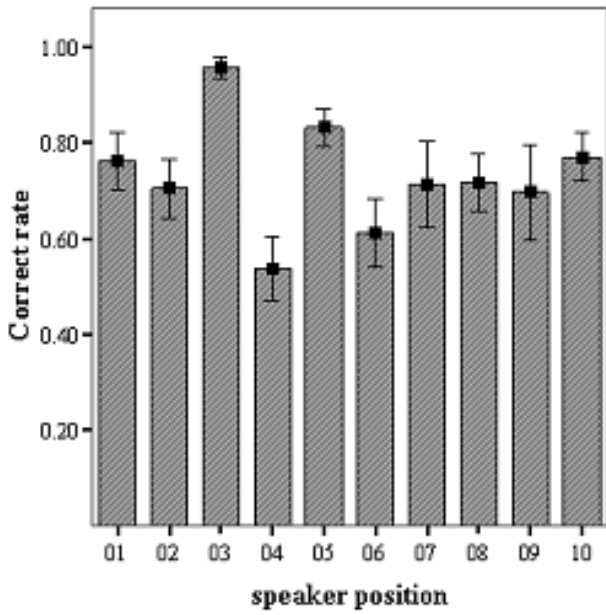
2 1 가 ,

6

1 > 2 > 3 & 5 > 4 & 6 (pattern 1’s Mean = .965, SD = .066;  $F(5, 50) = 27.616$ ,  $MSe = .006$ ,  $p < .01$ ),

1 > 2 & 3 > 4, 5 & 6 (pattern 1’s Mean = 1,252ms, SD = 131;  $F(5, 50) = 11.319$ ,  $MSe = 22,220.866$ ,  $p < .01$ ).

(ANOVA) 10



7. 2 10 가 (ms)

8. 2 ( , ) (ms)

3 & 5 > 1, 2, 6, 7, 8, 9, & 10 > 4

(position 3's Mean = .958, SD = .078;  $F(9, 90) = 3.347$ ,  $MSe = .044$ ,  $p < .01$ ).

1, 3, & 5 >

2 & 4 > 6, 7, 8, 9, & 10

(position 3's Mean = 1,257ms, SD = 191;  $F(9, 81) = 11.023$ ,  $MSe = 49,789.351$ ,  $p < .01$ ;

missing data ), 1

가

[ 7].

(angle)

가

(orthogonal)

(diagonal)

가

( Mean = .776, SD = .076;

Mean = .663, SD = .182;  $t(10) = 2.014$ ,  $p = .072$ ,

가

( Mean = 1,575ms, SD =

260; Mean = 1,764ms, SD = 411;  $t(10) = -2.930$ ,  $p$

< .05)[ 8]. 2

,

가

가

가  
가  
2 1  
가  
(orthogonal) (diagonal) 가  
가 가  
4.  
가  
가 가  
HRTF  
(augmented reality)

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