Vibrotactile Targeting and Tracking in Multimodal Systems: Accuracy, Integration, and Workload

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OBJECTIVES

- To evaluate targeting of tactile or visual spatial stimuli under conditions requiring that the user integrate those data with information from the other sensory modality, exploring whether sharing of cognitive resources across modalities interferes with processing of stimuli.
- To manipulate stimulus parameters for localization and identification of quality of individual targets presented on either vibrotactile or visual displays:
- To explore the accuracy of localization performance when both stimuli are presented simultaneously, one the target, the other the distractor, with redundant or competing qualities and locations.

ACCOMPLISHMENTS 5/2005 – 9/2005

- Tested over 72 subjects in 4 conditions;
- Software and hardware systems were designed for targeting of tactile and visual stimuli with different qualities;
- Studied localization accuracy for unimodal stimuli, finding that site within the dense array strongly affected performance, although stimulus quality (color of light flash or vibrotactile frequency) did not;
- Studied localization accuracy for bimodal tactile+visual stimuli, finding asymmetrical effects, *viz*, localization of visual stimuli was less affected by the presence of tactile stimuli than the converse when both had to be attended;
- Studied response time for bimodal (tactile +visual) stimuli, finding that, compared to baseline unimodal performance levels, response times increased significantly.
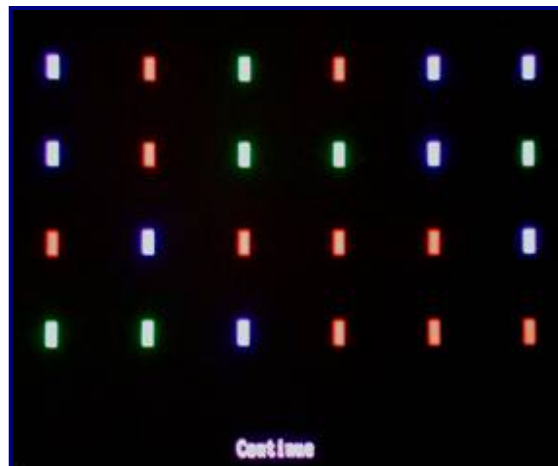
PUBLICATIONS/ PRESENTATIONS

- Cholewiak, R. W. & McGrath, C. (2006). *Vibrotactile Targeting in Multimodal Displays: Accuracy and Interaction..* Presentation at 14th Symposium on Haptic Interfaces For Virtual Environment And Teleoperator, IEEE Virtual Reality 2006 Meeting, Arlington VA (Mar 25-26).

ASSOCIATE:

Research Assistant: Chris McGrath

Tactor Arrays:

Project Title: Targeting and Tracking in Multimodal Systems:
Accuracy, Integration & Workload
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with Christopher M. McGrath

Multimodal Tactile Targeting	2005 (months)									
Milestone (including Studies**, Presentations)**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Ss**
Start of funding(cut from3 years to 9 months)	X									
Contract for PI awarded, PI arrives on board		X								
Tactile/ visual targeting software & hardware preparation		X	X							
Tactile Research Lab Assistant contract let, advertised, and hired		X	X							
PI placed on unpaid leave				X						
PI returns and RA arrives on board NAMRL					X					
Visual and tactile targeting with unimodal fixed quality targets with localization response (18 Ss)					X	X				18
Visual and tactile targeting with unimodal variable quality targets with localization response (18 Ss)							X			18
Visual and tactile targeting with unimodal variable quality targets with localization & priority responses (18 Ss)								X		18
Visual and tactile targeting with bimodal variable quality targets with localization & priority responses (18 Ss)									X	18
Accepted to Haptics Symposium'06, Arlington VA									X	
End of Contract & Grant, PI departs, RA transfers to another NAMRL Lab									X	
Total number of subjects tested (not including c. 10 whose data were unusable)										*72*