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"ROTATIONAL WIND" INDICATOR ENHANCES CONTROL OF ROTATED DISPLAYS: H. A. CUNNINGHAM AND M. PAVEL

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Rotation by 108° of the spatial mapping between a visual display and a manual input device produces large spatial errors in a discrete aiming task. These errors are not easily corrected by voluntary mental effort, but the central nervous system does adapt gradually to the new mapping. Bernotat (1970) showed that adding true hand position to a 90° rotated display improved performance of a compensatory tracking task, but tracking error rose again upon removal of the explicit cue. This suggests that the explicit error signal did not induce changes in the neural mapping, but rather allowed the operator to reduce tracking error using a higher mental strategy.

In this report, we describe an explicit visual display enhancement applied to a 108° -rotated discrete aiming task. A "wind indicator" corresponding to the effect of the mapping rotation is displayed on the operator-controlled cursor. The human operator is instructed to oppose the virtual force represented by the indicator, as one would do if flying an airplane in a crosswind. This enhancement reduces spatial aiming error in the first 10 minutes of practice by an average of 70% when compared to a no enhancement control condition. Moreover, it produces adaptation aftereffect, which is evidence of learning by neural adaptation rather than by mental strategy. Finally, aiming error does not rise upon removal of the explicit cue.

REFERENCE

Bernotat, R.K. (1970) Rotation of visual reference systems and its influence on control quality. *IEEE Transactions on Man-Machine Systems, vol. MMS-11*, 129-131.

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