A descriptive model of horizontal gradient and oblique effect in the haptic parallelity task1

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Previous research on the properties of haptic space has shown systematic deviations when performing parallel matching tasks, depending on horizontal distance and orientation of the bars, that are described as deformations of Euclidean space, or better a non-Euclidean space. In addition, a haptic oblique effect, that is, increments in the deviations when matching oblique orientations, has been shown.

There are several models developed to describe this striking effect. Cuijpers, Kappers and Koenderink (2003), and Kappers and Volvic (Kappers and Volvic, 2007; Volcic and Kappers, 2008), understand haptic spatial performance as a representational problem: in these matching tasks the perceived orientation of a reference bar is represented spatially in some frame-of-reference, and then has to be reproduced in the orientation of a test bar. Experimental results in parallel matching tasks show that performance can be described through neither an egocentric frame-of-reference, nor an allocentric one, but with a complex composition of both reference frames.

There are two main weaknesses in the above mentioned models. First, the general descriptive model by Cuijpers and cols. (o.c.) do not consider the strong individual differences in performance, whereas Kappers and Volvic (o.c.) present an additive model with a strong inferential level based on representations. In addition, none of these models give account of the oblique effect that is systematically found in the task.

Our study presents data of the standard haptic parallelity task for 5 subjects and develops an additive linear model of performance, including the oblique effect. Through the maximum likelihood method, subjects are the assigned to 1 out of 3 jerarquical models which reflects the amount of the deviations as well as the strength of the oblique effect in performance.

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