Berret, B.; **Gauthier, J.-P.**; **Papaxanthis, C.**
How humans control arm movements. (English) Zbl 1236.93012

Summary: This paper is devoted to the behavior of human arms during pointing movements. Several assumptions have already been made about the planning of such motions. None of these assumptions is able, up to now, to explain certain non-intuitive dynamic phenomena, in particular certain asymmetries in the motion and certain time intervals of inactivity of the muscles. In this paper, we propose an assumption explaining all these phenomena. Two strong points in this work are the following. First, our assumption is that human beings minimize a certain criterion that physically makes sense, namely, a compromise between the absolute work of external forces and a comfort term. Second, our conclusions do not rely on any numerical experiment and are completely justified mathematically (i.e., without any argument from simulation or "experimental mathematics," such arguments being usually considered as acceptable in neurobiology). Also, the conclusion that total inactivity holds during some time subintervals of the movement is shown to be a stable property (in our model).

MSC:

93A30	Mathematical modelling of systems (MSC2010)	Cited in **2** Documents
93C10	Nonlinear systems in control theory	
70E55	Dynamics of multibody systems	
92C10	Biomechanics	
93C15	Control/observation systems governed by ordinary differential equations	

Keywords:

behavior of human arms; pointing movements; absolute work of external forces; comfort term; no experimental mathematics

Full Text: DOI

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