Hinckley, K., **140.3: Issues in bimanual coordination: The props-based interface for neurosurgical visualization.** appeared in *Symposium 140: Human bimanual specialization: New perspectives on basic research and application*, convened by Guiard, Y., Montréal, Quebec, Canada, Aug. 17, 1996. Abstract published in *International Journal of Psychology*, Volume 31, Issue 3-4, *Special Issue: Abstracts of the XXVI INTERNATIONAL CONGRESS OF PSYCHOLOGY,* 1996.

140: Human bimanual specialization: New perspectives on basic research and application

- On the web: 140: Human bimanual specialization: New perspectives on basic research and application.

Convenor: Y. Guiard ***(SYM 12:30–15:00)***

140.1: Decision making as to which hand does what

Peters, M. ***University of Guelph, Ontario, Canada***
One of the interesting aspects of bimanual coordination lies in the question of decision making as to which hand does what. Under normally occurring conditions such decisions present no problems because roles and priorities are well defined. Here, I report on what happens if decisions as to which hand acts first are required under conditions where these decisions have to be made quickly and without prior lateral "priming". We are especially interested in comparisons between various handedness groups because there is an enduring belief (based on rather meager evidence) that some lefthanders lack a directional "dither".

140.2: Human two-handed manipulation of long rods

Guiard, Y. ***CNRS and University of the Mediterranean, Marseille, France***
Ferrand, T. ***CNRS and University of the Mediterranean, Marseille, France***
Humans use an impressive variety of rod-like bimanual tools. To investigate manual specialization in the context of normal bimanual action, we use a two-handed version of Fitt's (1954) tapping paradigm in which participants manipulate a long rod rather than a stylus. A nice feature of a rod is that it imposes tight geometrical constraints on bimanual movement, thus restraining the field of gestural possibilities. This field has structure, however. We present a simple taxonomy of bimanual grips and movements that are possible with bimanually-held rods, and we report some performance data consistent with predictions from the kinematic-chain model (Guiard, 1987).

140.3: Issues in bimanual coordination: The props-based interface for neurosurgical visualization

Hinckley, K. ***University of Virginia, Charlottesville, USA***
I will describe a three-dimensional human-computer interface for neurosurgical visualization based on the bimanual manipulation of real-world tools. The user's nonpreferred hand holds a miniature head that can be "sliced open" or "pointed to" using a cross-sectioning plane or a stylus held in the preferred hand. The nonpreferred hand acts as a dynamic frame-of-reference relative to which the preferred hand articulates its motion. I will also discuss experiments that investigate the role of bimanual action in virtual manipulation and in the design of human-computer interfaces in general.

140.4: Dynamics of polyrhythmic tapping: Two asymmetrically coupled oscillators

Peper, C.(Lieke)E. ***Free University of Amsterdam, The Netherlands***
When the hands tap at fixed but different frequencies, the taps of the slow hand seem to be subordinate to those of the fast hand. It has been suggested that this performance asymmetry results from a hierarchical time-keeping structure. From a dynamical perspective, however, the interaction between the hands can be understood as entrainment in a non-linear system of coupled oscillators, which results in parameter regions of stable frequency-locked behavior. Our empirical findings indicate that the dominance of the fast hand over the slow hand results from an asymmetry in the strength of coupling between the hands.

140.5: Ecological design and bimanual interaction with computers

Buxton, B. ***Alias/Wavefront Inc & University of Toronto, Ontario, Canada***
Ironically, the only bimanual task on computers (entering text) can be done with one hand. For most tasks performed bimanually in the everyday world, the computer counterpart is unimanual. This handicaps motor-skill transfers from the everyday world to that of the computer. We describe a program of experimental research, both theoretical and applied, that investigates the nature of bimanual action, with emphasis on its relevance for computer design. The presentation is illustrated with demonstrations. Our goal is to show that ecological psychology can help design computer systems with a reduced complexity and a more natural human-computer systems interaction.