

AVATech Expert Workshop 16-17 November 2010, MPI Nijmegen

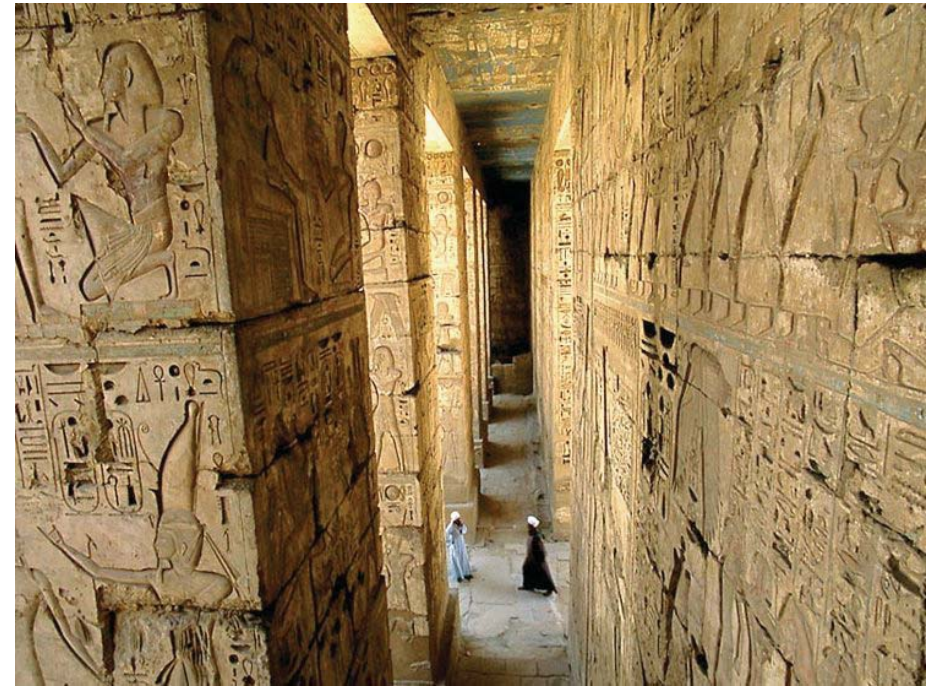
Current problems in behavioural gesture research

Hedda Lausberg

Dept. of Neurology, Psychosomatic Medicine, Psychiatry
Institute of health promotion and clinical movement science
German Sport University Cologne

Patrick Westfeld

Dept of Photogrammetry and Remote Sensing
Technical University Dresden



00:01:08:21
adjusts glasses + position shift to crossed arms while laughing



00:08:01:07
adjusts glasses + position shift to crossed arms while laughing



00:05:54:17
shrug + adjusting bra



00:15:48:17
shrug + adjusting bra

The NEUROpsychological GESTure (NEUROGES) Coding System

A Coding System for Hand
Movement Behaviour and Gesture

Aims

NEUROGES is designed to analyse hand movement behaviour (gestures, self-touches, practical actions, hand position shifts) as a medium to explore cognitive and emotional processes

- Specifically with regard to communicative gestures, NEUROGES enables to examine gestures as a medium per se, i.e., independently of speech. The focus of NEUROGES is on gestures as a reflection of visual and sensori-motor imagery.

Basic Procedures: Segmentation & Annotation

- NEUROGES segments the flow of spontaneous hand movement behaviour into naturalistic units.
 - Thus, it differs from approaches, which segment behaviour by time units (and which do provide information about the natural behavioural units).
- NEUROGES comprises several steps of segmentation and annotation resulting in a more and more fine-grained analysis of behaviour
 - At the first coding stage, the naturalistic units are defined by dynamic or static muscle innervation (hand movement unit) versus muscle relaxation (rest position unit). Thus, the hand movement behaviour is segmented into hand movement units and rest position units.
 - At further stages of coding, more and more complex features define the units resulting in a finer segmentation of behaviour.

Objectivity

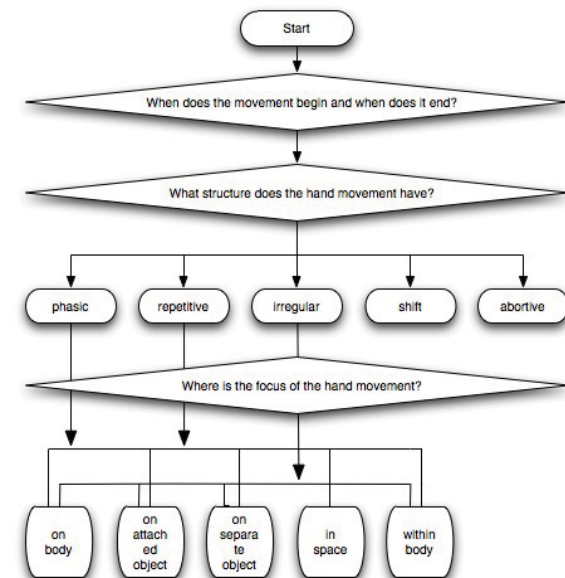
- The categories/tiers (Structure, Focus etc.) and values (phasic, repetitive etc.) are operationalized by obligatory and optional criteria (trajectory, efforts, etc.).
- The coding manual* contains the precise definitions of the categories and values, the coding algorithms, and it provides examples for each value. (* to appear Peter Lang Verlag, Frankfurt, 2011)

Structure

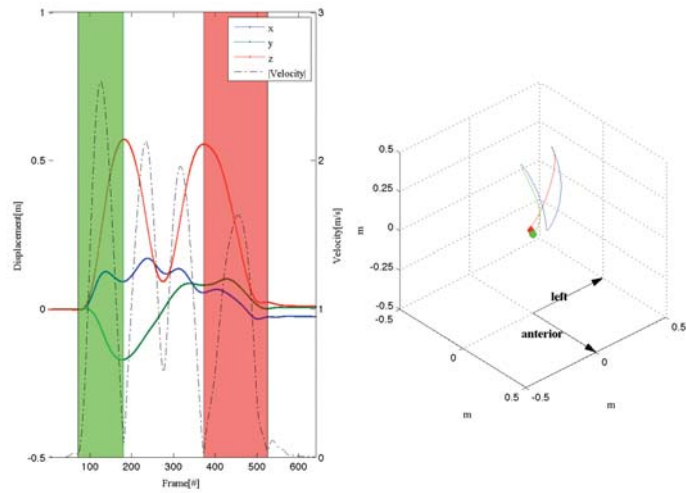
The analysis progresses from gesture kinetics to gesture function / semantics:

- **Module I: Kinetic gesture coding**
 - Hand movement units
 - Structure
 - Focus
- **Module II: Bimanual relation coding**
 - Spatial relation
 - Functional relation
- **Module III: Gesture function and semantics coding**
 - Gesture function
 - Gesture type

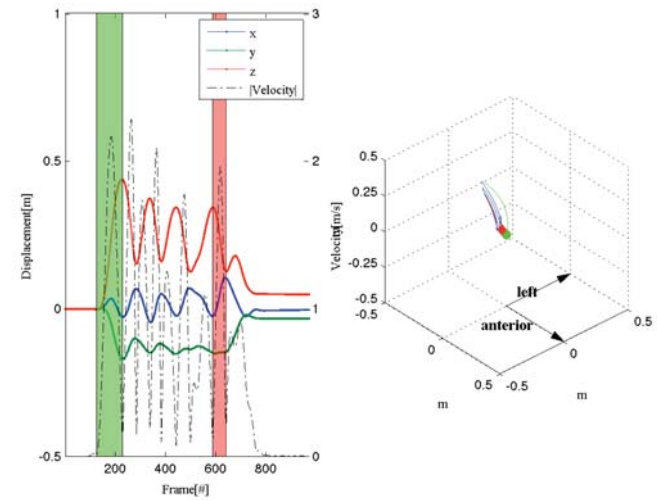
Module I Coding Algorithm



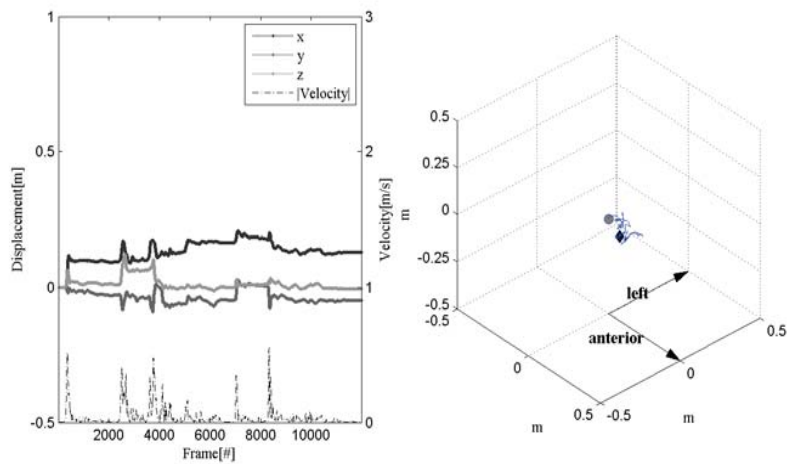
Phasic structure - Kinematics



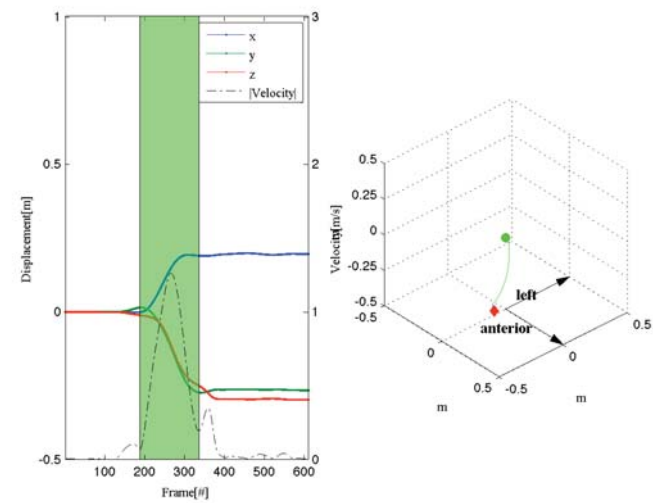
Repetitive structure - Kinematics



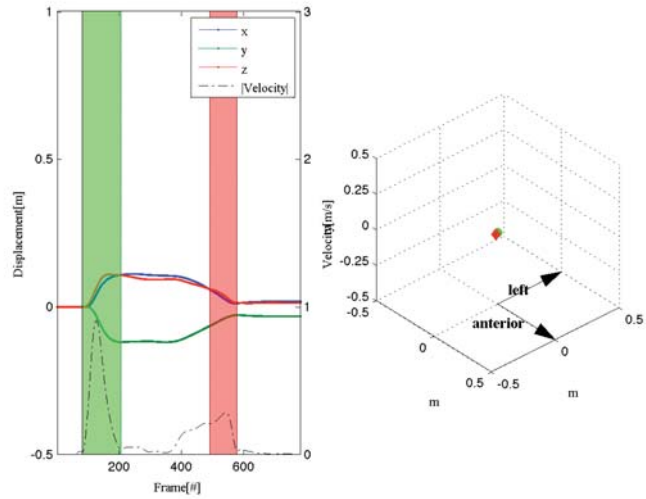
Irregular structure - Kinematics



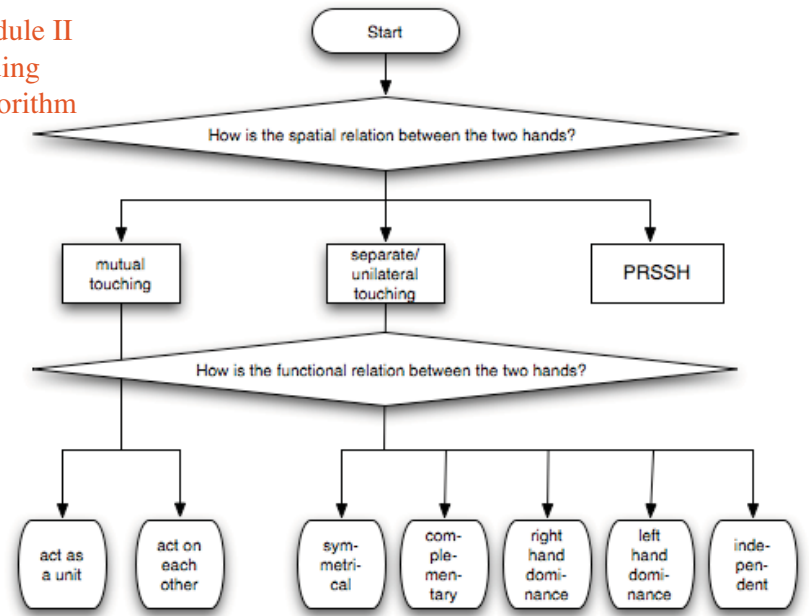
Shift structure - Kinematics



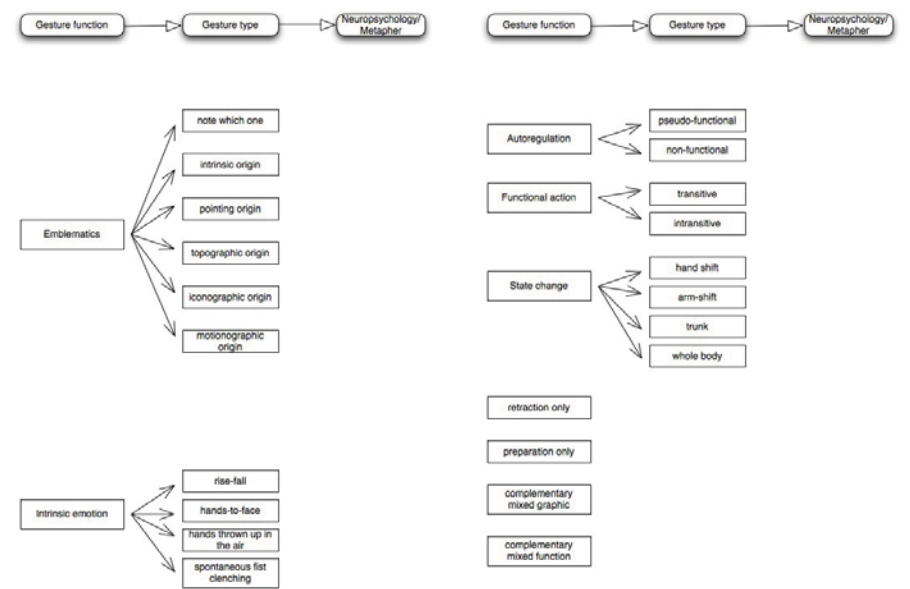
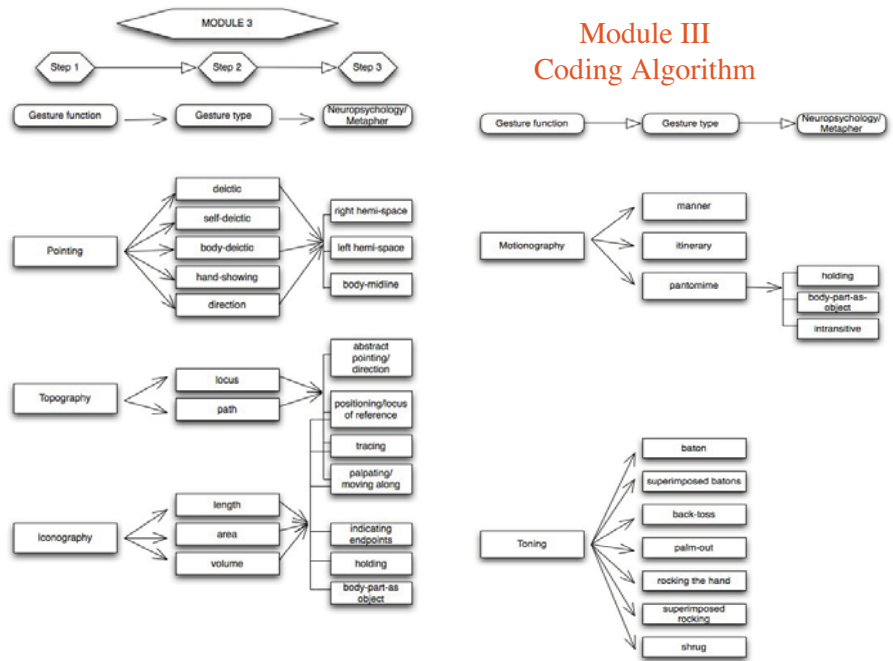
Abortive structure - Kinematics



Module II Coding Algorithm



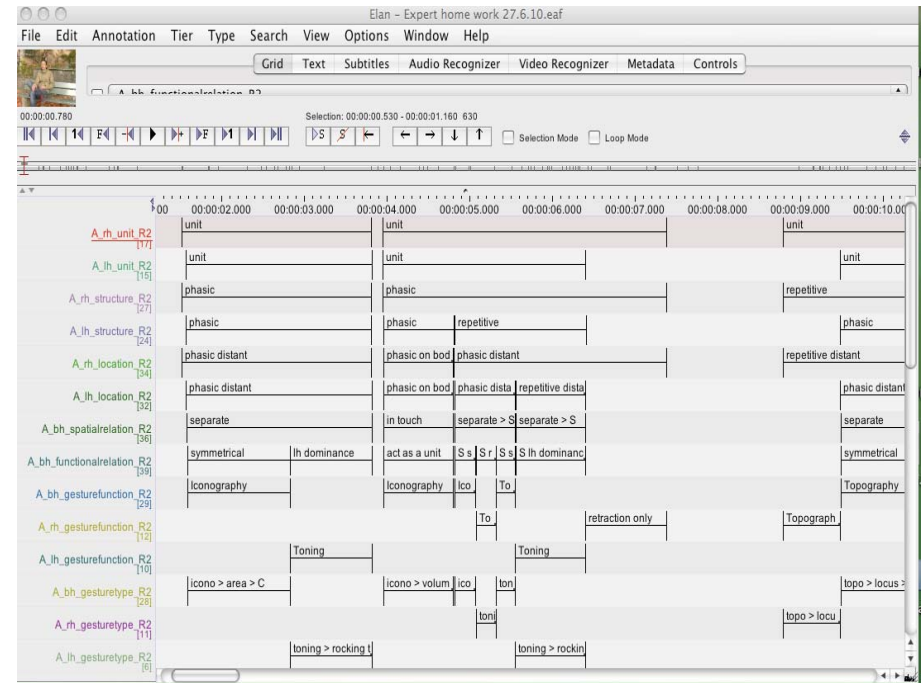
Module III Coding Algorithm



NEUROGES-ELAN System

- In the past years, the NEUROGES coding system was elaborated in mutual interaction with the annotation tool ELAN

(Lausberg H, Slöetjes H. Coding gestural behaviour with the NEUROGES - ELAN system. Behaviour Research Methods 41(3), 841-849, 2009.)



Reliability, validity, and sensitivity

- The categories are reliable, as confirmed by interrater agreement and intrarater retest reliability studies.
- Current research confirms the sensitivity of the coding system and the validity of the categories (DFG, VolkswagenStiftung, FU Excellence Cluster Languages of Emotion)
- ⇒ large samples (n = 180) of coded video-taped behaviour available (5 min. - 60 min. each subject)

Studies using the NEUROGES-ELAN System (and earlier versions)

- Sassenberg, U., Foth, M., Wartenburger, I., & van der Meer, E. Show your hands - are you really clever? Reasoning, Gesture Production, and Intelligence. Submitted.
- Kryger M. Gestisches Verhalten in guten und schlechten Psychotherapiesitzungen. Eingereicht.
- Lausberg H. Das Gespräch zwischen Arzt und Patientin: Die bewegungsanalytische Perspektive. Balint Journal (Thieme Verlag) 12, 1-10, 2011.
- Wartenburger, I., Kühn, E., Sassenberg, U., Foth, M., Franz, E.A., & van der Meer, E. On the relationship between fluid intelligence, gesture production, and brain structure. Intelligence 38: 193-201, 2010.
- Sassenberg, U., & van der Meer, E. Do We Really Gesture More When It is More Difficult? Cognitive Science 34: 643-664, 2010.

- Lausberg H, Kryger M. Gestisches Verhalten als Indikator therapeutischer Prozesse in der verbalen Psychotherapie: Zur Funktion der Selbstberührungen und zur Repräsentation von Objektbeziehungen in gestischen Darstellungen. Psychotherapie Forum IV, 2010.
- Dvoretzka, D. O. Kinetische Interaktion und Koordination. Department of Psychology. Berlin, Humboldt University. Diploma Thesis, 2009.
- Lausberg H, Zaidel E, Cruz RF, Ptito A. Speech-independent production of communicative gestures: Evidence from patients with complete callosal disconnection. Neuropsychologia 45: 3092-3104, 2007.
- Lausberg H, Davis M, Rothenhäusler A. Hemispheric Specialization in Spontaneous Gesticulation in a Patient with Callosal Disconnection. Neuropsychologia 38: 1654-1663, 2000.

Problems!

...at Step 1: Behaviour segmentation

- **Human rater problems**
 - **Time-consuming !**
 - No movement versus movement
 - A short rest within a movement sequence vs. a sustained spatially minimal or static activation
- **Assumed problems of automatic techniques**
 - Any static activation, especially stroke hold

...at Step 2: Structure Identification

- **Human raters**
 - Several phasic versus one repetitive unit
 - Irregular versus repetitive
- **Automatic gesture recognition**
 - Possibly similar to human raters

...at Step 3: Focus

- Human raters
 - Phasic versus within body
- Automatic gesture recognition
 - 3 D registration, when moving hand toward the body

