Topology, geometry, and function

Workshop / Seminar on topology and geometry of information visualization

Laboratory for Perceptual and Cognitive Systems, Faculty of Computing,
University of Latvia

19 Raina Blvd., Riga, Latvia, https://www.lpcs.lu.lv/upcoming-events/

June 1-2, 2018

ABSTRACTS (KEYNOTES)

The psychological science of visual information: How to engage an audience in a multimedia world

[June 1, 11:00-12:15, Room 12]

Professor Kenny R. Coventry
FBPS, FRSA, Head of the School of Psychology
University of East Anglia, United Kingdom

People process only a small amount of the visual information in front of their eyes at any given moment in time. In this talk I review what recent psychological science research can tell us about how people perceive visual information in a multimodal context, synthesising keys findings to consider how one can present information in a fashion that people find easiest to process, providing a more enjoyable and meaningful experience for them. I will use examples from recent projects at the University of East Anglia examining how to present climate change visual information in an accessible way (Harold, Lorenzoni, Shipley & Coventry, 2016), how gesture can be used to support visual processing (e.g. Coventry, Griffiths & Hamilton, 2014), and how emotion and position on screens become concatenated to influence ease of emotional engagement (Lynott & Coventry, 2014).

ACCENTURE Mad Science Talk

Brain Unity and Brain activity duality

[June 1, 17:30-18:30, Room 13]

Professor Cees van Leeuwen
Perceptual Dynamics Lab
University of Leuven, Belgium

Neuroimaging has thrown a bridge across the explanatory gap between brain and cognition. Or so it seems. Unfortunately a new gap has opened up, since the constructs of neuronal and regional “brain activity” play incompatible explanatory roles. This problem could be remedied by adopting a principle that applies to activity across scales. As such, I propose the principle of particle wave duality. Rather than for a static framework of neurons, circuits and brain regions, the duality exists for the entities that travel through them. At neuronal level, action potentials are the particles; the wave-field guiding their propagation consists of subthreshold potential fluctuations. At circuit level, packets of spatiotemporally coherent action potentials form the particles; their propagation is guided by their own wave field, consisting of weak modulations of spiking activity resulting from local population activity. At macrolevel, particles are precisely timed spiking activity propagating in coordinated fashion across pools of pyramidal neurons; their guiding waves are the product of their own synaptic activity. At all levels, these processes universally contribute to dynamically shaping an evolving architecture of complex networks and topographical maps, which in turn supports the flow of activity. At the largest scale, these patterns lead to the functional differentiation of conscious and unconscious processes.

Dot lattices and brain dynamics [June 2, 10:00-11:15, Room 415]

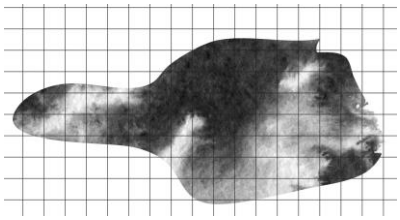
Professor Cees van Leeuwen
Perceptual Dynamics Lab
University of Leuven, Belgium

Michael Kubovy's work on ambiguous dot lattices has shown that perceptual grouping preferences depend quantitatively on proximity. Our EEG studies reveal that proximity grouping is a multi-stage process, irreducible to a single mechanism localized anatomically or chronometrically. Proximity sensitivity correlated positively with amplitude of the earliest ERP peak, C1, reflecting early feed-forward processes, and negatively with the next peak, P1, reflecting lateral and feedback interactions. This peak involved beta band synchronization, related to proximity sensitivity and inversely related to stimulus ambiguity. Pre-stimulus activity showed alternating modes of low and high alpha power. In the former mode, responses were biased towards the vertical orientation, irrespective of proximity; in the latter proximity-based responses were dominant. Biased responses, and their association with alpha power, vanished over the course of the experiment.

What, where and how in spatial language.
Where are we now? [June 2, 13:30-14:30, Room 415]

Professor Kenny R. Coventry
FBPS, FRSA, Head of the School of Psychology
University of East Anglia, United Kingdom

Originally Landau and Jackendoff's (1993) argued that spatial language maps onto the "where" visual system, with object properties regarded as largely irrelevant for spatial language use. Since then it has become clear that spatial language comprehension and production involves a combination of "what", "where" and (more recently) "how" information underpinning their situation specific use. Building on the "functional geometric framework" proposed to underpin spatial language comprehension and production (Coventry & Garrod, 2004), I present an update on this framework considering spatial adpositions and demonstratives across languages. In doing so, I will address the longstanding debate regarding semantic universals in spatial language versus cross-linguistic variability and cultural relativism.



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