Information Materialization

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Research Aims

This thesis explores the cognitive context of interaction with and the biologically inspired means of encoding, transcription and
fabrication of material artifacts as a rich communication medium to facilitate exploration of domain specific phenomena in complex data sets. It tackles the challenge of a formalized process to produce material media for better insight and increased feature discoverability in the exploding volume and complexity of Big Data.

An experimental framework incorporating a set of computational methods and new processes of mapping and transcription is developed employing grammars for shape generation (RGG relational growth grammars) which are then applied within a set of empirical studies to create data manifestations in two specific Big Data domains.

The project aims to apply recent findings in interdisciplinary research in cognitive psychology & neurosciences, neuro-aesthetics, embodied perception and computation in computer science and robotics to the formative, computational and communication aspects of touch & the spatially situated nature of information discovery and interaction in materialized information artifacts.

Cognitive affordances of physical objects made from data -- as carriers of embodied information -- are explored for their way of steering and engaging interaction and communication. This is followed by identifying and employing key applicable techniques and processes to information capture, transcription, encoding and storage by way of material embedding and feature inscription taking cues from insights in computer graphics, architectural design, synthetic biology and agricultural plant modeling. These will be referenced as precursors towards a set of new methodologies, processes and tooling to produce material artifacts.

Methodology

A series of initial experiments in information manifestation has already been completed and extended which has led to the design and application of further relational growth grammar implementations (rgg) for material form development. This tooling and additional implementations will be evolved further and tested experimentally in two use cases. As part of the process a ‘sense-making’ interface and tool kit is developed which facilitates the creation of Percept-Maps; precursors to the fabrication of a physical experience that determine the fabrication detail and facilitate processing of the material objects.

The two use cases where this is applied are each part of rapidly evolving arenas in IoT concerned with personal monitoring:

1. lifestyle & fitness monitoring
2. Parkinson Disease patient health monitoring.

In the first case, emphasis will be placed on new means for personal reflection on well-being over time and in the second case focus will be on motor symptom progression monitoring for patients with Parkinson Disease (PwP). The latter assists surfacing individual disease progression patterns to both clinicians, patients and carers enabling new ways of patient engagement, discussion and care management.