SHAPES 2.0

The Shape of Things

Workshop held at the

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Editors

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PREFACE

Shape, Form, and Structure

Shape, Form, and Structure are some of the most elusive notions within diverse disciplines ranging from humanities (literature, arts) to sciences (chemistry, biology, physics etc.) and within these from the formal (like mathematics) to the empirical disciplines (such as engineering and cognitive science). Even within domains such as computer science and artificial intelligence, these notions are replete with commonsense meanings (think of everyday perception and communication), and formalisations of the semantics and reasoning about shape, form, and structure are often *ad hoc*. Whereas several approaches have been proposed within the aforementioned disciplines to study the notions of shape, form and structure from different standpoints, a comprehensive formal treatment of these notions is currently lacking and no real interdisciplinary perspective has been put forward.
The workshop series SHAPES provides an interdisciplinary platform for the discussion of all topics connected to shape (broadly understood): perspectives from psycho-linguistics, ontology, computer science, mathematics, aesthetics, and cognitive science, amongst others, are welcome to contribute and participate in the workshops. We seek to facilitate a discussion between researchers from all disciplines interested in representing shape and reasoning about it. This includes formal, cognitive, linguistic, engineering and/or philosophical aspects of space, as well as their application in the sciences and in the arts.
We also welcome contributions on the relationship of shape representations at different levels of detail (e.g. 2D, 3D) and in different logics, and with respect to different qualitative and quantitative dimensions, such as topology, distance, symmetry, orientation, etc.

Form and Function in Natural and Artificial Systems

Within the philosophy and practice of design, the ontological notions of shape, form and structure have a further role of constraining function, malfunction, and behaviour of things. In this perspective, the decision-making process in design is a trade-off between physical, logical and cognitive laws and constraints that intertwine shapes and functionalities. Here, the spatio-linguistic, conceptual, formal, and computational modeling of shape serves as a crucial step towards the realization of functional affordances. This line of thought extends to several other disciplines concerned not only with the design of technical systems, but also with the understanding of biological as well as socio-technical systems. For instance, in biochemistry the shape of molecular entities (proteins, small molecules) has a direct effect on their interactions which give rise to the capacities they can manifest and, in turn, to the processes of life and death. Representing and reasoning about the shapes and realizable functionalities of these entities is essential to understand basic biological processes. Of special importance, in this as well as other

contexts, is the understanding of shape complementarity, that is, categorising the shapes of holes as well as the shapes of the entities that can fit into those holes, which can either facilitate or block the functionality of the overall system.
The results of this workshop will stimulate and facilitate an active exchange on interdisciplinary applications, ideas, approaches, and methods in the area of modelling shape, form, pattern and function. The format of the workshop combined invited speakers, peer-reviewed full contributions, as well as short position and demo papers, and allowed ample time for open discussions amongst the participants. Topics covered included:

Linguistics / Philosophy shape and form in natural language; differences between shape, form, structure, and pattern; shape in natural and artificial objects.

Cognition shape perception and mental representation; gestalt vs. structuralist understanding of shape cognition; perception and shape (e.g. identifying objects from incomplete visual information); affordances, dispositions, and shape.

Logics, Spatial Representations formal characterisations of shape and form; logics for shape: e.g. fuzzy, modal, intensional; logics for topology, symmetry, shape similarity; design semantics, spatial semantics; shape and 3D space; shape and space in cognitive assistance systems.

Ontology ontologies and classifications of shapes; ontological relations among shape, objects and functions; patterns as shapes of processes; forms and patterns in ontology.

Applications *Biology & Chemistry*: molecular shapes, shape in anatomy and phenotype definitions, shape complementarity between objects and holes, shape in medical image analysis and annotation.
Visual Art and Aesthetics: shape in Film and Photography; shape in computational creativity.
Naive Physics and Geography: e.g. qualitative classifications of shapes of geographic objects.
Design & Architecture: shape grammars; CAD, symmetry and beauty in architectural design.
Engineering: formal shape analysis in engineering processes.

The workshop SHAPES 2.0 followed a successful first event held at CONTEXT 2011 in Karlsruhe, Germany.[1]
SHAPES 2.0 grew significantly in its second installment[2], running as a full two-day workshop, and attracting a total of 23 contributed submissions of which we selected 14 for presentation at the workshop, with an additional 5 invited contributions. We thank all the speakers for their great presentations, and the audience for generating very lively and fruitful discussions.

[1] See http://cindy.informatik.uni-bremen.de/cosy/events/shapes/ for the workshop website. The proceedings have been published as Vol. 812 of the CEUR workshop proceedings, edited by Janna Hastings, Oliver Kutz, Mehul Bhatt, and Stefano Borgo, see http://ceur-ws.org/Vol-812/.
[2] See http://cindy.informatik.uni-bremen.de/cosy/events/shapes2/ for the workshop website

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- CNPq – National Council for Scientific and Technological Development (www.cnpq.br)
- International Association for Ontology and its Applications (IAOA) (www.iaoa.org)

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