

ROBOTIC BUILDING (RB): Continuous Variation

InDeSem Workshop 2015

COORDINATORS

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APPROACH / DESIGN VISION / D2RP METHOD

The workshop focuses on applying design-to-robotic-production (D2RP) methods developed by the RB team (fig. 1) to the design of an urban interface between the water and the building on the assigned site, which is the Fenix Dock in Rotterdam (fig. 2). Programmatic use of the urban interface will be defined in relationship to local urban analysis, global societal challenges, and D2RP constraints with the aim to explore hybridity, variation, and componentiality at different scales, ranging from micro levels, as material systems, to macro levels as spatial and architectural configurations.

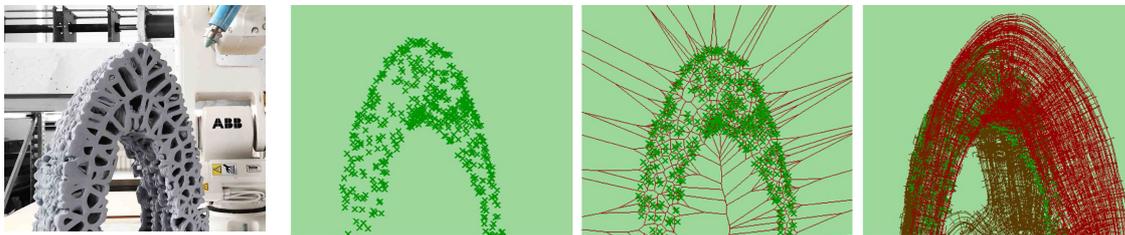


Fig. 1: D2RP involving additive techniques developed by Hyperbody's RB team and MSc 3 students (2015)

In general terms, hybridity implies multiple materials and systems that have various performances indicating how these materials and systems perform. Changes in performativity requirements addressing, for instance, inside-outside transitions may imply phase change or some other material transformation.

Variation implies varying conditions, characteristics, and aspects that may be based on performative aspects (related to functional, structural, and/or environmental needs) and may be customized according to individual and personalized specifications. For that mapping of 24/7 individual needs may be necessary in order to understand nature of needs and corresponding variation criteria.

Componentiality implies, in the context of the workshop that architectural systems consist of components operating together as a distributed system, whereas building systems and components can be scaled up and down to some degree. Investigations into applications of data-driven design, multi-agent systems, topological optimisation in architectural design and architecture aim to provide a framework for integrating functional,

structural, and environmental aspects into building components from the very beginning of the D2RP process.

The aim is to apply and advance D2RP for the urban interface by taking into consideration requirements with respect to function/use, form, structure, and climate:

(A) Functional requirements are addressed by identifying global urgencies, local urban needs, and mapping of 24/7 individual and collective activities;

(B) Formal aspects are explored by taking into consideration material, structural, climatic requirements as well as principles of customisation, continuous variation, and modular/componential recombination;

(C) Environmental requirements are considered by taking wind, sun, and rain conditions into consideration.



Fig. 2: InDeSem 15 workshop site (Fenix Dock, Rotterdam)

Main consideration is that the interface is composed of building components (such as wall-floor-ceiling-skin) consisting of various materials (porous, gradient, etc.), which are establishing hybrid systems (functional-climatic-structural, etc.) that are processed with multimode robotic techniques, as for instance, volumetric cutting and NC milling.

ORGANISATION/SCHEDULE

Participating students (InDeSem students, Hyperbody MSc 2 and 4 students) are split in in 3 groups of 12 students and each group has 4-5 Hyperbody students. Each group will focus on one of the themes: Hybridity, Variation, and Componentiality and will develop a proposal for an urban intervention operating as interface between water and building. Also, each group will have 3 subgroups of 4 experts each: The documentation-presentation experts, the parametric design experts, and material-fabrication experts. Developed work and presentation will be regularly uploaded to the InDeSem folder on the RE-wiki (<http://re.hyperbody.nl/>).

Mo, 14:00-18:00+

Design

Identify parameters related to urban context and societal urgencies that are relevant for defining programmatic requirements

Identify material (foam), structural (geometry), climatic (material thickness, porosity, etc.) requirements as well as principles of customisation (according to users needs), continuous variation (according to changes in structural, functional, and climatic needs), and modular/componential recombination.

Manipulate given parametric framework accordingly and develop 2-3 mutants for each of the instances Hybridity, Variation, and Componentiality

Tue-Wed, 9:30-17:00+

Design-to-production (D2P)

Identify multimode robotic techniques such as volumetric wire cutting and milling that are relevant for the D2P process

Test multimode robotic techniques on fragment of urban interface

Evaluate and choose design mutants and respective production modes for final 1:1 prototype

Produce fragments of 1:1 prototype

Thu, 9:30-17:00+

Production

Finalize production of 1:1 prototype addressing Hybridity, Variation, and Componentiality aspects and presentation material

Fri, 9:30-17:00

Presentation

Finalize documentation and presentation material / present publicly results from RE-wiki