Trans-co-design in systemic approach to architectural performance: The multi-layered media and agency in creative design and its processes

Davidova, Marie

Suggested citation:
Trans-Co-Design in Systemic Approach to Architectural Performance

The Multi-Layered Media and Agency in Creative Design and Its Processes

Marie Davidová
Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance
Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance
Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance
Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance
> Focusing on Landscape, Social and Cultural Ecology in Built Environment for Co-Living Performance

> Shift from Anthropocene in Built Environment

> Biodiversity and Climate Change Adaptation
> architectural design and construction
> holistic approach
> real life laboratory
Fusion of Several Process-Based Fields:

• ‘Systems Oriented Design’
• ‘Performance Oriented Architecture’
• ‘Prototypical Urban Interventions’
• ‘Time-Based Design’
• ‘Service Design’
• ‘Co-Design, Co-Creation and DIY’
Sevaldson 2013
Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance
Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance

Joint 270°-110°

Joint 180°-45°

Joint 270°-110°

Joint 180°-45°

Joint 270°-110°

Joint 240°
• ‘Performance Oriented Architecture’ > Responsiveness
Eco-Systemic ‘Prototypical Urban Interventions’

> Generativness

Photo: Carrithers 2017
Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance
"Time-Based Design" > Generativeness

> > > > COLidor Project Action Diagram > > > > Marie Davidová 2017

Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance
Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance.

Photo: Novotná 2014.
Traditioinal Architecture from Extreme Climates Observations:

- today practice adaptation
GIGA-mapping Svalgangs and Skuts

Systemic Approach to Architectural Performance Project with the kind support by GIGA Grants

The study was performed by Marie Davidová and Danica Škrobáková who are also the authors of the images. The data were collected from Mari Eide bruun in Oslo - The Open air Museum, Stoltzarchive in Sandnes, Larvik Museum, Vigs, Snås, Kulturhistorisk museum, and Skuttskogen museum in Bergen.

We would like to thank to Rigmor Swedalinn from the Oslo School of Architecture and design and Solbjørn Eidsfjord and Tor Steinar Eidsfjord from the Oslo Open Air Museum, Sandnes Museum, and Oslo Museum from Oswald浴神 from Skuttskogen museum in Sandnes, Vigs høgskolen from Vigs, and the Danish Institute for Conservation and Nationalmuseet from the Norwegian and danish nationalmuseet in Bergen for providing us with information and for Clark Thomas and Sverre Iversen from the university of Bergen for assisting us with the technology.


Website: http://www.yr.no/

Source of image:

Planke from Oslo Open Air Museum, Sondre Skur Roberg, Kris Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance

SPATIAL DIMENSIONS

PENETRATION OF ENVIRONMENT

Moisture content of wood in semi-interior space

Moisture content of wood in exterior space

We refer to the original image for a more detailed explanation of the process and the data.

The diagram illustrates the systemic approach to architectural performance through various gradients and arrows suggesting the process and the development through various scales, reflecting the systemic nature of the performance.
Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance

- material responsive performance
- climatic performance
- shelter for other species
- animal dwelling
- storing of material
- loading of material
- communication
- working
- leisure

- transformable openness
- closed
- semi-closed - ventilation openings
- semi-open - lace like semitransparent
- semi-open - large openings
- semi-open - open side
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>North Face</td>
<td>3°C</td>
<td>52% RH</td>
<td>18% MC</td>
<td>3°C</td>
<td>52% RH</td>
<td>17% MC</td>
<td>3°C</td>
<td>51% RH</td>
<td>22% MC</td>
</tr>
<tr>
<td>North-East Face</td>
<td>21°C</td>
<td>54% RH</td>
<td>14% MC</td>
<td>4°C</td>
<td>52% RH</td>
<td>17% MC</td>
<td>4°C</td>
<td>52% RH</td>
<td>21% MC</td>
</tr>
<tr>
<td>North-West Face</td>
<td>16°C</td>
<td>76% RH</td>
<td>15% MC</td>
<td>4°C</td>
<td>52% RH</td>
<td>21% MC</td>
<td>4°C</td>
<td>52% RH</td>
<td>21% MC</td>
</tr>
<tr>
<td>East Face</td>
<td>17°C</td>
<td>71% RH</td>
<td>22% MC</td>
<td>4°C</td>
<td>52% RH</td>
<td>14% MC</td>
<td>4°C</td>
<td>52% RH</td>
<td>15% MC</td>
</tr>
<tr>
<td>South-East Face</td>
<td>16°C</td>
<td>67% RH</td>
<td>11% MC</td>
<td>4°C</td>
<td>52% RH</td>
<td>17% MC</td>
<td>4°C</td>
<td>52% RH</td>
<td>17% MC</td>
</tr>
<tr>
<td>South-West Face</td>
<td>16°C</td>
<td>65% RH</td>
<td>16% MC</td>
<td>4°C</td>
<td>52% RH</td>
<td>17% MC</td>
<td>4°C</td>
<td>52% RH</td>
<td>17% MC</td>
</tr>
<tr>
<td>West Face</td>
<td>17°C</td>
<td>65% RH</td>
<td>16% MC</td>
<td>4°C</td>
<td>52% RH</td>
<td>17% MC</td>
<td>4°C</td>
<td>52% RH</td>
<td>17% MC</td>
</tr>
<tr>
<td>South Face</td>
<td>18°C</td>
<td>60% RH</td>
<td>16% MC</td>
<td>4°C</td>
<td>52% RH</td>
<td>17% MC</td>
<td>4°C</td>
<td>52% RH</td>
<td>17% MC</td>
</tr>
<tr>
<td>North-East Face</td>
<td>16°C</td>
<td>62% RH</td>
<td>32% MC</td>
<td>4°C</td>
<td>52% RH</td>
<td>17% MC</td>
<td>4°C</td>
<td>52% RH</td>
<td>17% MC</td>
</tr>
</tbody>
</table>
Ground and Semi-Ground Inhabitation:
Cappadocia Case Study Thematic GIGA-Map

Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance

The thematic GIGA-Map is relating macro and micro climatic relations of exterior and semi-interior spaces with geological position and world axis orientation, subtractive and additive building within and with tuff stone. The dashed lines express intensity and periodicity of the occurrence of certain fields, while the marking dot suggests the abundance by their size and intensity by gradients. The graphics arrows express increases and decreases, while the text arrows suggest the reading directions.

The map clearly expresses that when designed wisely, the semi-interior space without full enclosure, can manipulate the internal climate up to approximately 10°C through the ground material and natural ventilation; and different climates and world axis orientations were designed for different purposes of use. This also relates to co-habitance with different species with different climatic, excess and spatial needs.
Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance

Underground City
Fairy Chimneys
Valleys
Rock Walls
Valleys
Rock Hills

Author: Maximilian Dörrbecker, source: https://commons.wikimedia.org/wiki/File:Map_of_Cappadocia.jpg, licenced under: Creative Commons Attribution-Share Alike 2.5 Generic license.

Underground City
Fairy Chimneys
Valleys
Rock Walls
Valleys
Rock Hills

North Face Orientation
East Face Orientation
South Face Orientation
West Face Orientation

Exterior Temperature
Exterior Relative Humidity

<<<<

32°C e 32% RH
25°C e 31% RH
35°C e 28% RH
24°C e 32% RH

Ground and Semi-Ground Inhabitation: Cappadocia Case Study Thematic GIGA-Map

Author: Marie Davidova
Project: Traditional Architecture and Its Performance
Funded by Student Grant Competition at the Technical University of Liberec, Czech Republic

The thematic GIGA-Map is relating macro and micro climatic relations of exterior and semi-interior spaces with geological position and world axis orientation, subtractive and additive building within and with tuff stone. The dashed lines express intensity and periodicity of the occurrence of certain fields, while the marking dot suggests the abundance by their size and intensity by gradients. The graphics arrows express increases and decreases, while the text arrows suggest the reading directions.

The map clearly expresses, that when designed wise, the semi-interior space without full enclosure, can manipulate the internal climate up to approximately 10°C through the ground material and natural ventilation; and different climates and world axis orientations were designed for different purposes of use. This also relates to co-habitance with different species with different climatic, excess and spatial needs.
Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance

Fully Ground

Masonry Addition - Wall

Masonry Addition - Wall

Masonry Addition - Interior and Semi-Interior Spaces, Terraces

Farm Animal Inhabitation

Human Inhabitation

Pigeon Inhabitation

Permanent Use

Occasional Use

Exterior Temperature

Exterior Relative Humidity

Semi-Interior Temperature

Semi-Interior Relative Humidity

Relationship of Carving and Adding

Ground and Semi-Ground Inhabitation: Cappadacia Case Study Thematic GIGA-Map

author: Marie Davidová

project: Traditional Architecture and Its Performance

funded by Student Grant Competition at the Technical University of Liberec, Czech Republic

The thematic GIGA-Map is relating macro and micro climatic relations of exterior and semi-interior spaces with geological position and world axis orientation, subtractive and additive building within and with tuff stone. The dashed lines express intensity and periodicity of the occurrence of certain fields, while the marking dot suggests the abundance by their size and intensity by gradients. The graphics arrows express increases and decreases, while the text arrows suggest the reading directions.

The map clearly expresses that when designed vise, the semi-interior space without full enclosure, can manipulate the internal climate up to approximately 10°C through the ground material and natural ventilation; and different climates and world axis orientations were designed for different purposes of use. This also relates to co-habitance with different species with different climatic, excess and spatial needs.
Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance

På Vei:
- speculation
Responsive Transformer:

- application
Spiralling Slope:

- practice application
‘Service Design’ > non-anthropocentric eco-systemic services
Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance
Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance
• ‘Co-Design, Co-Creation and DIY’
Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance
Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance
Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance
Marie Davidová, MArch, Ph.D.: Systemic Approach to Architectural Performance
The code is written for Rhino 6 (Robert McNeel & Associates, 2016) to be open source in Grasshopper (Davidson, 2017). Download its evaluation version here.

Please, download it here.

3.2 FOLLOW THE STORY BOARDS

Figure 4: Design Process Story Board (Pseras 2018)

Figure 5: Brainstorming Process Story Board (Pseras 2018)
This GIGA-map developed as a 1Hp analysis of GIGA mapping software led by the GIGA team that was mapping positions from the project Wood as a Primary Medium to Architectural Performance. It is mapping a gradient of different types of environmental, biological as well as physical, interactions through a range of boundary conditions of different designs. The case designs were either authored or co-authored by the GIGA-maps' author and were selected from different projects. The map has a matrix of parameters and naming their interactions. Despite a range of not so complete feedback loops, some of them are even in environmental co-relationships. The case designs do not strictly reflect this interactivity or the system, but the importance of related interactions. The gradient of the system represents the boundary conditions, while the colour gradient of lines and texts for each project represents a range from design's openness to closedness of the boundary.

Design’s Boundary Conditions in Relation to Environmental Interactions

Systemic Approach to Architectural Performance and Wood as a Primary Medium to Architectural Performance project

Wood as a Primary Environment - design responsive
environmental conditions - material responsive
physical environmental condition

relation - humidity responsive
air flow responsive
light responsive
sound responsive
radio waves responsive

biological environment conditions

symbiosis with flora
patterns for fauna - areas for perimeter marine
human - design responsive
design - environment responsive
material - environment responsive
physical environmental conditions

temperature - effect
air flow - effect
light - effect
sound - effect
radio waves - effect

biological environment conditions

water - interlace
individuals - interlace

reproduction
leisure
work
entertainment
communication
materialising

social boundary conditions

public
private
supermarket use
social space
furniture
blinds
screens
private

Mood for Wood: Community Origami Furniture

The project covers transformable furniture for periphery community garden in the city of Poznań. The courtyard space was occupied by balloons for people to chill out, play and interact. The semi-interior space - the peel generates a general visual diversity of both interior as well as exterior.

SpiralTreeHouse (Marie Davidová & Prokop Závada 2010-2013)

SpiralTreeHouse is built from the rest trees in the forest as a shelter for rest. The tree growth will be monitored and the tree will be a growing organism. The dynamics of the tree and its environmental input that will evolve the tree's growth.
Biodiversity and Climate Change Adaptation

Design’s Boundary Conditions in Relation to Environmental Interactions GIGA-map

Systemic Approach to Architectural Performance and Wood as a Primary Medium to Architectural Performance project

Marie Davidová

This GIGA-map developed as a 3D analysis of GIGA mapping technology used in Roger Tallon’s ‘GIGA-map’ project. The map is a visualization of different types of environmental and physical interactions through a range of boundary conditions of different designs. The case designs were either authored or selected and then simplified and visualized within the GIGA context. The map is one of a series of visualizations and studies that visualize different spaces after converting complex data into simple lines that loop, some of them extending even to conceptual co-locations. The color changes from light to dark reflect the density, or the system, but the importance of related interactions. The gradient of the system represents the boundary conditions, while the color gradient of lines and texts for each step represents a range from design’s openness to closure of the boundary conditions.

Design boundary conditions:
- Public
- Private
- Infrastructure
- Social aspects
- Environment
- Material

Systemic approach to architectural performance and wood as a primary medium to architectural performance project:

- Public space
- Private space
- Infrastructure
- Social aspects
- Environment
- Material

Shift from Anthropocene

Biodiversity and Climate Change Adaptation
Research by Design through:

- > Eco-Systemic Prototypical Urban Interventions
- > Related Historical Prototypes Studies
Leading to the Shift from Anthropocene in Built Environment >

- cross-species co-living > dwelling and edible landscape
- co-design process > the process of its performance
- public and transdisciplinary communication and co-design
  - analogue and digital co-design for adaptation
- Creative Commons Attribution-NonCommercial 4.0
Shift from ‘Cities for People’ (Gehl, 2010)

> Participation of Both, Biotic and Abiotic Agency

> One Co-Performative Ecosystem, the ‘Real Life Laboratory’
Twofold ‘Ecological Urbanism’ (Mostafavi & Doherty, 2016):

- physically prototyping and testing our work through overall ecosystemic engagement
- tool to communities to spread the work through DIY
These multi-layered and multi-scaled local specific eco-systemic trans-co-design real time processes are therefore building the ground of the very open newly emerging design field of **Systemic Approach to Architectural Performance**
Thank you!

Marie Davidová, MArch, Ph.D.

Founding Member and Chair of Collaborative Collective
md@collcoll.cc

Lecturer at the Welsh School of Architecture
Founding Member of Systemic Design Association

Read my publications at: