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Socio-environmental relations of non-discrete spaces and architectures

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Socio-Environmental Relations of Non-Discrete Spaces and Architectures:

Systemic Approach to Performative Wood

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Abstract:

The paper puts into the context of practical applications my case study research of responsive wood located in Czechia, being inspired by Norwegian and oriental traditional architecture. Approaching the field from a socio-environmental perspective, the article relates human, social and biotic behaviour with climatic and geographical data, addressing interactions in the performance of architectures and its additional issues in urban design. The opportunistic activities, use or habitation of spaces and objects, meets its performance through environment – material and/or design interactions. The paper claims that, at least in observed climatic locations, semi-interior, or so called non-discrete architecture addressed by Hensel and others, are the grounds for and generators of individualistic and social activities in public and public-private spaces, securing environmental comfort. In this time of increased weather extremes coming with climatic change in certain locations, noise, light pollution, etc., the topic is gaining greater relevance.
Inspired by Library of Systemic Relations for GIGA-mapping introduced by Sevaldson (Sevaldson, 2016c), the relationing of such in GIGA-maps required its own coding or update and/or combination of the existing proposed library. The maps are expressing different ranges and intensities of behaviour or performance in relation to placement or designs that are represented by informational layers of images. Relating gradients within (Allen, 2011; Banham, 2009; Michael Hensel & Menges, 2009; Hight, 2009) and among the fields, thus generating a matrix of interlinked information where zooming, sequencing or feedback looping appears. This way somewhat develops the core ideas of Allen from 1997 on matrixes and fields (Allen, 2009). The three thematic GIGA-maps are in fact developed ZIP-analyses (Sevaldson, 2016d) of each other, zooming a problem of the theme's topic. The semi-interior or non-discrete spaces as a climatic, sound, etc. and biotic – including social gradient-are complex interlinkings of outside and inside environments and have implications for activities and forms of life. Therefore, a systemic approach is needed to fully understand it.

Introduction:

'Architecture is a material practice. Materials make up our built environment, and their interaction with the dynamics of the environment they are embedded within results in the specific conditions we live in.
Moreover, culture and the way materiality and materials are understood and instrumentalised mutually condition one another.' (Michael Hensel et al., 2008)
I have expressed my understanding of environment in relation to interaction in space and time in exploratory paper for NORDES in 2009 as an exemplification of the difficulty of imagining space which is, for instance, traditionally defined by three dimensions x, y, z, but there is no light there making possible to see anything (and perhaps there is also nothing to see either), there is no heat

you could feel, nothing to hear, no smell, etc. Pointing out that it is as difficult to imagine that this space is happening in time. Arguing that, from the architectural view, the word environment could be defined as space which is enriched by interaction and that we could say that the space as such does not exist in time and that the space-time dimension is defined by interaction, concluding that the space-time with interactors then forms the environment. This is supported by the fact that to design in relation with light, sound, wind, weather or stars position, politics, etc. has been common throughout architectural history whether in symbolic, metaphysical, pragmatic, phenomenological or other manner, which leads to the fact that these factors are important dimensions of the environment (Davidová, 2009).

This seems to be supported by Oliver, who emphasize that the concept of space is not universal and, i.e.:

'In the Navajo world view, all is in motion and all is changing within an overriding concept of order and harmony. Space is related to movement,…' (Oliver, 2006)

Though considering himself a modernist, Frampton called for an environmentalist direction in architecture's future development several decades ago in the early eighties (Keneth Frampton, 2011), discussing the poetical approach of the relationship between humans and nature in an interview with Mitášová in 2010 (Kenneth Frampton & Mitášová, 2012). In my mind, humanity, such as everything we know, is fully part of nature, and therefore I would better discuss the relationship of the individual and its environment – living or non-living-which involves their evolving interactions. Reconsidering regionalism, Heat stays:

'For example, some practitioners study the built environment through a culture concept, whereby regional landscapes become sources for exploring the manner in which human populations around the globe create, adapt, and transform their environments in response to personal beliefs, human interactions, situational opportunities and constraints, traditional and evolving technologies, and forces of the natural environment.' (Heat, 2009)

This seemed to be exemplified in the following study of Norwegian semi-interior spaces 'svalgangs' (see Figure 3), where different alterations of openness and closeness appear even on one building, reflecting climatic and site orientations and locations as well as opportunities of use and social interactions. Furthermore, in some cases their aesthetics, often decorated by carvings, securing special climatic conditions through environmental exchange has an almost spiritual character, while other parts are unfoldable for more down-to-earth activities such as material loading.

Jan Gehl categorised three types of human activities that in my opinion also must cause various layers of interactions in outdoor areas: 1) necessary, 2) optional and 3) 'resultant' social activities, arguing that the two last appear way more frequently in good quality of physical environment. (Gehl, 2011) 'Good quality of physical environment' or I would better say suitable environmental conditions, are in large degree operated by weather or other physical aspects such as sound and light. Therefore, in most of the climatic locations semi-interior, so called non-discrete architectures defined by Hensel (Michael Hensel, 2013), take place. Discussing the spatial transitions from exterior to interior, Hensel is for instance mentioning canopies, screenwalls and full enclosures. (Hensel, 2015)

Vegas and coll. expresses their performance from socio-cultural perspective as such:

'… – but in-between spaces that generate relationships, places for sociocultural exchange. Just as it occurs in nature, where life does not flourish as much in a homogeneous habitat as on the borderline between two different habitats, they are architectural sites with a great wealth of cultural and social activity, which often foster life and promote personal, familial, social and other relationships.' (Vegas, Mileto, Songel, & Noguera, 2014)

Such spaces operate on public – public-private – private transition levels, often increasing self-confidence of anxious individuals to interact with the outside world. The analysed projects that have been presented involved observations and interviews with the participants of various age, gender and disciplines/professions, while enacting and interacting with the designs. Working in the

experimental field, the children's play and socialization observation, complained to be seriously under-researched by Oliver (Oliver, 2006), played a crucial role next to the artistic enactment and embodiment of the performative objects or architectures.
The modern history and theory of well-tempered environment in relation to social context was discussed by Hight, concluding with a call for conversion of ecology and environmental issues from technical problems with engineering solutions into engines for innovating and opening the discipline (Hight, 2009), which has been the aim of this research from start to completion.
Within the Czech region, these questions were not fully addressed by local practices. To my knowledge, the only exception is my own practice Collaborative Collective (Collaborative Collective, 2012) and ORA – Original Regional Architecture office (Zmeková, Hora, & Veisser, 2016), both mainly integrating social and/or cultural with physical environmental performance.

Design's Boundary Conditions in Relation to Environmental Interactions:

Searching to understand the dialogue of a design and its environment, I GIGA-mapped the interactions of some examples of my designs, organized in range from fully open to almost closed. GIGA-mapping has been proposed by Sevaldson as a tool in Systems Oriented Design and expressed as follows:
'*For each design case the phenomena at hand is deeply researched, starting with a very rapid learning process with a very steep learning curve. This process starts with visualisation: large maps are used for systematizing and interrelating the knowledge, preconceptions or speculations we already have of the subject. This needs to be done to an extent that produces several hundreds of items on the maps.*'
(Sevaldson 2013b)
In all these, in certain degrees performative projects, the local environmental conditions meet human sensory through poetics discussed by Frampton (Frampton and Mitášová 2012). It is interesting to note that the designs with larger non-human act responsiveness seem to be engaging humans to interact through generating ideal settings for opportunistic use without their involvement. Furthermore, it seems that the parasitic semi-interior spaces, enabling openly programmed environmental exchange, are motivating different individual and social activities to generate a pleasant environment in larger diversity of conditions.
The following GIGA-Map of Design's Boundary Conditions (see Figure 1) was developed as a ZIP-analysis, which is defined by Sevaldson as a simple method for developing GIGA-maps through finding and zooming in potential areas for interventions and innovations (Sevaldson 2016b), of GIGA-map of a workshop lead by Birger Sevaldson at the Faculty of Art and Architecture at the Technical University of Liberec that was mapping pavilions from the project Wood as a Primary Medium to Architectural Performance. It is mapping a problem 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 me and were selected due to their suitability to the not fully strict 'gradient'.
The map lays out a matrix of parameters and relates their interactions that often generate more or less complex feedback loops, some of them cycling even in hierarchical constellations. The stroke thickness doesn't fully reflect the hierarchy in the system but the importance of related interactions. The gradient of the splines represents the boundary crossings, while the colour gradient of lines and texts for each project represent a range from design's openness to closeness of the boundary. The detail (see Figure 2) shows feedback looping documenting, i.e., sound, visual or climatic aspects through and by specific media effect on different biotic, i.e., human, behaviour and/or perception and returns to the effect of the later on the former.

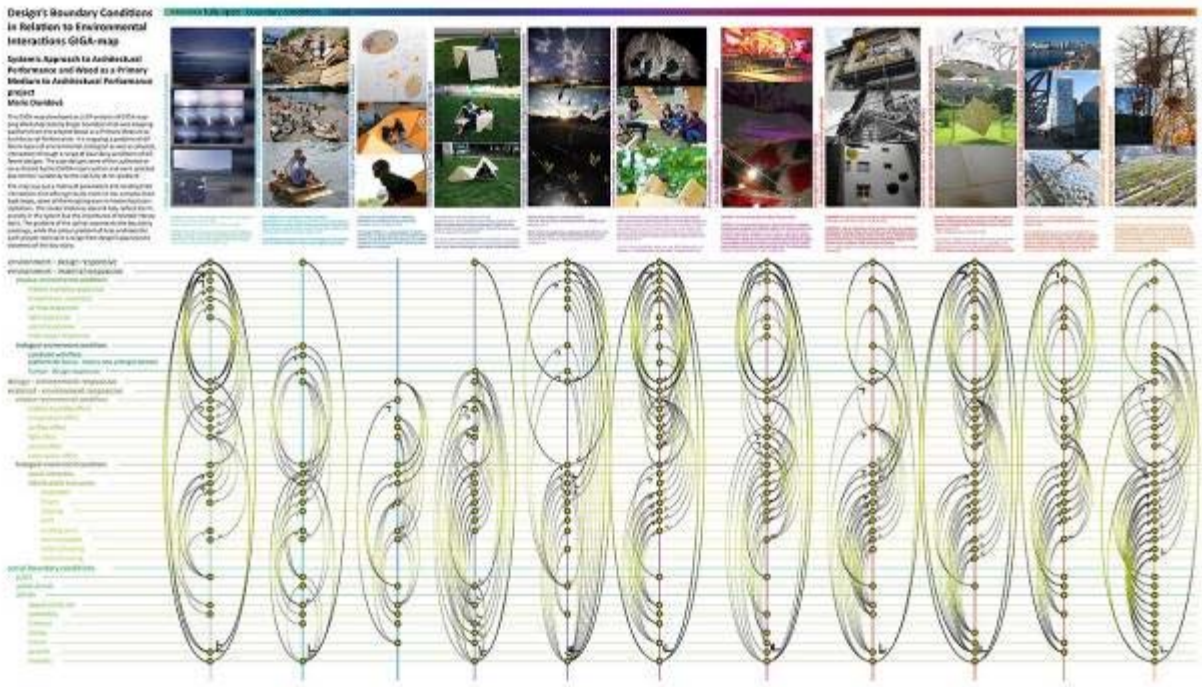

Figure 1: Davidová: GIGA-Map of Design's Boundary Conditions in Relation to Both, Physical and Biotic, Including Social, Environmental Interactions, Mapping the Spaces Organized from Fully Open to Almost Closed (please, zoom in at my blog post: Davidová, 2016a)

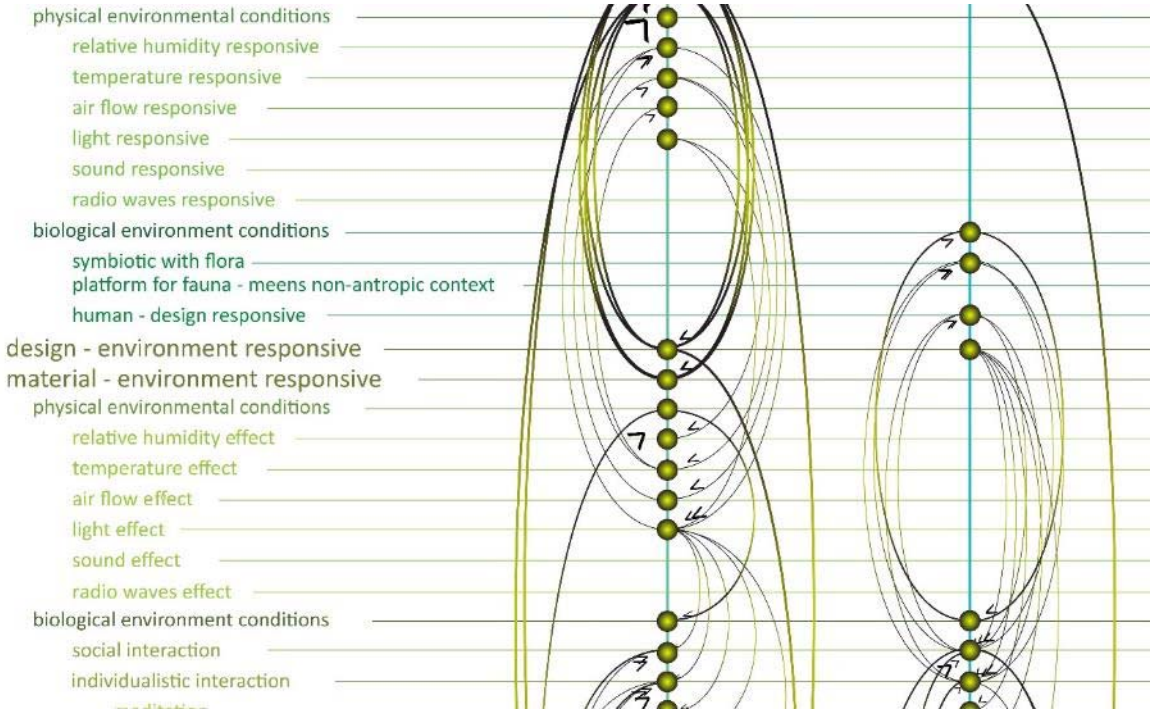

Figure 2: Davidová: Detail of GIGA-Map of Design's Boundary Conditions showing different interactions, levels and hierarchies in feedback looping among interactions of different parameters through the boundaries.

Svalgangs:

Figure 3: Svalgang of Hjeltarstua from 1763, recently placed in the Maihaugen Open Air Museum in Lillehammer (photo: Davidová 2016) shows the opportunity of indoor-outdoor environment including the range from social to climatic interaction while working actively.

The unclimatized spaces between the interior and the exterior, generating the onion principal of the building (Davidová 2016c, 2016e), securing to different extents visual, sound and climatic penetration through its boundary conditions have its place in almost all traditional architectures, functioning as its energy exchange with the surrounding environment. Nice examples from around the world are, for instance, discussed in the article In-between spaces, borderline places by Vegas and Coll. in the publication entitled Heritage for Tomorrow: Vernacular Knowledge for Sustainable Architecture (Vegas et al. 2014). This publication, next to, i.e., Sustainable Environment Association (Hensel 2011b) and many others argue for studying and learning from traditional examples as they are source of knowledge of architectural environmental interaction developed through generations. 'Svalgangs' (see Figure 3), the semi-interior spaces in Norwegian traditional architecture, that give various opportunities of use and serve as public-private and indoor-outdoor interface, developed in high potentials of articulation with different or even gradual degrees of permeability in relation to socio-environmental conditions were analysed and speculated through GIGA-mapping (see Figure 4).

The GIGA-map relates such spaces in the context of their original climatic location, opportunities for use or inhabitation, options of penetration of overall environment and spatial dimensions, its distribution enveloping the interior spaces and measurements of micro climatic exchange and moisture content of the material within the onion principle. Similarly, microclimatic research of 'exchange of different strata' was proposed by Hensel already in 2010, mentioning it as pending for advances (Hensel 2010a). The overall mapping requires both soft and hard data as discussed by Sevaldson:

'*In design we most often are looking at composed perspectives. This means that we are navigating complexities that are crossing technological, biological and social realms. We deal with both deterministic and unpredictable systems, framed and tamed ones as well as wild and wicked ones. This implies that we might find ourselves at both soft and hard ends of the systems approaches*.' (Sevaldson 2015)

The GIGA-map is zooming into various scales, relating data and their development through colour coding gradients, their intensity through dashed lines and weights, themes through curvature degrees (see Figure 5) and arrows suggesting the process of the performance. Generating a matrix of 'micro systemic relations'(Sevaldson 2016a) while placing in sequences spatial evolutions ranging from open to closed spaces, while paying attention to options of penetration density and its aesthetics character, in relation to regional site location, orientation, macro and micro climatic, social constellations and opportunities of use, the map serves as an analysis for proposing new architectural spaces and atmospheres.

The map relates data, such as if the boundary can retransform or how the exchange is secured, for instance through carving, if it generates space for which periodicity of leisure, work, etc., how such is distributed along the interior space and what the climatic and wood moisture content data is of the interior, semi-interior and exterior (see Figure 5). The researched buildings are from Norsk Folkemuseum Oslo, Maihaugen Open Air Museum, Lillehammer and Glomdalsmuseet, Elverum. However, their original locations are known and were mapped and linked with their macro climatic data, as such must have had crucial effect on their design and redesigns. A lot of 'svalgang' spaces were added to the original building later on, often after a century of its use (Berg et al. 2011; Hauglid et al. 2005; Sveen 2016). The interiors were not heated and the data were measured after a period of very cold temperature within one afternoon in February 2016 in Oslo Folkemuseet. Therefore, the interiors are mainly the coldest but variations are obvious, though the data cannot be precise for the reason that the climate was changing also with the progress of that particular afternoon of measurements. The moisture content was not measured on the original wood of the buildings, as the preservation does not allow it, but on the wooden objects in particular spaces or wooden elements that replaced the old ones through reparation.

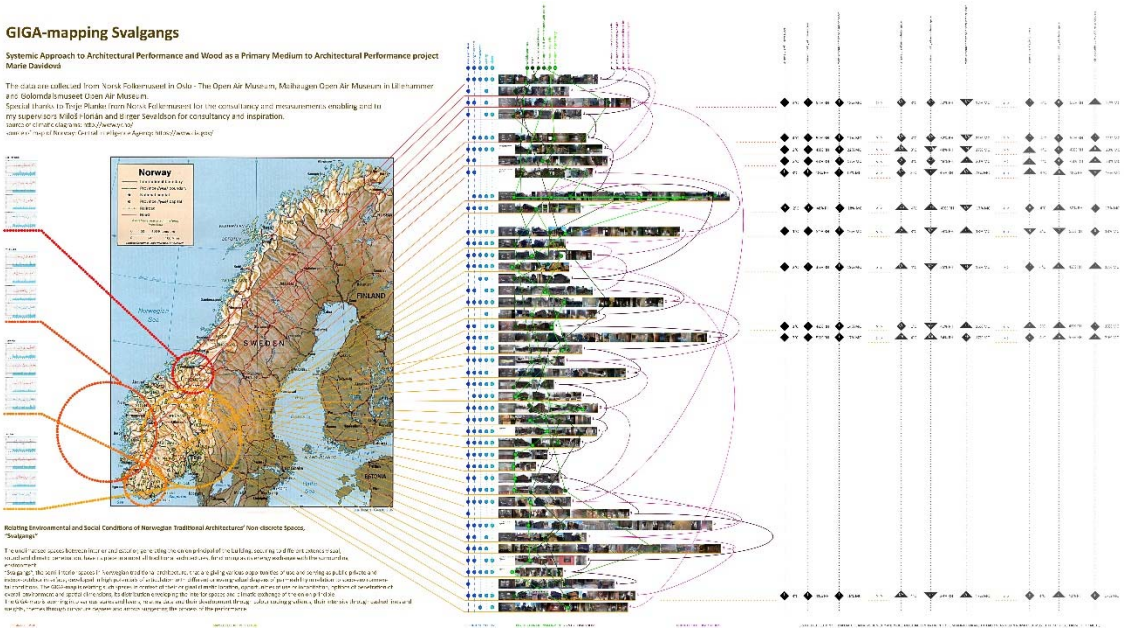

Figure 4: Davidová: GIGA-mapping Svalgangs (please, zoom in on my blog post: Davidová, 2016a, the map of Norway is a public source from: Central Intelligence Agency: https://www.cia.gov/ the macro climatic diagrams are used with the courtesy of yr.no reached at yr, 2016)

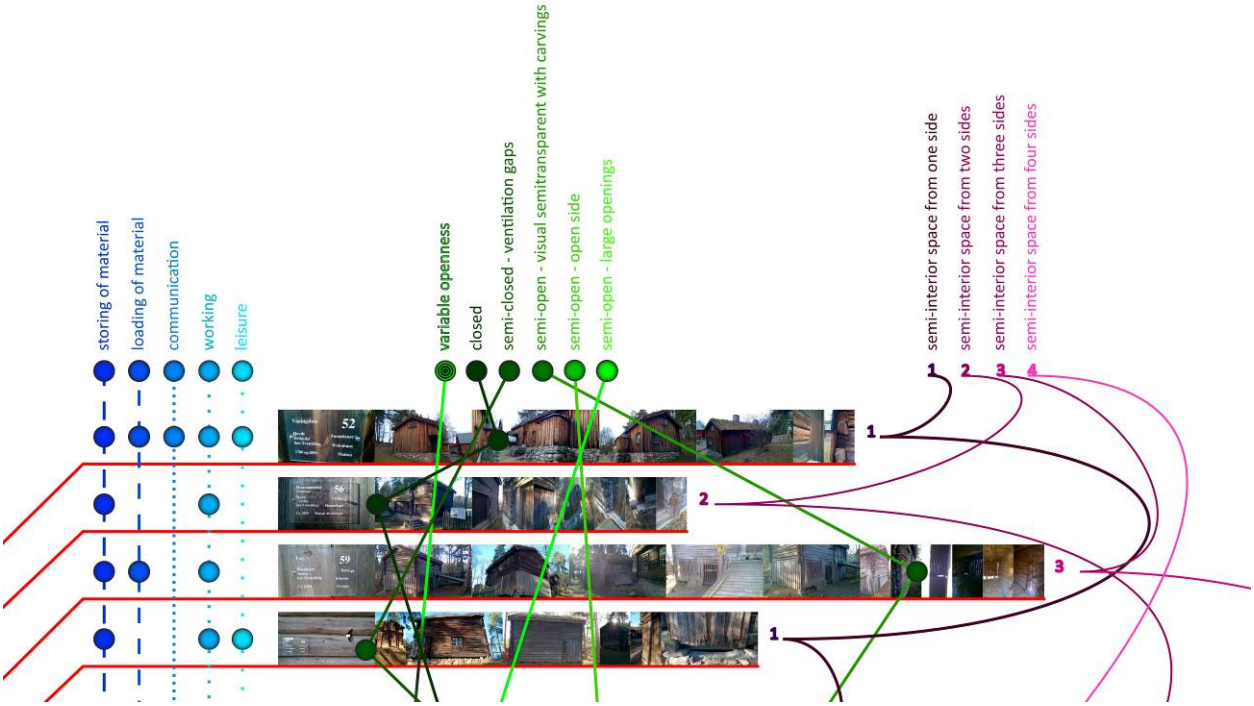

Figure 5: Davidová: Detail of Svalgangs GIGA-Map showing differentiation in relations mapping

Reading from the map, the spaces with better variosity of penetration options and spatial distribution along the building, thus offering different levels of biotic and abiotic exchange, seem to offer more opportunities of use activities. Svalgangs certainly serve as climate control of the interior spaces that are aimed to be climatised, generating and extra layer of energy exchange over

time. There is not much literature regarding ‘svalgangs’. For the consultations and enabling the measurements, I would like to thank to Terje Planke from Norsk Folkemuseet, Oslo.

Wood as a Primary Medium to Architectural Performance Project:

Figure 6: Sevaldson’s GIGA-mapping Workshop Result (photo: Málek 2016)

Following the ‘bottom up’ approach, the project Wood as a Primary Medium to Architectural Performance started on the side of material science, craftsmanship, forestry and meteorology while having speculative imaginations of its applications, thus slightly combining it with a ‘top down’ approach. Through one part, the Environmental Summer Pavilions projects, pareSITE (Nam 2013) (see Figure 7) and LOOP (Slavíčková 2014) (see Figure 8), originally planned mainly as a more complex study for the environment responsive envelope Ray project, it immediately reached a social dimension. As opposed to Katarína Boháčová’s doctoral thesis classifications (Boháčová 2012), the pavilions joined both purposes, design-research experimentation as well as public social activities generator and prototype. Its relations have been mapped (see Figure 6) at Birger Sevaldson’s GIGA-mapping workshop (Davidová 2016b) at the Faculty of Art and Architecture at the Technical University of Liberec (FUA TUL 2016), that developed more complex understanding/questions also in relation to its multileveled opportunities of use and social aspects. The above GIGA-map with several ZIP analyses’ takes into consideration the overall process, introducing feedback loops. The color-coded threads and markers were employed in mapping with a highlighter for zoom points.
The pavilions served as more complex material-environment interaction prototypes for the development of the performative envelop Ray project while following their own biotic – human and social responsive agenda. Generating a pleasant climatic environment for both its festivals’ (Barry 2016; Davidová and Kernová 2016; Kernová 2014) events as well as for individual opportunistic use, the pavilions provided data for interrelated interactions of actors and their physical environment (Davidová and Sevaldson 2016). Freely inspired by the performance of oriental screens, so called 'mashrabīyas' (Fathy 1986; Hensel 2010b, 2011a, 2013, 2015b), the pavilions generate humid air circulation evaporated out of its material on dry, hot summer days lately typical for the city of Prague. Such performance for the outdoor interaction is also taken into consideration by Ray project.

Figure 7: pareSITE pavilion (photo: Wágnerová 2013)

Figure 8: Loop pavilion (photo: Novotná 2014)

Figure 9: Ray 3 (photo: Davidová)

Figure 10: Ray 2 Performing in the Sun, Being Inhabited by Algae after Three Years in an Outdoor Environment (photo: Yildirim 2016)

The envelopes Ray 2 and 3 (Davidová 2013, 2014, 2016c, 2016e) (see Figure 9 and Figure 10), proposed as, in a way parasitic, screens for semi-interior spaces of the so-called onion principle in the environmental design field, generates public-private, semi-outdoor social and physical interactions as known from 'svalgangs'. Ray 2 and 3 has performative capacities through material-environment interaction for regulating the non-discrete space's comfort in relation to climatic conditions, not letting in moisture in high relative humidity exterior conditions, while airing in dry warm weather. In addition, Ray 3 is heat reflexive, thus generating by its warm surface thermal comfort in lower temperatures, while the preceding prototype Ray 2 (Davidová 2013, 2014) is more permeable, thus, a different range of spatial properties might be reached.
This research proposes a shift from recent trends in architecture and the building industry that aims for impenetrable insulations of spaces, in addition often through toxic or energy consuming produced materials (Davidová 2009). Instead, it introduces case study solutions for non-discrete spaces to be applied as urban design architectures or as a boundary within the 'onion principle' of habitable buildings. Thus generating rich variations of living environments for different opportunistic use and human/biotic activities through indoor-semi-indoor-outdoor interaction of climatic, or generally the physical environment, as well as biotic, namely human, agents.

Summary:

This paper sets the case study research Wood as a Primary Medium to Architectural Performance into the context of architectural and urban design practice. It proposes a different approach to built environment than what is widely-used and supported by today's building laws and markets through suggesting sustainable applications for performative environments and atmospheres. It is exhibiting a range of variety of possibilities of boundary conditions on my, or co-authored by me, today designs/realisations, showing where the research's case projects take place. Such ranges have been common throughout the history as climatic or other physical agents as well as social or practical use adaptation to environment through gradients of boundary conditions. As seen from the 'svalgangs' mapping example, some of these spaces have been also widely transformable according to current need/suitability and/or use. These solutions were developing over generations through a 'trial error' approach while modernism cut this link in most of its specifications and adaptations. I would agree with Jan Michl, that, i.e. functionalism was a merely special aesthetics movement rather than related to any use or general performance (Michl 2003). This loss causes issues on any liveable aspect, starting from social performance through good physical as well as mental state and/or comfort, understanding an individual's belonging to nature and universe, ending with negative effects on environment that generates feedback loops to all the other aspects. I am not even mentioning the loss craftsmanship's knowledge that relates to all of this and my research had to face it through all its stages. This research does not exclude the relevance of emotional states/interactions, tacit and subliminal knowledge/behaviour of individuals and groups from relation to hard data measurements, that to be honest, in all the cases are rather informative than exact due to the complexity of the conditions.
The four constructed research by design prototypes of Wood as a Primary Medium to Architectural Performance project suggest various range of opportunities for boundaries and its environments, while the latter ones involve the findings of the former ones, thus generating feedback loops within the design research process. These prototypes haven't been just produced, but also actively observed for performance. This includes all different aspects of behaviour, ranging from artistic and other living expressions of its enactment and embodiment (Merleau-Ponty 2002), through social behaviour observations, to its weathering and aging (Mostafavi and Leatherbarrow 1993) and 24 hours hourly measurements with a weather station, moisture meter and calliper in various weather/seasonal conditions.

The research claims that this soft and hard collected data are interrelated while none of them are really exact when seen from holistic perspective that can never be reached in total. Therefore, it is also of interest of collecting subliminal knowledge in GIGA-maps, such as various uses of recordings, including photography. The majority of data that are linked to our/others interaction with the surrounding environment cannot be truly quantified due to its complexity. Therefore, new ways in relation to particular projects and their observations had to be developed and improvised through the process, not really following any pre-set, as justified by Sevaldson for such situations (Sevaldson 2005). This covers the methodology of Systems Oriented Design (Sevaldson 2013a), Research by Design accompanied by full scale prototyping (Hensel 2012, 2013), while involving NGOs (Davidová and Sevaldson 2016) and combining physical with digital design techniques (Sevaldson 2005), social, individual and hard environmental data observations. Thanks to this and also to the researched topic, a new line of GIGA-mapping as well as other research methods and methodologies were performed and developed. The research ranges from programming the material behaviour to how it is perceived and what impulses it generates into endless feedback loops set in matrixes, proposing a shift from today's common approach to building environment, suggesting a small but applicable part into the discussion of generating rich variosity of environments for researched location, that ferly relates to today's climatic changes and its implications.

Conclusions:

If we agree with Jan Gehl that the natural starting point for the work of designing cities for people are, next to human mobility, importantly the human senses because they provide the biological basis for activities, behaviour and communication in city space (Gehl 2010), we have to consider variations of non-discrete, or semi-interior spaces of different levels of interactions through its boundaries discussed several times by Hensel and others (Hensel 2009; Hensel and Menges 2009; Hensel and Turko 2015). Such spaces are common in different regions over the world, always designed for local climatic conditions. Dry, hot summers and cold winters of high relative humidity level are common in the Czech Republic (Tolasz and Coll. 2007). These extremes are even more and more increasing every year with climatic change (CzechGlobe – Global Change Research Institute of the Czech Academy of Sciences, 2016). The Prague Institute of Planning and Development (The Prague Institute of Planning and Development, 2016) has already joined the international Urban Heat Island project focused on recent microclimatic urban phenomenon of overheated cities in Central Europe (Urban Heat Island 2016) some years ago. Several deaths are reported during the summers and winters due to climatic conditions every year. Such environment certainly does not generate a pleasant ambience for individual or social activities. Therefore, the discussion that the region could benefit from the concepts of architectural performance from both, arid and northern climates while adjusted to local settings seems to be relevant. This seems to support Michael Hensel's argument for ''schools of thought' that are not local in terms of their location, yet in their determination' (Hensel 2015b). At the moment, except shopping arcades, the alternative of non-discrete architectural spaces are not mentioned in Prague's Public Space Design Manual released by The Prague Institute of Planning and Development (Prague Institute of Planning and Development 2014). Also, these values are not considered by property marketing, where only fully indoor spaces are calculated into selling square meters. Though not that common in so many alterations as elsewhere, also not totally alien to Czech traditional architecture these spaces, in different site specific iterations, will become necessity for living cities and/or generally, habitation in the location. Wood as a Primary Medium to Architectural Performance project offers one of many site specific possibilities of spatial climatic performances and atmospheres to be adjusted in design and its site specific settings.

When mapping the different systemic relations in interactions happening in time and space, different agents are involved in feedback loops. Furthermore, these agents are often interchangeable by transformation of the boundary conditions and the environment, caused either by biotic or abiotic force involvement. This enables more opportunities for use and inhabitancy of all exterior, semi-interior and interior, as they are modulated through different layers of boundary crossings and reflections of the onion principle with different peels. It is clear from the shown GIGA-maps (see Figure 1 and Figure 4), that the more non-human, biotic as well as abiotic, factors are involved in the design, the more human interactions and use opportunities it generates. Introducing a soft systemic matrix and gradients in ranges and actions and sorting activities through curvature degrees while applying Sevaldson's codification of relations by line fonts and weights (Sevaldson 2016a) proved to be suitable tool for mapping of such. Each of the GIGA-map mentioned here is in fact theme specific ZIP-analysis (Sevaldson 2016b) of each other, mapping the problem in detail.

Future Visions:

The research study: 'Wood as a Primary Medium to Architectural Performance: A Case Study in Performance Oriented Architecture Approached through Systems Oriented Design Methodology' covers a small part in the field of Performance Oriented Design (Hensel 2015a). Its main contribution is in sustainability and in relation to practice application for lively built environment through systemic approach, relating both hard and soft data enabled through Systems Oriented Design methodology (Sevaldson 2013b).
The research discusses down-to-earth strategies such as the moisture content when the wood is cut, as well as its systemic relations to climate adaptations. This means that we cannot exclude ourselves from the discussion of the previously mentioned transformations necessary for the building environment of our future. The relationship of micro-macro climatic conditions starts to be common while its social or biotic aspect within the urban area are rarely discussed in detail, except the dehydration warnings for elderly people, common for at least 15 years or the previously mentioned Urban Heat Island project (Urban Heat Island 2016).
Through employing new, or actually old, visions of present, I would like to suggest a search for a wide range of designs in different fields with different boundaries penetrations. Not excluding ideas of systems that are, i.e., through wood's moisture content locking into its sockets in high humidity levels, thus totally closing the environment, in the same time accepting designs that are just transferring reflections or even memories or thoughts through air or other media.
While proposing the use of solid wood for the discussed performance in the discussed location at the present time, I believe that all different variations and applications within the field might be relevant in the future and/or today, in reference to different performance, product, location and technology. This suggests more explorations in all discussed fields, from microscopic to macroscopic; soft and hard data levels, employing environmental performance in all of its aspects, biotic – including social, as well as abiotic and most importantly, their relations. This seems necessary to be handled through methodologies covering complexities such as Systems Oriented Design (Sevaldson 2013a) and Research by Design while full scale prototyping (Hensel 2012, 2013). As discussed in paper 'Systemic Approach to Architectural Performance: Handling Data in Creative Design Process: Mixing Physical with Digital' that is in reviewing process of Systems Oriented Design special issue of FORMakademisk, this all, together with participation (Hensel 2012), could be handled in 'Rich Design Research Space' (Sevaldson 2008, 2012) in the future.

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