

BIM 08- 11

CITA - Centre for IT and Architecture
The Royal Danish Academy of Fine Arts
Schools of Architecture, Design and Conservation

CITA <http://cita.karch.dk>



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EDITORIAL

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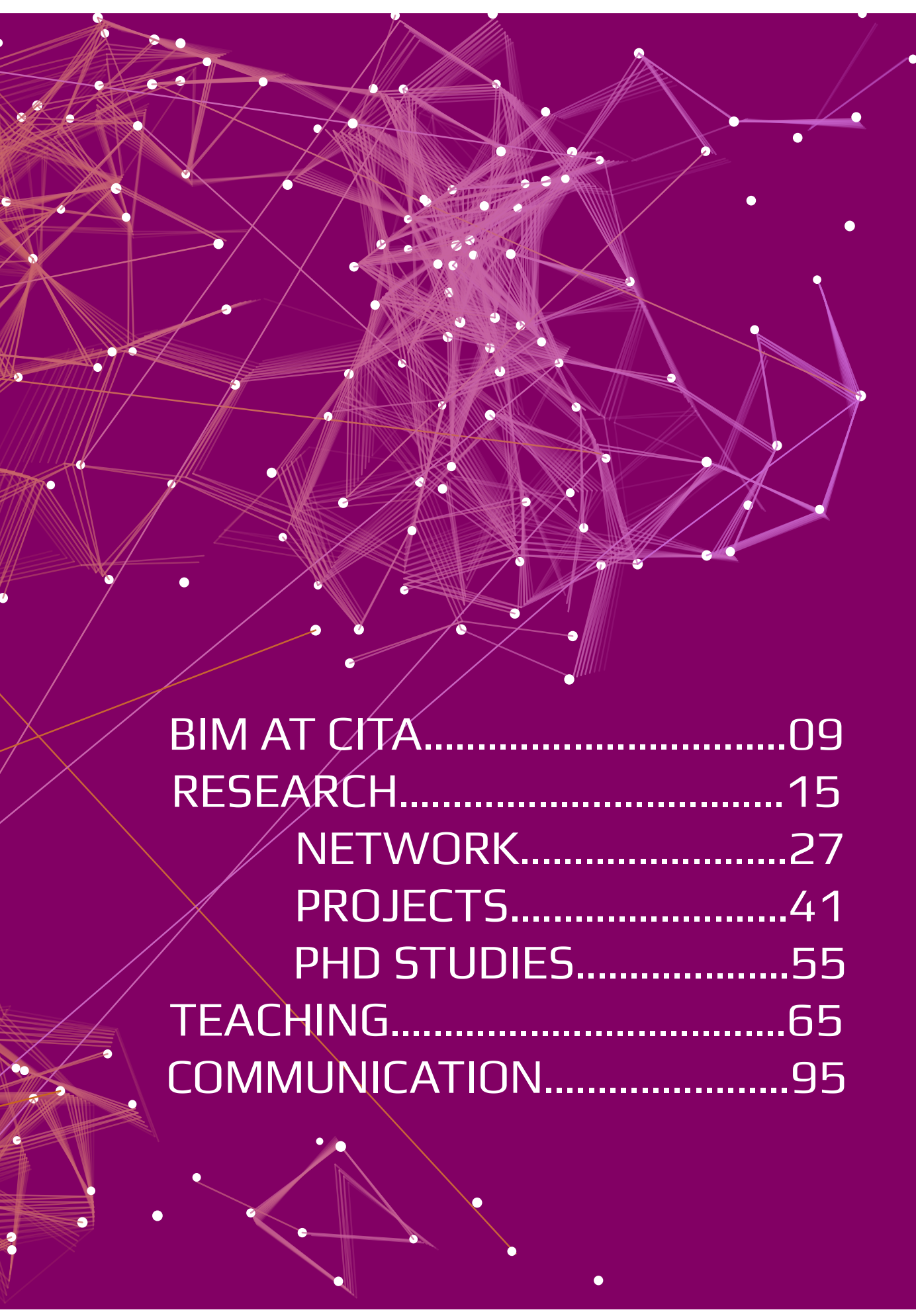
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Royal Academy of Fine Arts, Schools of Architecture,
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BIM at CITA

During the last 10 years Building Information Modelling (BIM) has become an increasingly used tool in architectural design practice. The ideal that the architectural drawing evolves into a model that can contain information about its site, material and use, has presented architects with a new set of representations that fundamentally change the organisation of the design process and the partnerships that make up building practice. Information modelling means parametric modelling. Rather than informing the drawing in an absolute manner, the BIM model understands information as input parameters that can be dynamically changed and updated during the design process. As such, the architectural representation becomes inherently dynamic, allowing for encoded relations between its internal components and new feedback loops between analysis and design. But BIM is also a communication tool. As a shared

platform that crosses the professional boundaries of all the partners in the building process, BIM allows an exchange of information between practices. Bridging design, analysis, process-management and costing, information modelling is a broad tool with many aims for many people. In this publication we present our research and teaching into BIM as a new platform for architectural thinking. Understanding BIM as a way of thinking rather than a particular software, our aim has been to study the breadth of the BIM umbrella; from GreenBIM and environmental simulation to project management and digital fabrication. The research projects and teaching efforts presented here have been undertaken by the CITA team as well as through collaborations with academia and practice in a national as well as international context.

WHY BIM AT CITA: THE NATIONAL CONTEXT

The government initiative Digital Construction of 2007 seeks to support a stronger and more competitive building industry by stipulating a new set of demands for the use of information modelling in government owned building projects^[1]. In this light the Danish Ministry of Culture gave CITA a direct grant to strengthen the focus on BIM at KA in the period 2008 – 2011. Our objectives have been to introduce and discuss the digital design concepts that BIM involves and develop the necessary skill base at university

[1] In 2007 the Danish government made a series of requirements for the building of public building of a certain scale. These demands "...aim to ensure increased and improved knowledge-sharing between the parties of the construction sector" and include BIM as well as electronic tendering, an IT based information exchange platform called Project web and electronic hand-over. <http://www.detdigitalebyggeri.dk/english>

and professional training.

This publication shares an overview of the teaching activities and research projects as well as the many public seminars, workshops and lectures that have been part of this project. The publication aims to outline and discuss our research findings, communicate our results and develop a perspective for future research projects into BIM and complex information modelling.

WHAT IS BIM AT CITA

The research and teaching into BIM at CITA has fallen into three categories. With a focus on Process Modelling, Green BIM and Cross Disciplinary Collaborations we have studied how these fields are challenged by the emergence of this new information platform. Process Modelling examines the changes to the design process as parametric and information based modelling. It expands the design process allowing direct a linkage and transfer of information so that shop drawings and digital fabrication data can be directly derived from the model. In projects such as It's a SMALL world and Lamella we explore design as a process of system design and how new pipelines are created between the different phases in the design process. In Green BIM we investigate how information modelling and the incorporation of environmental or material simulation

can lead to better design decisions in the early design phase. Introducing performance driven design we work with parameteric- and information based sketch tools based on local data that can serve as a platform for a more environmentally sustainable building practice. In projects such as Distortion and Dermoid we have been investigating the incorporation of acoustical and material simulation as active design parameters. Finally in Cross Disciplinary Collaborations we have been exploring BIM as a shared tool that can bridge between different practices and their particular design traditions. For BIM to have real consequence for the building industry it needs to become a truly shared method where information is continually exchanged between the processes of design, analysis and realisation. Through collaboration and dissemination events such as the BIM Camp, Creative Data Seminar and BVU Net we have explored the boundaries of these practices and the new shared languages that are emerging.

A FUTURE PERSPECTIVE

With a focus on architectural practice our aim has been to understand how BIM can support creative design practice while ensuring a better and more informed design environment. Our findings lead us to understand computation as a way of shifting design practice into the dynamic, the flexible and the informed. But BIM also holds its own inherent problems. As unified representations the size of our models expands. They become *bigger* as they incorporate data from the multiple practices that make up the building

industries, they become *longer* as they extend to include more of the building phases and they become *deeper* as they address a wide array of topics from environmental simulation, analysis to digital fabrication. This results in a dramatic increase in complexity and poses fundamental questions to the organisation of the model. To work with large sets of data, to simulate and to analyse these in ways that meaningful to their designers, collaborators and clients, necessitates the rethinking of how the model itself is presented. The future for BIM is therefore to find answers to how BIM can become a critical and creative tool by which we can engage with high degrees of complexity. If BIM relies on the heritage of the 3 dimensional representations, echoing the dimensions of the drawing board, we ask what are the other modes in which we can understand these complex models. How can ideas of dynamic distribution, networking and nesting become part of a vocabulary by which we can design?





RESEARCH

RESEARCH

CITA has a dual research model. On the one hand CITA works through applied research focussing on professional partnerships and practice led research questions with direct implementation in mind. On the other hand CITA understands computation as a ground research question. Querying the underlying conceptual and intellectual consequences of computation enables us to discuss and understand the potential for these tools to develop our practice. Through a research-by-design model engaging directly in the design and development of working probes and full scale demonstrators our aim is to understand technology as something we create rather than something we use.

Our focus on BIM has therefore had a two fold approach. The applied research strand has focussed on building networks with academic and professional partners within the field of architecture and engineering so as to establish common research problems and understand the national

context of BIM as a practice based tool. Our focus here has lied on BIM in the early design phase. The ground research strand has focussed on understanding the expanded role of the digital model. Through implemented design projects such as Distortion, Persistent Model and Lamella our aim has been to understand the concepts and techniques in information modelling focussing on system design, networked modelling and digital fabrication.

BIM has a strong base in CITAs research training. Over the three year period we have established three parallel PhDs in information modelling each with their own focus and research questions. One of the PhD is a fully funded academic PhD focussing on the conceptual consequences of the emergence of a new design paradigm. The two other PhDs are industrial collaborations with leading national design practices and focus on applied research problems, centring on a professional context and engaging with contemporary problems in design practice.

Brikker til en "bimmet" skitsering

INTERVIEW WITH ODILO SCHOCH (CITA) IN ARKITEKTEN JUNE 2010

The Swiss architect Odilo Schoch asks his Danish colleagues to cross the "bips line" and create a better relation between design and construction. Architects should have modeling tools in the early design phase – and should be more aware of their methods and processes.

"Arkitekter kan sagtens skitsere kreativt i et BIM-værktøj. Udfordringen ligger i at skabe en struktur og et workflow, som støtter skitseringen og giver tid til det kreative", konkluderede Sara Asmussen og Bengt Kalderén i sidste bips-nyt – med baggrund i erfaring-erne fra en arkitektworkshop i efteråret.

Netop det at få arkitekterne til at bruge BIM-værktøjer i de tidlige designfaser og skabe sammenhæng ind i den egentlige projektering har været et centralt tema i den forskning og undervisning, som den svejtsiske arkitekt Odilo Schoch i to år har udført på Kunstakademiets Arkitektskole. Med udgangen af januar er Odilo rejst tilbage til Svejts for at tiltræde et professorat på Fachhochschule Bern, hvor han skal stå i spidsen for et nyt institut for digitale byggeprocesser. Men i løbet af sine to år i Danmark nåede den svejtsiske arkitekt med det krøllede hoved at sætte spor både på skolen på Holmen og i den danske arkitektverden og med et skarpt blik danne sig sit eget indtryk af den byggedigitale situation i Danmark. Bipsnyt nåede lige at fange Odilo Schoch på hans sidste arbejdsdag på Holmen.

- Hvordan kan arkitekterne med udbytte anvende digitale modelleringsværktøjer i skitseringen?"

"Det hurtige svar vil være: Ved at begynde at bruge dem. Det er en del af pointen men også kun en del af den, for der er mange forhold, der spiller ind."

"Et af dem er, at vi savner kvalificerede værktøjer, der er udviklet specifikt til at understøtte arkitekten i skitseringsfasen. Der er en lang række værktøjer, man kan bruge SketchUp, Ecotect, ArchiCad, Revit for at tage nogle eksempler som hver især giver arkitekten nogle muligheder, så det gælder bare om at prøve dem af, hele paletten. Men ingen af dem er udviklet til akkurat det formål at imødekomme arkitektens behov for et modelleringsværktøj til de tidlige designfaser."

RUM FØR KONSTRUKTIONER

"De fremherskende BIM-værktøjer er skabt til at designe og specificere konstruktioner. De er ikke skabt til at designe rum. Men det jo bygningens rum, arkitekten i første række interesserer sig for. Og når bygningen står færdig og bliver taget i brug, er det bygningens rum, som brugerne tager i besiddelse. Det er arkitektens faglighed at favne dette spænd, og defineringen af rummet er centralt. Materialerne er selvfølgelig vigtige for designet men de kommer efter. I de indledende stadier handler først og fremmest om rum."

Men det er jo netop modelleringsværktøjernes allerstørste fortrin, at arkitekten her for første gang har et værktøj, som sætter ham eller hende i stand til at arbejde frit med sine rum, modellere og flytte rundt på sine parametre i ét væk. Så hvad er problemet?"

Netop det, at værktøjerne indtil nu hovedsageligt er rettet mod at designe de bygningsdele, der omslutter rummene - ikke rummene i sig selv. Der er jo en grund til, at SketchUp er blevet så populært. Det er ikke et BIM-værktøj, og det er ikke præcist, men det er enkelt at bruge og gør det nemt at modellere simple voluminer og rum. Men det ændrer ikke ved, at vi savner værktøjer, som kan gøre det samme for skitseringen som Revit for konstruktionsdesignet. Selvfølgelig kan man anvende Revit til at skitsere, når man behersker det og er kreativ - men det er ikke skabt til det. Hvis jeg vil indsætte et vindue i min facade, vil den først have mig til at definere en række parametre, som i denne fase er mig inderligt ligegyldig!"

”BIPS-BLOKERINGER”

Værktøjerne er dog kun en del af problematikken, understreger Odilo Schoch. Han oplever hos mange arkitekter en indgroet skepsis over for at tage modelleringsværktøjerne til sig i skitseringen. Der ligger en forforståelse af, at værktøjerne i sig selv bliver styrende for processen. ”Og arkitekter hader at blive styret af prædefinerede processer”, bemærker Odilo Schoch:”

Det ser jeg også i holdningen til bips-standarderne. Da jeg kom til Danmark for tre år siden, rejste jeg rundt til forskellige tegnestuer og arkitektmiljøer for at stikke fingeren i jorden. Her slog det mig, at mange oplevede bips-regelsættene som noget begrænsende, noget der pressede en bestemt proces ned over hovedet på dem. På samme måde havde mange en opfattelse af, at de digitale værktøjer begrænser deres frihed i processen. Det er jo ikke tilfældet, tværtimod, men det afgørende er, at mange har denne forståelse af, at ”bips’ede” digitale processer dræber kreativiteten.

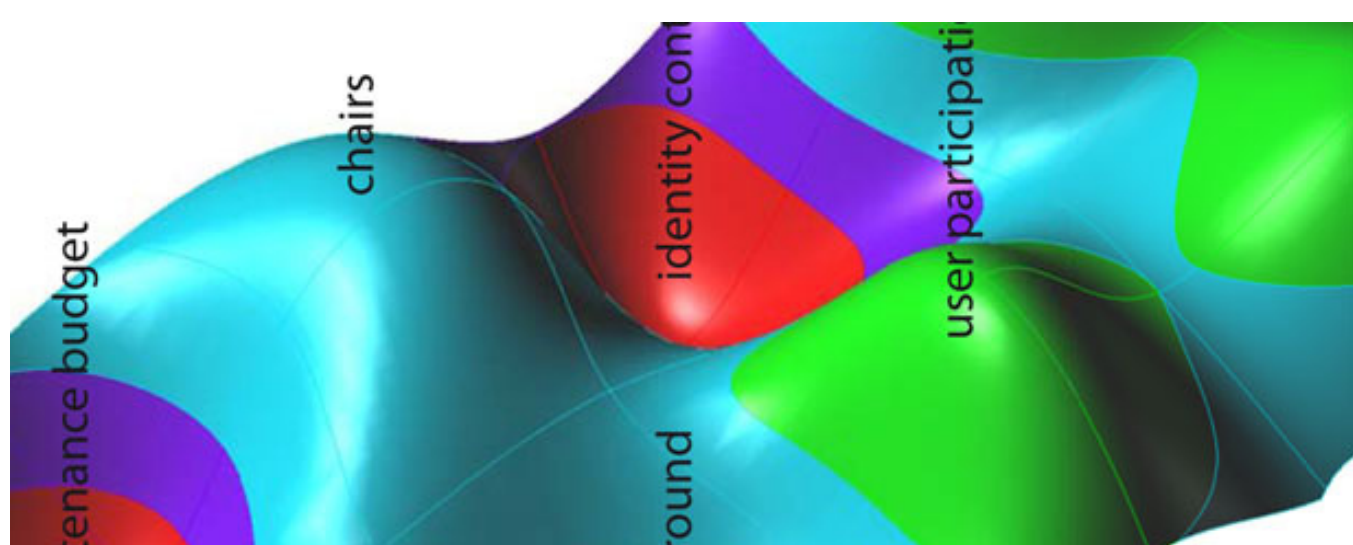
- Hvor kommer den opfattelse fra?”

Jeg tror, det hænger sammen med den måde, Det Digitale Byggeri og bips fra begyndelsen blev kommunikeret på. I dag er det anderledes, men tidligere handlede det mest om at anskue projekteringsprocesserne som en produktion – at ordne og strukturere, klassificere osv. Så mange oplevede, at hele set-up’et, værktøjerne osv. retter sig mod at strukturere og sætte ting i kasser – hvad arkitekten ikke ønsker i de tidlige designfaser.”

”BIPS-LINJEN”

Mange arkitekter kunne dog med fordel blive bedre til at strukturere deres arbejde i skitseringsfasen, og derved også blive mere bevidste om, hvad det egentlig er, de gør, erfarede Odilo Schoch, da han sidste år var med til at gennemføre en tematisk undersøgelse for tidsskriftet Arkitekten:”

Vi er ikke vant til at forklare i detaljer, hvad vi gør og hvorfor vi gør sådan. Mange ser det som et vilkår i den kreative proces. Men når man ikke er bevidst om sine egne metoder og processer, bliver det svært at hjælpe kreativiteten på vej. De, som er i stand til at identificere fordele og ulemper ved den måde, de arbejder på, er også bedre til at kommunikere det i samarbejdet med andre. Og kommunikation er essentiel i arkitekters samarbejde. Klarheden i kommunikationen er afgørende. Hvordan kommunikere din designidé? Traditionelt gør vi det ved hjælp af skitser og tegninger. Men hvis vi ønsker at udnytte fordelene ved en digitalt understøttet arbejdsproces, må vi lære at kommunikere det den vej rundt også.”



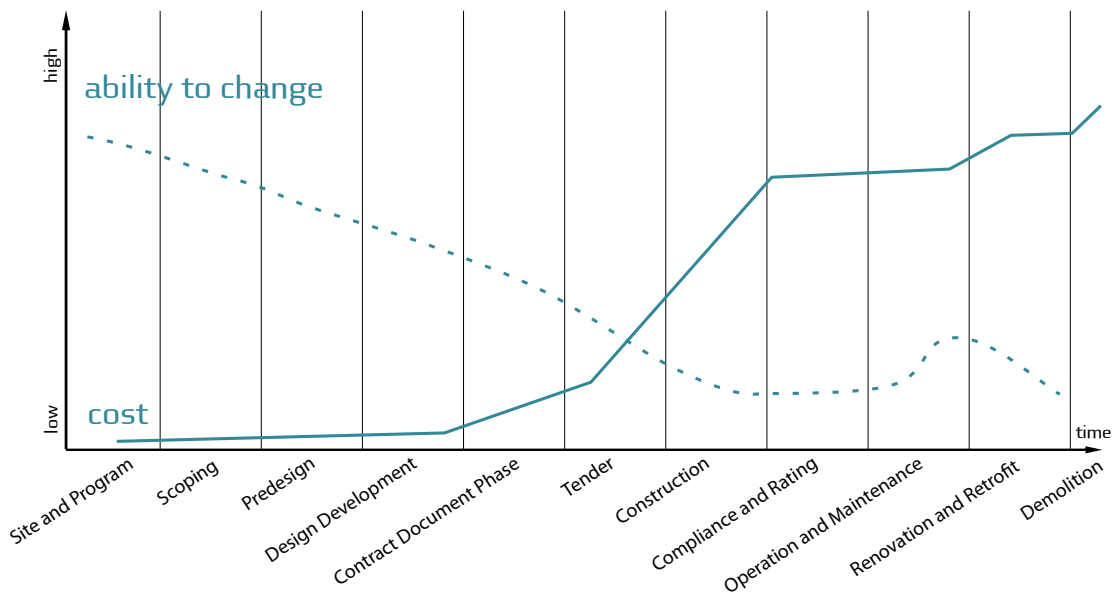
Odilo Schoch har iagttaget, at der i danske arkitekters praksis er et skarpt skel mellem den "frie" skitseringsfase og den bundne projekteringsfase. "bips-linjen" eller "Friborg-linjen", kalder han dette skel, fordi Gunnar Friborg i 2008 gjorde det klart for ham, at DBK og bips-paradigmer og regelsæt alle retter sig mod de faser, der ligger efter det, man på Arkitektskolen især beskæftiger sig med.

"Jeg drog derfor den konklusion, at man i Danmark øjensynlig ikke mener, at BIM har noget at gøre med de tidlige designfaser. IKT-bekendtgørelsen stiller krav om DBK, men der er ingen krav om at arkitekten anvender BIM i de tidlige designfaser, hvor de afgørende valg i forhold til byggeriets omkostninger og bæredygtighed bliver truffet", påpeger Odilo Schoch. I sin undervisning og forskning på CITA, KA's Center for IT og Arkitektur – har han netop været optaget af at identificere redskaber og workflows, som kan støtte de kreative processer og samtidig pege frem mod de efterfølgende faser tværs over "bips-linjen": "Vi har siden 2008 prøvet at fokusere på, hvordan vi kan "bimme" den tidlige designfase og det er noget af det, som vi gerne vil bringe ind i samarbejdet med det nye videntcenter", fortæller Odilo Schoch.

PARAMETRENE PÅ PLADS

Han står ikke klar med en fix og færdig workflow-model, som linker ind i projekteringen. I hvert fald ikke en, som uden videre kan udmøntes i et nyt bips-paradigme. Men han har, sammen med ph.d forskere i afdelingen, udviklet en konceptuel tilgang, som man har forsøgt at implementere i undervisningen.

"Skitseringen er jo en proces, hvor nogle abstrakte tanker gradvist gøres mere konkrete. Det handler om dels at håndtere de parametre, der er givne for opgaven - dels de indfald og ideer om opgavens løsning, der opstår undervejs. Vi fandt ud af, at diagrammer,



Change/Cost diagram according to Kochendörfer 2006 contemporary BIM programs focus on the phases between conceptual design and construction where changes have already high cost implications.

The development of BIM related processes for the early design phase is necessary

flows, skitser – alle former for abstrakte illustrationer af et givet emne eller en given idé – var nyttige værktøjer. Og vi begyndte at lære de studerende mind-mapping som et værktøj til at overskue og kommunikere abstrakte tanker for derigennem at blive bevidst om, hvad der er det centrale i mit design. Er farven grøn afgørende? Er døren i endevæggen vigtig? Hvor stor skal den være, for at være vigtig? Ved at definere nogle nøgleparametre i vores designidé begynder vi at få greb om de parametre, der er vigtige for os – og relationerne mellem dem. Og det leder ret frem til en forståelse af, hvordan man kan have fordele af at anvende et parametrisk værktøj, som BIM jo er. For BIM handler jo først og fremmest om at håndtere alle de mange parametre, der indgår i et byggeri – og relationerne mellem dem”, påpeger Odilo Schoch.

En anden udfordring er at håndtere da mangefacetterede interfaces i processen: Mellem de deltagende personer, mellem forskellig software og gennem de faser, processen gennemløber: “Hvis vi ønsker at etablere en digital kæde, som sikrer, at information fra de tidlige faser kan føres videre frem i processen – sådan at vi tidligt i processen kan lave energianalyser, cost-analyser osv. og siden også gå tilbage til dem – må vi finde ud af at slå bro over de interfaces, som ofte koster informationstab og som blokerer

for en sammenhængende proces. Vi må udvikle værktøjer og applikationer, som kan hjælpe os. Men vi må først og fremmest udvikle vores egen procesforståelse”, mener Odilo Schoch.

GENNEM SVEJTSISKE BRILLER

Gennem sine svejtsiske briller har han under sit ophold på Holmen identificeret to forhold ved den danske arkitekttradition, som han ser som problematiske i forhold til at ”bimme” de tidlige designfaser:

”Sammenlignet med den tysk-svejtsiske arkitekttradition har de danske arkitekter ikke den store tekniske eller håndværksmæssige forståelse for, hvordan et hus er skruet sammen – i hvert fald ikke, når vi møder dem på arkitektskolen. Det er den grafiske – billedmæssige forståelse af arkitektur, der er fremherskende, arkitekten som kunstner.”

”Men i dag kræver Universitets- og Bygningsstyrelsen en IFC-model, når de udskriver en konkurrence eller bestiller et byggeri. De vil vide, hvad bygningen koster og hvor meget energi den bruger. Når arkitekten så skal ind og arbejde med nye værktøjer som fx Ecotect, stiller det ofte krav om en byggeteknisk indsigt på et højere niveau end man har været vant til i den danske arkitektskoletradition. Du skal fx kunne håndtere spørgsmål om u-værdi. Det kan halvdelen af mine studerende som udgangspunkt ikke.”

Anvendelsen af BIM-værktøjer, for eksempel ved konkurrencer, vil give arkitekten en bedre forståelse af sit design – og dermed også bedre projekter, mener Odilo: ”For man er nødt til at kende relationerne mellem de designede elementer og ”rum”, og BIM-værktøjerne introducerer i designfasen nogle ikke-grafiske kvaliteter som fx energieffektivitet eller bevægelsesstrømme, som i sidste ende resulterer i et bedre design-koncept”, siger Odilo Schoch.

”Så nytter det jo ikke at den første software, de studerende bliver introduceret til, er Adobe’s Illustrator og Photoshop. På den måde lærer de jo at se en væg som fire linjer på en flade – ikke som et objekt! Vi har her på skolen otte studieafdelinger. De fem af dem ignorerer som udgangspunkt BIM-udviklingen i den forstand, at de ikke forholder sig til, hvordan BIM ændrer vores forudsætninger.”

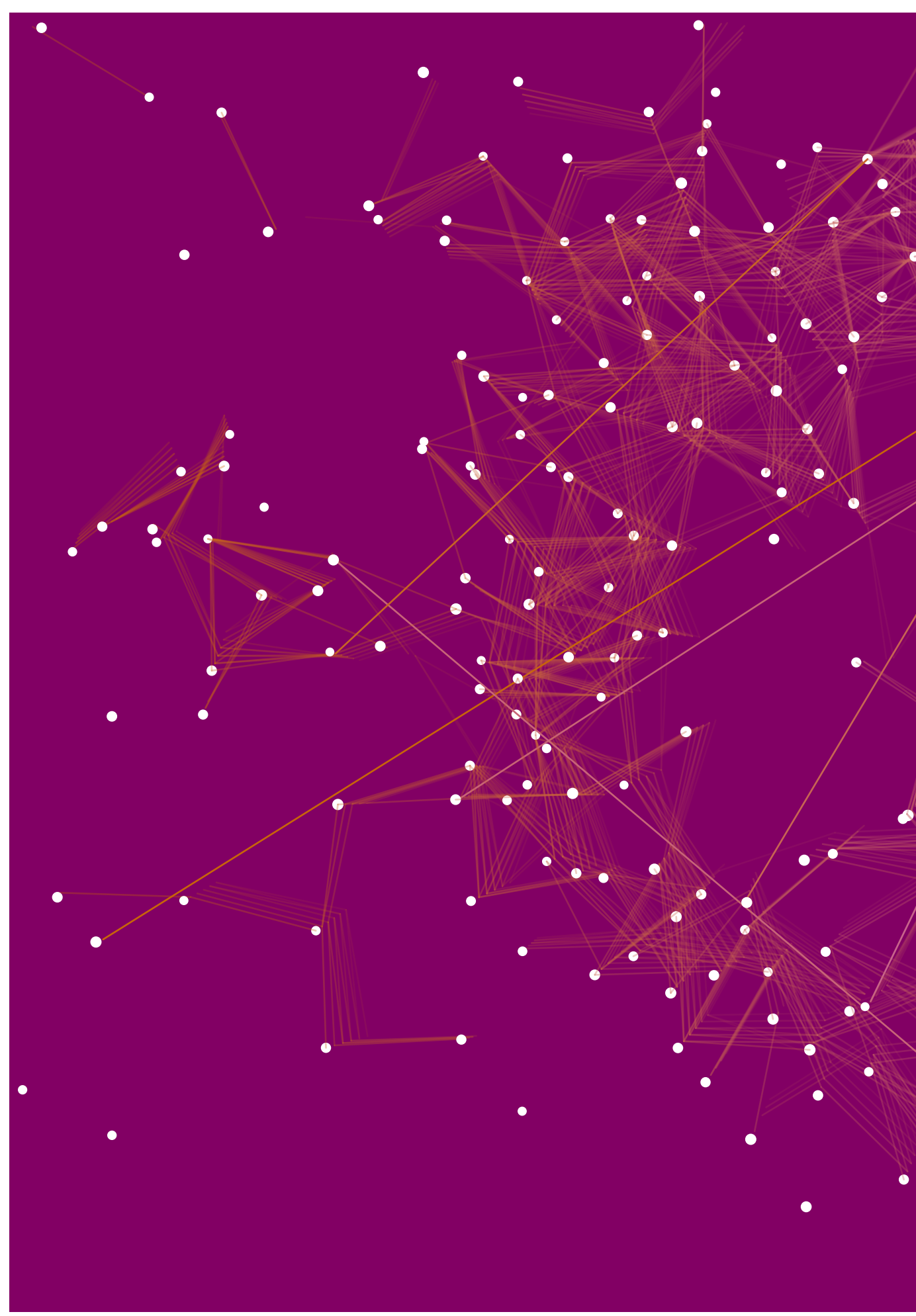
”Skolens ledelse er dog heldigvis nu opmærksom på det, og der er indført nogle obligatoriske kursusforløb, sådan at alle lærer om BIM – og om u-værdier. Og de studerende selv er parate. Jeg har i de sidste ni måneder haft 450 studerende på kurser i BIM, som har lært at bruge simple BIM-programmer til at teste deres design. Det indebærer også, at de ikke bare har et billede af det hus, de skitserer, men en rumlig og byggeteknisk

forståelse. De bliver ganske enkelt bedre til at diskutere deres design, fordi de bedre forstår deres design. Det er egentlig alt hvad jeg ønsker!”

- Hvad vil du foreslå de arkitekter, som gerne vil følge dine ideer i forhold til de tidlige designfaser?

”For det første at se på deres egne processer, og spørge sig selv og hinanden, hvorfor de gjorde, som de gjorde. Hvad var det, der fik det til at lykkes – eller ikke lykkes. Og blive ved med at spørge ind til det. Det kan blive fantastisk meget klogere på sine egne processer af. Samtidig skal man kaste sig ud i at af-prøve de forskellige værktøjer, der trods alt findes, og undersøge hvilke, der passer bedst med sin egen og tegnestuens workflow. Og så må man lære at mestre sine værktøjer, sådan at man kan designe det, man vil. Kan man ikke det, bliver man frustreret. Men det er ikke noget nyt for arkitekter – vi har altid skullet lære at mestre vores værktøjer. Nu er det bare nogle nye.”

Interview by Poul Høegh Østergaard in collaboration with bips



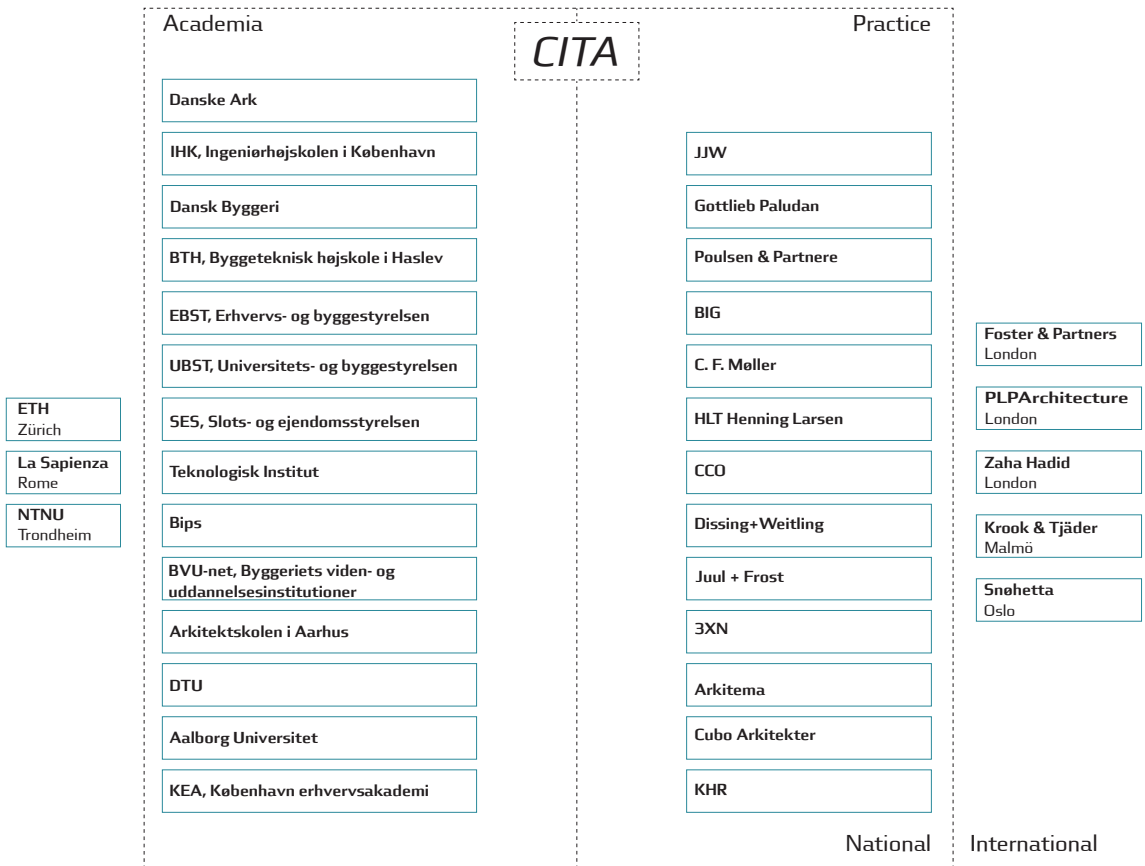
The image features a complex network diagram on a solid purple background. The network consists of numerous white circular nodes of varying sizes, interconnected by thin, light-colored lines. The nodes are arranged in a way that suggests a hierarchical or clustered structure, with a dense central area and more sparse, radiating connections towards the periphery. The overall aesthetic is clean and modern, typical of a corporate or technical presentation.

NETWORK ACTIVITIES

NETWORK ACTIVITIES

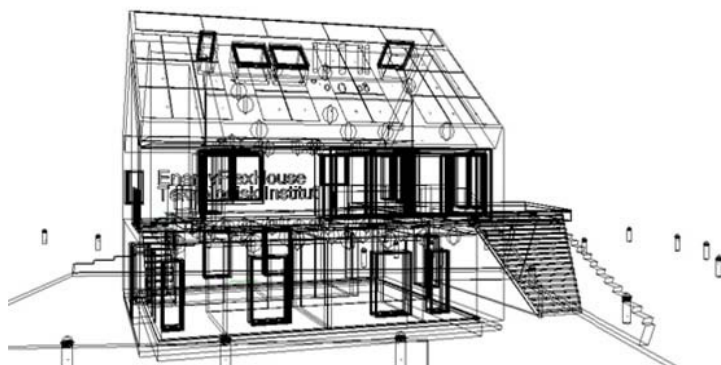
The network activities undertaken over the 3-year period have been core to the research effort. The network has been fundamental to better understand the national as well as international context for working with BIM. Our aim has been to build a cross disciplinary network that is representative of the breadth of the field, engaging architecture and engineering from both academia as well as highly specialised computation focussed practices and established national design practice.

With a strong focus on dissemination and exchange we have arranged a series of network events that have sought to bring partners together, foster discussion and enable sharing of working practices and problems. Through hands-on events such as BIM-Camp and BIM-day-at-KEA we have deliberately merged direct skill based teaching with debate



and reflection. Our aim has been to support the creation of an open environment, support the development of BIM skills in offices while offering an international perspective and debate.

The network furthermore aims to mature key partnerships into new research collaborations. The network has been instrumental in developing academic relations to the Danish Technological Institute, to ETH, Zurich as well as to the practice based partners 3XN, JJW, Erik Møller Tegnestue and KHR all of which CITA now engages in second stage collaborations.

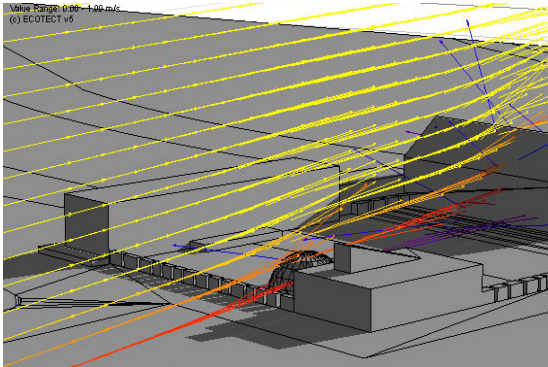
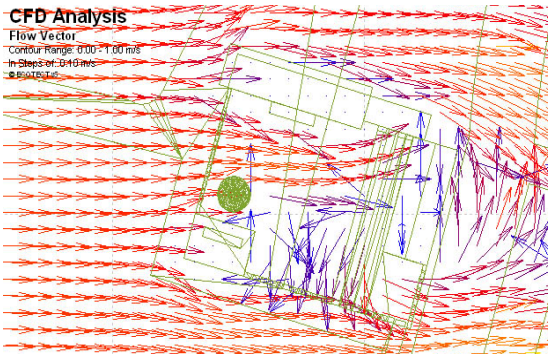


BIM-CAMP / BIM-LOGE

The idea of a BIM-Camp and a BIM-Loge was developed in order to gather interested students and professionals from the fields of architecture and construction in a focused and creative environment. The first BIM summer camp was realised in 2009 as a four-day workshop at the Entreprenørskolen in Ebeltøft/Denmark. The workshop invited 50 participants, all with a strong interest in digital construction and architectural design. Daily presentations from experts from the building industry and research gave insight into the possibilities of the latest BIM technologies and software. The workshop was driven by hands-on tutorials skilling

up participants. This approach situated the discussions in a informed and constructive relation to the discussed themes.

Creating an environment of learning and immediate testing in groups added an important social dimension to the BIM-camp that allowed a new professional network to emerge. The informal atmosphere and the practical and problem-based design-led teaching agenda allowed interaction between participants from the different fields of architecture and engineering. This informal network formed the basis for further exchange between research, students and professionals. The success



of the first workshop allowed us to repeat it in 2010 and 2011. In 2011 the BIM-Camp moved to Copenhagen and took place at The Royal Danish Academy of Fine Arts, School of Architecture.

As an addition to the annual BIM-Camp, we introduced the BIM-loge. This more formalised network provides the opportunity for participants to meet each other on a more frequent basis. The BIM-loge is open for everyone with an interest in architecture and building information modelling. The events take place in informal locations in the Co-

penhagen area where invited speakers give a short inspirational presentation in pecha-kucha format, followed by discussions and a drink.

BIM-Camp and BIM loge were initiated by Anders Hermund, CITA and Asbjørn Levring, Danish Technological Institute.

Dates

29 June - 02 July 2009

28 June - 01 July 2010

27 June - 30 June 2011



CREATIVE DATA SEMINARS

In August 2010 CITA and Institute 4 at the Royal Danish Academy of Fine Arts, School of Architecture held the public seminar series “The Creative Use of Data in Architecture”. The three seminars were aimed at a national audience, and introduced them to local and international speakers who presented their experiences with Building Information Modelling.

The premise of the seminars, was that architecture holds in difference to many other industrial fields a highly specialised and individualised practice. In architecture, each practice and each project possesses its own design specifications, priorities

and methodologies. The guiding question for the seminar series was to explore how this inherent diversity can be reflected in building information modelling. This new need for case-specific data, challenges the foundations of contemporary BIM practice that is defined around shared standards and libraries. The invited presenters discussed their practice developing bespoke design tools for information based design, building implementation and fabrication. Reflecting on the future of architectural design practice, they discussed how the role of the architect changes with information modelling as this might position the practice as a tool maker in addition to being tool users.



The seminars consisted of three full-days of lectures featuring practitioners and theoreticians with different architectural background. Spanning from urbanism, to engineering, building technologies, graphic design, film, virtual environments, computer science and gaming, presenters were invited from Europe and the United States. The lectures were open to the public and well attended by students and the professional network.

Dates

Creativity in Sustainability: 10 August 2010

Parametric Creativity: 17 August 2010

Integrated Creativity: 24 August 2010

Lectures

Brian Edwards - Kunstakademiets Arkitekt-skole - Institute 2 - Denmark, Lars Junghaus - University of Michigan - USA, Ulrich Grassmann - Baumschlager -Eberle Architects - St. Gallen - Switzerland, Asbjørn Levring - Teknologisk Institut - Denmark, Sebastian Gmelin - Aarhus Arkitektsskole - Denmark, Eilif Hjelseth - Standards Norway / UMB OSLO - N, David Stasiuk - USA, Jan Hendrik Hansen - WHIST Zürich - Switzerland, James Harty - KEA - Denmark, Martin Tamke - CITA - Denmark, Lorenz Lachauer - ETH Zürich - Switzerland, Peter Dang - Snøhetta Architects - Norway, Søren Nielsen - Vandkunsten - Denmark, Line Rahbek - linerahbek.com - United Kingdom

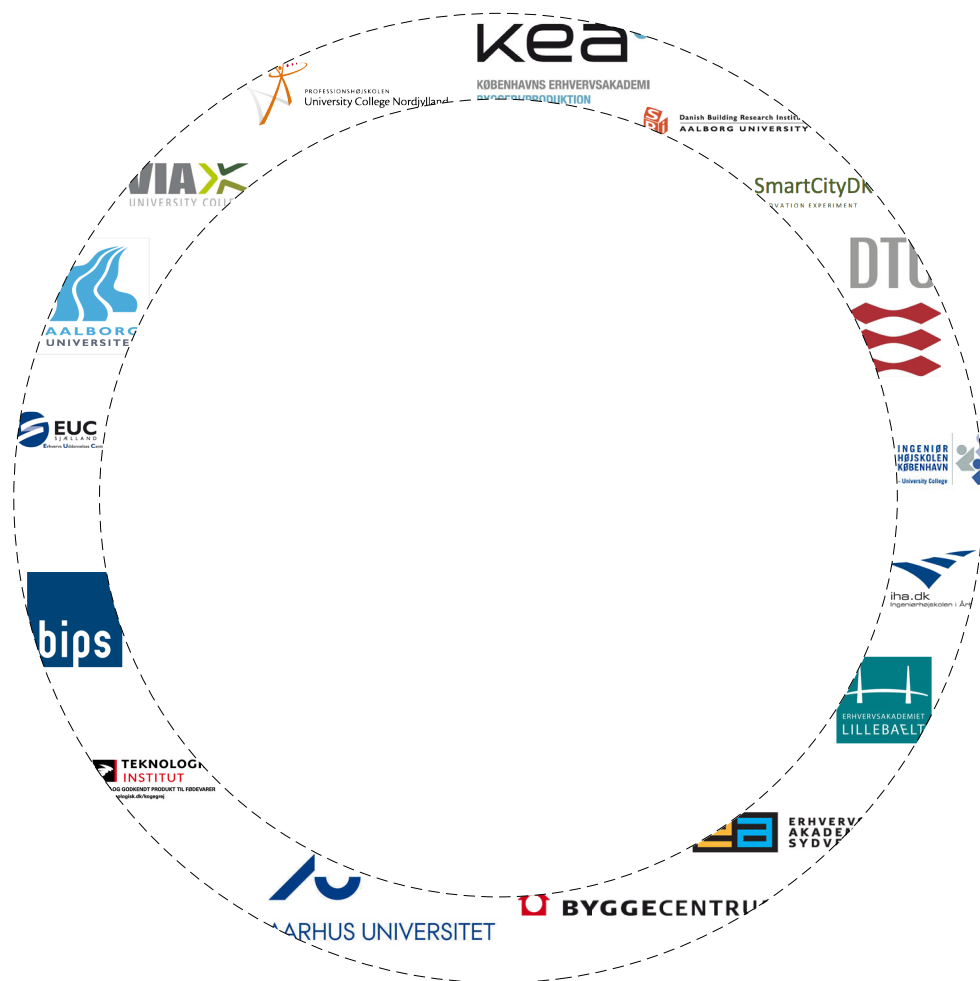
BVU NET: KNOWLEDGE CENTRE & BIPS

Byggeriets Videns- og Uddannelsesinstitutioner – BVU.net.dk is a network consisting of the knowledge- and educational institutions of the Danish building profession. CITA is an active member of this community that aims to build up awareness and understanding of the ongoing paradigm shift that accompanies the digitalisation of the architectural profession.

The network has been founded in order to further collaboration between the founding institutions in the areas of research, teaching and dissemination. The partners of the network hold knowledge of methods and techniques to increase buildings

practice level of quality and productivity through the use of digital techniques. In order to share this knowledge, the network establishes a common ground for concepts and terminology and qualifies the participating institutions.

BVU.net.dk aims to support its participants through activities directed at the training of individuals, specialised boards as well as events open to a broader public. All these activities deal with contemporary and future questions that arise through the interdisciplinary understanding of BIM processes.



The BVU.Net.dk is now consolidated. Since January 2011 it has attained a formal structure that includes a secretariat and multiple organisational levels that coordinate the manifold activities in the network and disseminate them via the mutual webpage <http://bvunet.dk/>

Collaborators

Kunstakademiets Arkitektskole, Arkitektskolen Aarhus, KEA – Københavns Erhvervsakademi, SBI – Statens byggeforskningsinstitut, Aalborg Universitet, SmartCity DK, DTU – Danmarks Tekniske Universitet, Arkidata, VIA University College,

Aarhus Universitet, Erhvervsakademiet Lillebælt, Erhvervsakademi Sydvest, EUC Sjælland Byggeteknisk Højskole, IHK – Ingeniørhøjskolen København, Ingeniørhøjskolen i Aarhus, TI – Teknologisk Institut, UCN University College Nordjylland, Byggeriets Uddannelser, Byggecentrum, Videncentret Bips.

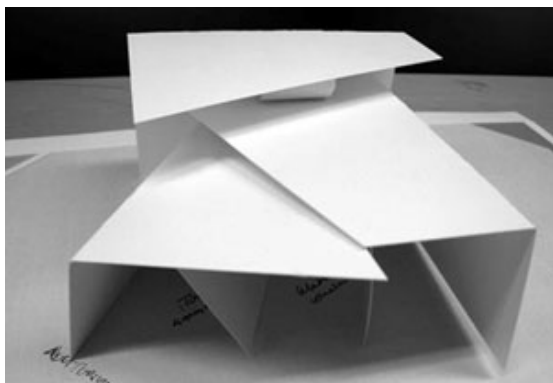


BIMDAY AT THE COPENHAGEN SCHOOL OF DESIGN AND TECHNOLOGY (KEA)

This one-day event at KEA was directed at students giving them insight into the future requirements of the building industry. It aimed to demonstrate the current use and implementation of BIM in practice and outline the paths by which educational institutions provide relevant skills and knowledge to their students.

The BIMday included presentations and short workshop-sessions from both industry and educational institutions. The aim of the CITA workshop, undertaken by Anders Hermund, Odilo Schoch and Morten Myrup, was to discuss the role of diagrams

in sketching and architectural modelling. The workshop is based on Anders Hermund's PhD research into techniques that allow diagrams to contain parameters based on facts as well as on intuition. Participants were introduced to methods that allow architectural designers to transfer atmospheric ideas into a building. A hands-on three-step approach was presented, resulting in a set of paper models that were discussed amongst the participants for their atmospheric and communicative value.

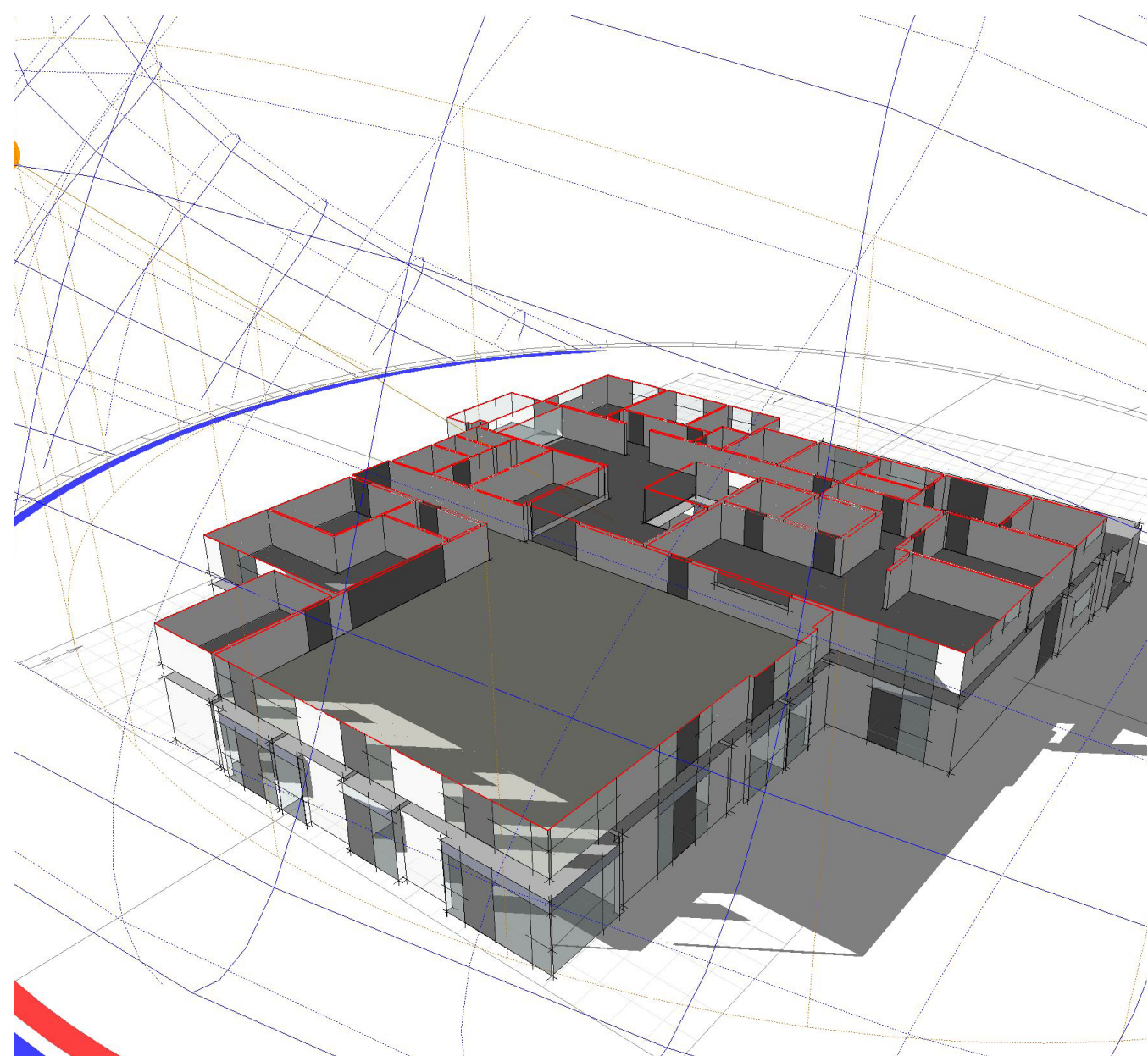


Dates

18 March 2010

Presentations

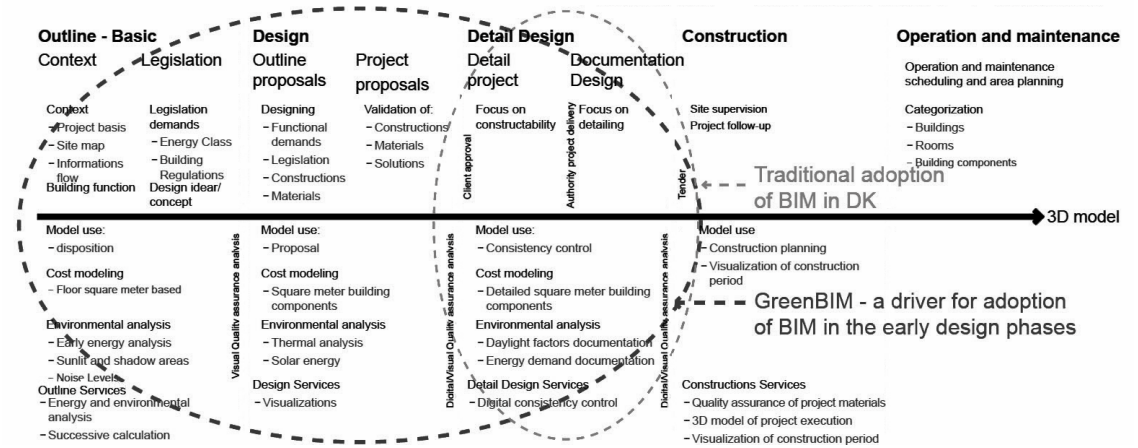
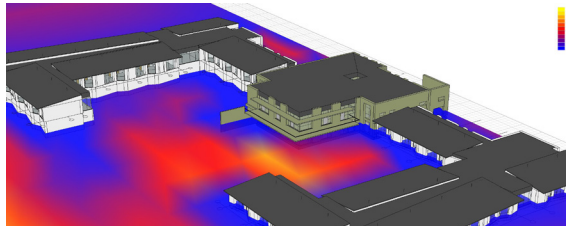
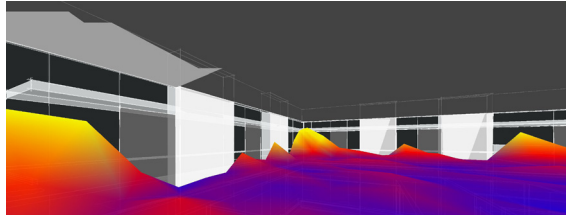
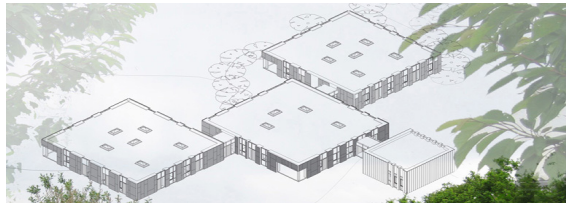
Søren Nielsen – Tegnestuen Vandkunsten, Morten Alsdorf & Niels Tredal – Rambøll, Stig Mikkelsen – Dissing+Weitling, Clars Danvold – Slots- og Ejendomsstyrelsen, Asbjørn Levring – Teknologisk Institut, James Harty – Københavns Erhvervsakademi, Ib Kaa – BIMbyen.dk, Markus Lampe & Flemming Vestergaard – DTU Byg, Odilo Schoch & Anders Hermund – Arkitektskolen.



GREENBIM - KNOWLEDGE VOUCHER

The Green BIM project is a collaboration between the architectural practice Poulsen & Partner Architects (P+P), the Danish Institute of Technology (DTI) and CITA. With a focus on energy and environmental simulation and optimisation, the aim is to transfer state of the art research-based methods and technologies to professional practice. The guiding question for the collaboration is how the introduction of BIM processes in the schematic design phase can enable a professional practice to take better energy and climate related decisions.

During the collaboration a holistic design process was developed and implemented that reflects the specific needs of P+P. This process was based on a constant dialogue and exchange between the projects partners. The first steps in the project looked at the competencies, processes and arguments that form the existing workflow at the office. Simultaneously the offices application area was strengthened through the improvement of skills, workflows and interfaces of BIM related tools that are already in use at P+P. This included Ecotect Analysis, Revit architecture, the light



simulator Radiance and CFD- tools. The collaboration continued with the development of a design manual for the office. BIM and energy related tools and processes that supplement the design process at P+P were selected and introduced to the office.

The key to success in the project was the insight and knowledge about the offices processes and applications. This was prominently gathered through the collaboration in projects. Here DTI and CITA participated successfully in design projects at P+P architects.

Collaborators

Danish Institute of Technology, Poulsen & Partner Architects, CITA

Project leader

Asbjørn Levring, Danish Institute of Technology

Dates

2010-2011

Funding

The Ministry of Science and Innovation.



The background features a complex network of white circular nodes connected by thin, semi-transparent purple and orange lines. The lines crisscross the frame, creating a sense of interconnectedness and flow. The overall aesthetic is modern and technical, typical of a research or data visualization theme.

RESEARCH PROJECTS IN BIM

RESEARCH PROJECTS IN BIM

The research projects into BIM follow a research-by-design model. Exploring the use and implementation of information models, these externally funded projects seek to develop their own information tools by which localised problems within the BIM umbrella can be explored.

The projects are developed through a set of professional collaborations with industry partners in practice and academia. Developed for exhibition contexts such as the digital.material exhibition in Oslo and the Research-by-Design exhibition in Copenhagen, the projects are to be understood as speculative probes that query the nature and potential of information modelling. The exhibition context allows

dissemination to a wide audience of interested parties as well as the broader public. The projects hold a clearly defined research focus that allows them to isolate particular inquiries from the complexity of architectural design.

The projects explore the idea of the networked information model. Each project develops its own bespoke design system into which direct information can be parsed. Rather than assembling all information into one unified representation, the projects seek to understand information as distributed across multiple computational nodes arranged and interfaced to exchange information at critical stages. The parametrically defined system design allows the design process to retain its inherent flexibility, enabling multiple design directions to be evaluated and discussed. The projects all hold a special focus on mass-customisation and digital fabrication develop design tools that can output directly to the CNC tools of the manufacturers.



IT'S A SMALL WORLD

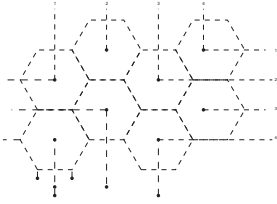
"It's a SMALL world" examines the development and implementation of generative design and production systems that can hold the wide range of information a building project consists of. In 2009 CITA was asked by the Danish Design Centre to develop the design for the "it's a SMALL world" exhibition. The design centres around 6 exhibition scenarios designed as part-stages onto which the exhibited artefact were placed. We used the task to investigate the programming of building information models, gain experience with digital fabrication methods and create a seamless link between design and production.

The project furthermore allowed us to set up a new collaboration with industrial partner Sign Partner, Esbjerg and was shaped by the real world restraints of a limited budget and time constraints.

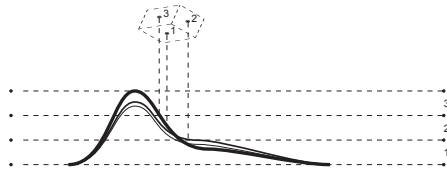
The task: designing for different scales:

"It's a SMALL world" is a cross disciplinary exhibition show-casing the work from the fields of architecture, design and crafts. The exhibition was developed by a team of three curators from the Danish Design Centre, the Danish Architecture Centre and Danish Crafts. Initiated by the Danish ministry for Economy and Industry, the exhibition is developed for international showcasing necessitating a light-weight and transportable design.

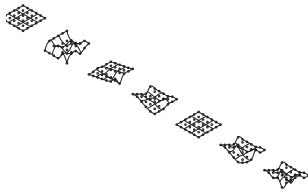
Step 1:
Defining overall grid



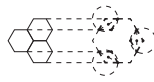
Check current recursion level by measuring size of input geometry



Step 2:
Construct control surfaces



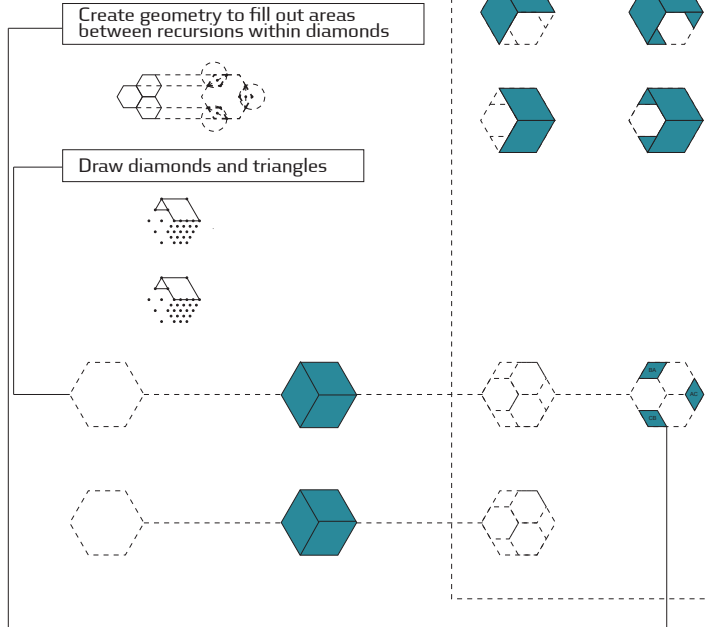
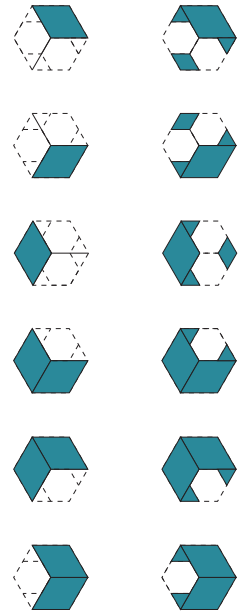
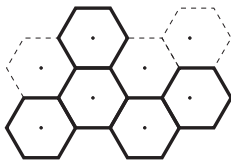
Create geometry to fill out areas between recursions within diamonds



Draw diamonds and triangles



Step 3:
Generate pattern



The developed exhibition concept is based on the generative design system. The system is parametrically controlled, and by defining the variables of the design setups, the structure “grows” in response to the particular needs of each exhibited object.

Our task was to design and implement a custom-made generative tool establishing a common digital platform between architects, engineers and producers. This enabled a direct feedback to structural analysis and finally the generation of the fabrication files. The information model creates an interdisciplinary platform enabling new collaborations between architect, engineer and manufacturer.

Principal Investigators

Mette Ramsgard Thomsen, Martin Tamke, Jacob Riiber Nielsen (CITA).

Dates

The exhibition was first shown at the Danish Design Centre (August 2009 – April 2010) after which it toured throughout Asia and South America.

Sponsors

The travelling exhibition is a development project in collaboration with the Danish Design Center, Danish Arkitektur Center and Danish Crafts funded by the Danish Ministry of commerce.

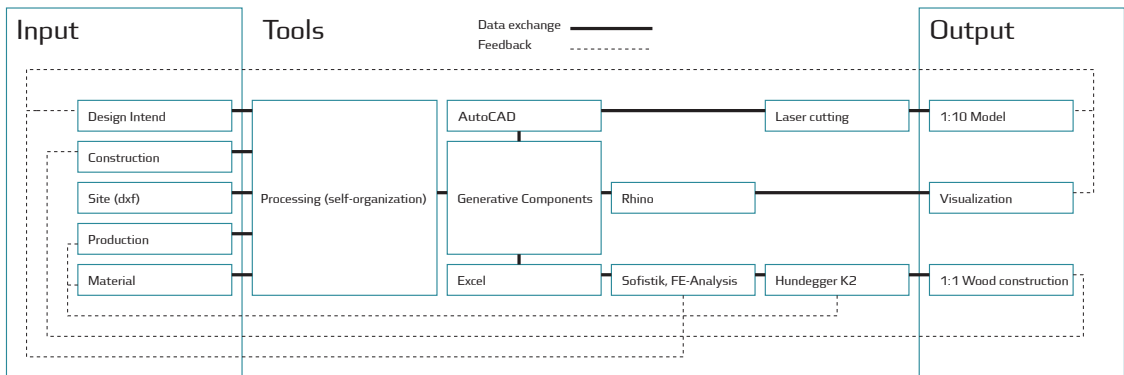
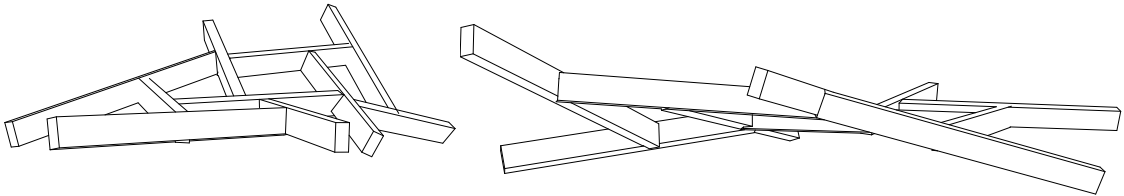
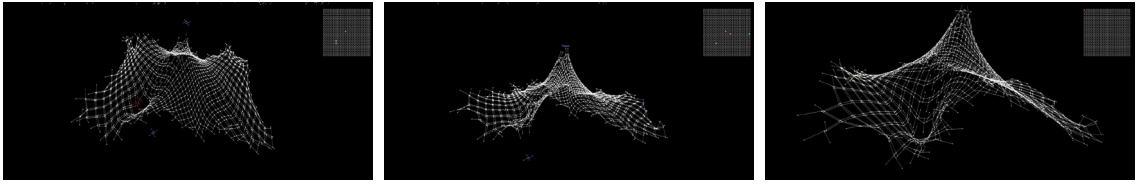


LAMELLA FLOCK

The integration of design, analysis and production in a customised building information model asks designers to reconsider the standardised approach in current BIM tools and demonstrates ways to re-introduce valuable knowledge and skills from the past into our current practice. Lamella Flock investigates the use of traditional timber construction and state-of-the-art CNC timber machinery in order to create freeform structures in wood. Where contemporary projects such as the Centre Pompidou in Metz achieve similar affects in large scale through the use of resource-heavy production techniques such as glue lam timber construction, complex joints and 5-axis milling, our research investigates the design of freeform surface structures using in-

expensive straight beam elements. To achieve this we have examined the principles of the traditional Zollinger lamella construction in combination with a non standardised production.

With this project, challenges arose from the complex interdependency of beam elements in the structure, and the non-linear relationship between the requirements of structure, material and production. To solve this we proposed an approach that used principles of self-organization. This led to the development of generative building information tools that allow feedback between design intent, structural analysis, production requirements and material knowledge.



The project explored how the integration of recursive feedback can help designers in the future to handle the growing complexity and size of design information. The project examines furthermore how digital tools can support the use of wood, as one of the few truly renewable building materials, in modern construction. Our research has shown that complex timber structures using short, straight beams can be efficiently fabricated and assembled.

Principal Investigators

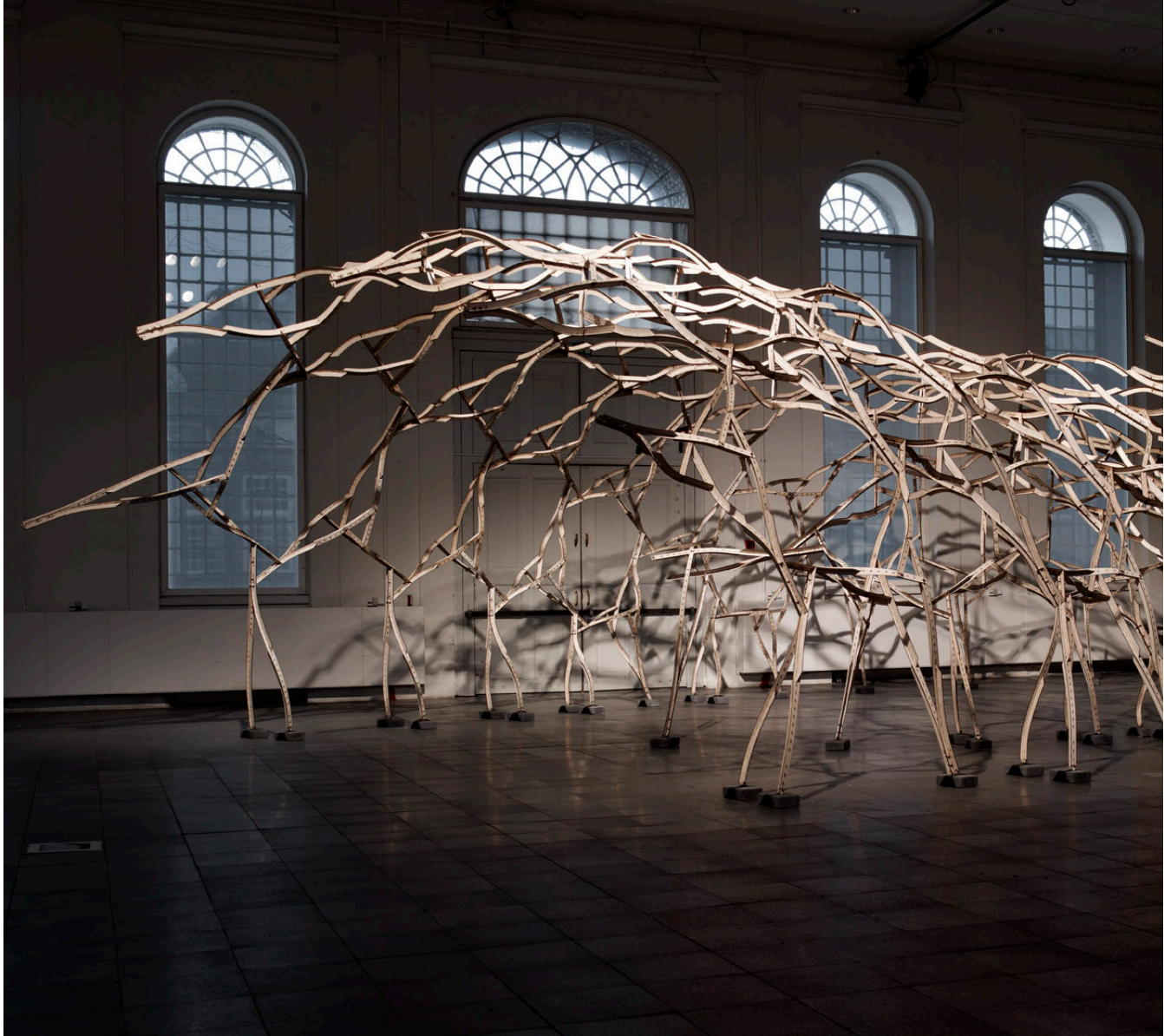
Martin Tamke, Jacob Riiber Nielsen, Stig Anton Nielsen (CITA)

Dates

Lamella Flock was exhibited as part of the digital material exhibition at R.O.M Gallery for Art and Architecture, Oslo in May 2010.

Sponsors

The project was developed by CITA in collaboration with Knippers Helbig Engineers and Trebyggeriet.no Further consultancy and support was granted by HSB Systems, Hundegger Maschinenbau GmbH and Prof. Christoph Gengnagel/ TU-Berlin Chair of structural engineering The exhibition digital.material was kindly supported by the Nordic Culture Foundation.



DERMOID

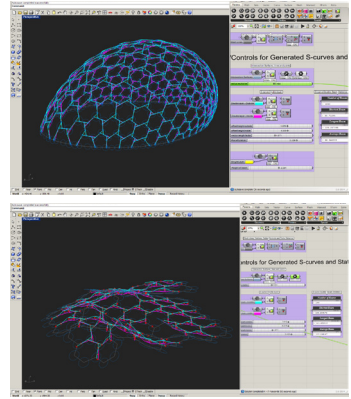
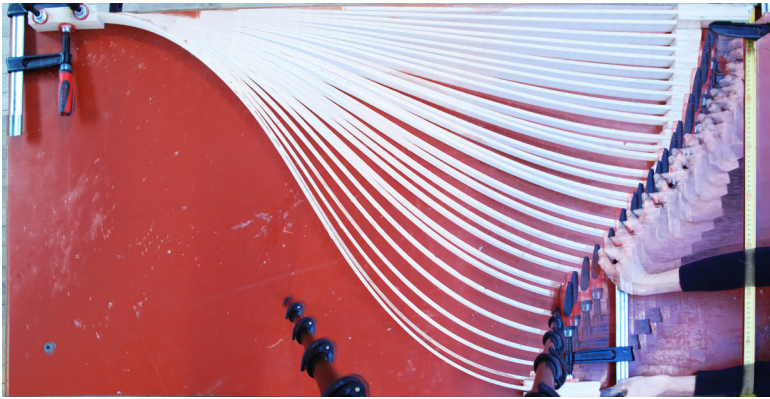
In spring 2009 Prof. Mark Burry won the prestigious Velux Visiting Professorship Award to work with CITA over a two year period. The aim for the Visiting Professorship was to explore how computation may lead to a new collaborative material practice in architecture. Where BIM often attempts to tie all partners of a building project onto a common digital platform, the Dermoid project took its point of departure in the creation of a plenitude of interlinked tools, that could be developed in parallel by a team spread between Europe and Australia.

The project was based on visiting professor Mark Burry and CITAs joint expertise into advanced dig-

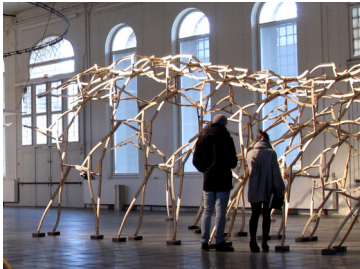
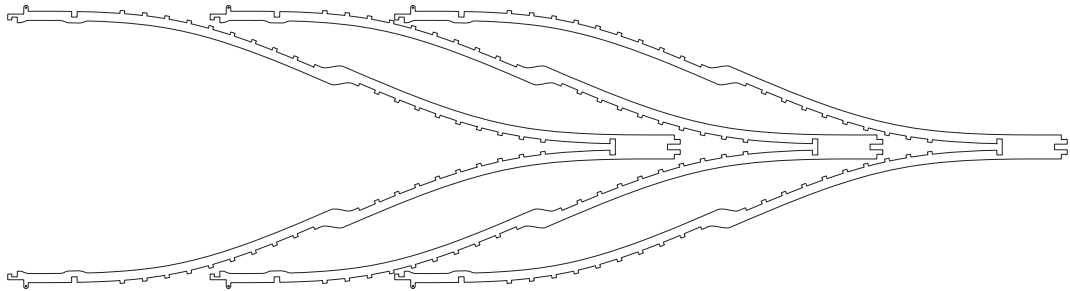
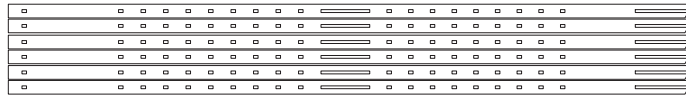
ital design technologies and digital fabrication. Working with and participating in the development of interfaces between design and fabrication has led to a common understanding that digital design practice is characterised by a nearness between design intent and material understanding.

BIM related techniques played a major role in the development process. Here a chain of standard parametric and more customised software tools allowed for the integration of design and simulation techniques with material production.

The two year project was developed through a series of consecutive workshops of different dura-



Lug sites 33
 Top Rail Bouding box 1.5
 lug size 1
 top rail thickness 6.3
 web thickness 6.3
 Lockpin 1.5
 Laser Tolerance .1
 material centerline .52



tion with participants level ranging from 3rd year student to researcher .The knowledge generated through the research was concluded with the Dermoid installation, a full scale demonstrator exhibited in the 1:1 Research by Design exhibition.

Principal Investigators

Mette Ramsgard Thomsen, Mark Burry, Martin Tamke, Phil Ayres

Project team: Jane Burry, Alexander Pena, Daniel Davis, Anders Holden Deleuran, Stig Anton Nielsen, Aron Fidjeland, Morten Winther, Tore Banke, Michael Wilson and students from the departments 2 and 10 (Copenhagen).

Dates

Dermoid was unveiled in March 2011 as part of the "1:1 - Research by Design" exhibition at the School of Architecture.

Sponsors

Dermoid is supported by the VELUX Visiting Professor Programme 2009- 2010 of the Villum Foundation.



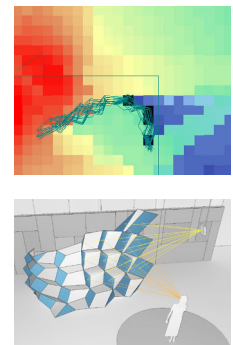
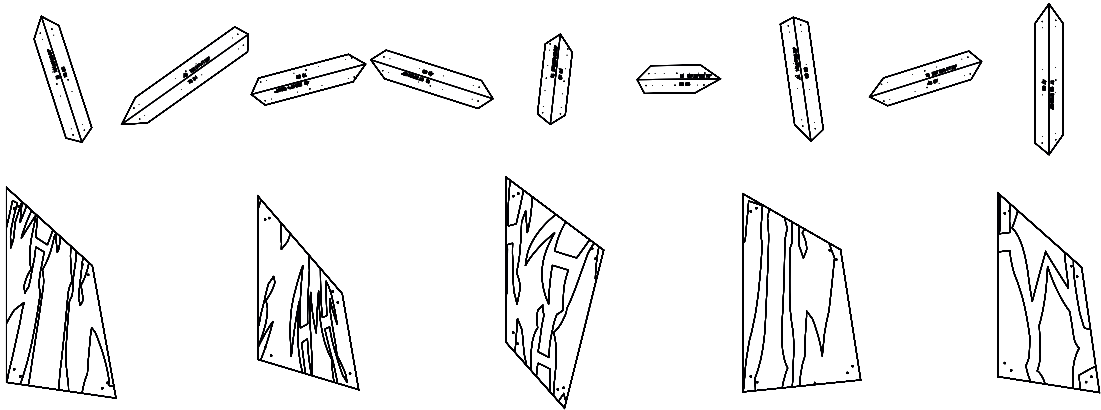
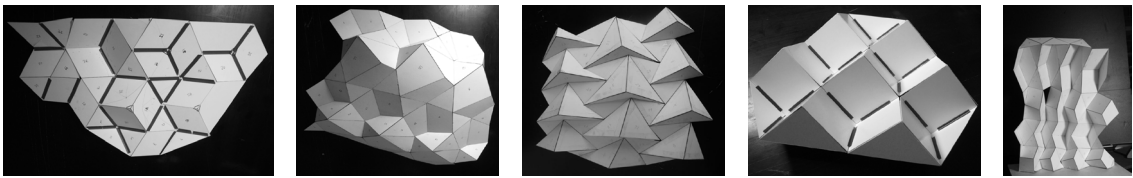
DISTORTION 2.0

The project Distortion 2.0 is the result of a research collaboration between CITA and Krydsrum Arkitekter with the industrial partner Akustikmiljø Sweden.

The primary research question in Distortion 2.0 was how the information we gain from simulation can be integrated into our building models (BIM) thus creating new potentials for better performance in architecture. The focus in Distortion 2.0 was on the design of building acoustics, and how it can inform architectural design through computational specifications of geometry and materials. Where architecture traditionally investigates the areas of sound performance, design and production separately, the project sought to develop new interfaces between acoustical science, building industry and the build environment. Within the research project an

information flow was setup between customised BIM design environments, computer based acoustic simulation, parametric modelling and digital production technology.

The development of Distortion 2.0 took was informed by the development of bespoke software tools and material testing of physical prototypes fabricated using CNC techniques. This process enabled us to design the digital model with an awareness of the properties and processing of the high end engineered materials used for acoustic damping. Here, a single wall membrane- only 15mm in depth, separates two defined spaces each with their own acoustic identity. The simulated acoustic performance was later verified through qualitative and quantitative analysis of the full-scale installation.



Through its custom-modelled flow of information, the project challenges the way acoustics are generally designed and implemented in architecture. Conventionally, acoustic design is either engaged in the architecture of high-end music performance sites such as concert halls or in the sound regulation of open plan working and learning environments. Where the former is often highly designed and tested the latter is more often implemented as an afterthought. Typically, acoustic design seeks to optimise reverberation time as a single criteria, whereas Distortion 2.0 sought to explore the potential of multiple sonic parameters. New digital tools and techniques were developed to test design propositions digitally, and physical experiments were completed to evaluate the results.

Here, BIM strategies allow thinking about and designing, sound and architecture at the same time.

Principal Investigators

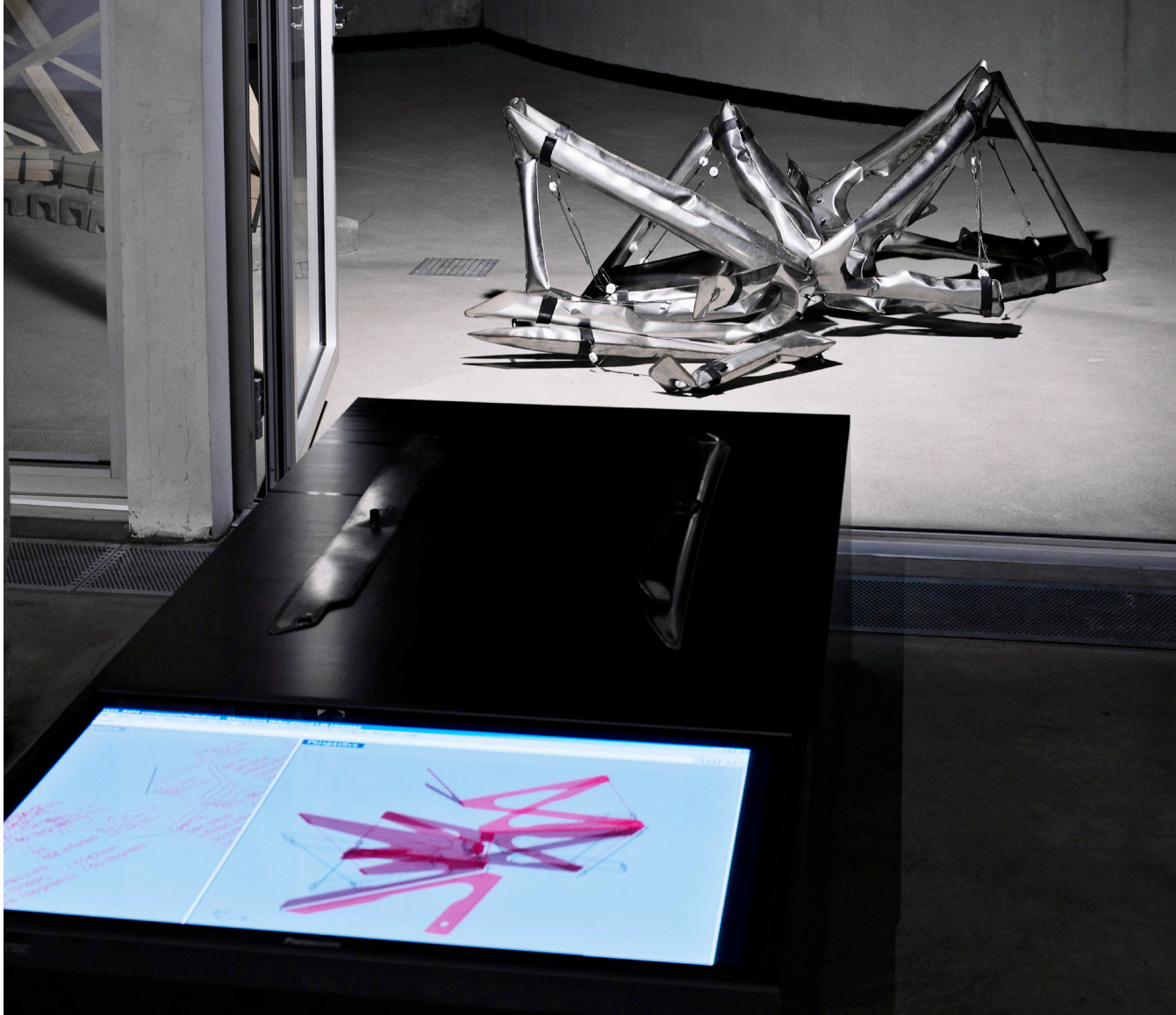
Martin Tamke, Brady Peters, Stig Anton Nielsen (CITA) and Niels Jakubiak Andersen, (Krydsrum)

Dates

The project has been exhibited at the Stockholm Furniture Fair 2011 and in March 2011 as part of the "1:1 - Research by Design" exhibition at the Royal Danish Academy of Fine Arts, School of Architecture.

Sponsors

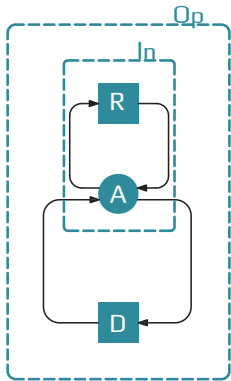
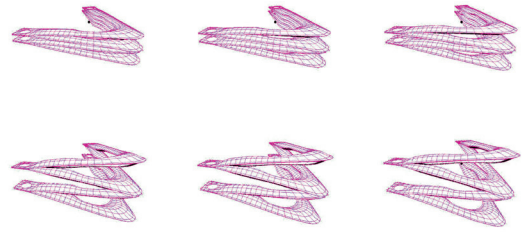
Akkustikmiljø Sweden, Statens Kunstfond, JJW Arkitekter, School of Architecture Copenhagen, CarlBro and Sennheiser Nordic.



PERSISTENT MODEL

Where BIM projects often focus solely on the integration of different sources of information the research project Persistent Model focuses on computational methods to manage the indeterminacy that characterises the various phases of architectural activity, namely: design, fabrication, construction and use. The project investigates a design strategy that couples representation and artefact in a circular relationship. This proposition maintains the instrumental capacity of representation as a space of speculation and specification, whilst addressing issues pertaining to representations ideal, predictive and pre-determined attributes in relation to contexts of use that tend towards the endemically dynamic and contingent.

The part project Persistent Model #1 considers the site of indeterminacy as the fabric of the construct itself. Free-form metal inflation provides a conceptually congruent material veil to these concerns. It is a procedure through which outcomes deviate from initialising representations with greater or lesser degrees of predictability – a result of a sensitive dependency established between material behaviour and the nature of the imposed geometry. This deviation requires feedback mechanisms for the artefact to re-inform the representation. As components are inflated they dramatically transform in formal and performance characteristics - these transforms are an outcome of material behaviour steered through imposed geometry.



Op - environment of operation

In - environment of intention

R - representation

A - artefact

D - disturbances relevant to artefact



The simplicity of the forming process belies a complex matrix of interactions occurring within and between a variety of microstructures (atomic lattice & grains) and macrostructures (component & aggregate). Developing an understanding of these material behaviours, and learning how to represent them and steer them through design, is of central concern to this aspect of the research project.

This aims to re-inform the essential design parameters for this method of fabrication and the performance characteristics of its resulting artefacts - as individual components and aggregates typical of architectural production.

Principal Investigators

Phil Ayres, Anders Holden Deleuran

Dates

Persistent Model #1 was exhibited as part of the digital.material exhibition at the R.O.M Gallery for Art and Architecture, Oslo in May 2010 and at the 1:1 Research by Design exhibition at the Royal Danish Academy of Fine Arts School of Architecture, Copenhagen in March 2011..

Sponsors

The exhibition digital.material was kindly supported by the Nordic Culture Foundation.



The background of the entire page is a dark purple color. Overlaid on this background is a complex, abstract network diagram. This diagram consists of numerous thin, light purple lines that connect various white circular nodes. The nodes are scattered across the frame, and the lines between them create a dense, interconnected web of geometric shapes, including triangles, quadrilaterals, and larger irregular polygons. Some lines are thicker and more prominent, while others are very thin and subtle. The overall effect is one of a dynamic, multi-layered structure, possibly representing a data network or a complex system.

PH.D. STUDIES INTO BIM

3D modelling, BIM and parametric design

BY ANDERS HERMUND (CITA)

The PhD research into 'applied 3D modelling and parametric design' is defined on the basis of the Danish governmental client demands, which since 2007 has required that all public clients apply digital tools and working methods. The idea of parametric design has already for many decades been theoretically discussed as a possibility for a development, but it is only within recent years that it has gained real ground in architecture as a result of increased computational capacity to deal with complex geometry.

The research examines the relationship between the architectural sketching phase and the rest of the construction process. Although the design costs in relation to the operating cost may seem marginal, it is in these initial stages of construction, the early sketching phases, that crucial decisions are made, and will affect the entire building lifecycle. It is therefore interesting to focus on how this sketching phase can be included in a digital context.

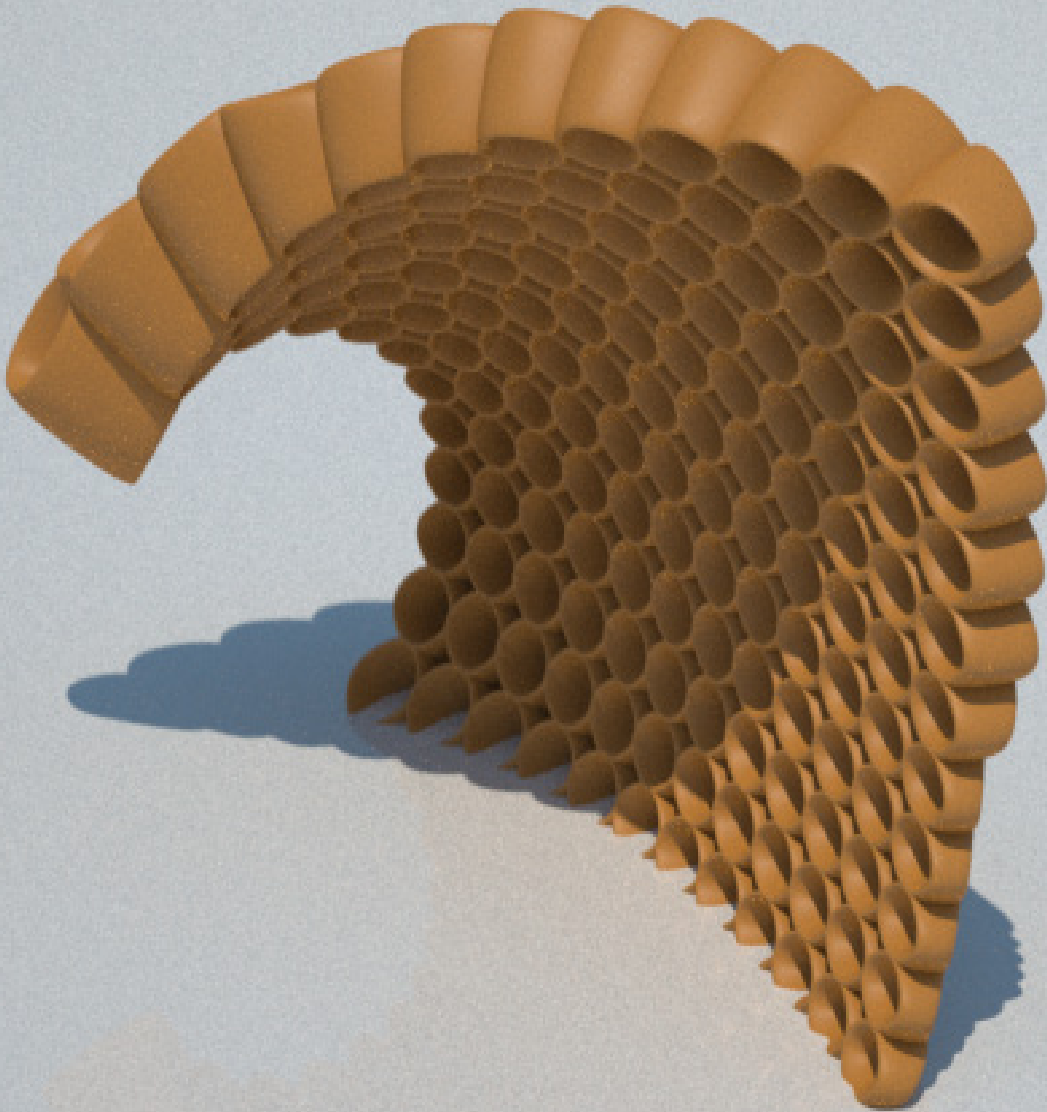
This includes research in the application of building information modelling and parametric systems on a number of architectural firms in Denmark and abroad. By associating the implementation of digital tools in a practical context with a theoretical framework, it is sought to highlight how the opportunities and challenges will come to affect the way we work with the design of architecture in the long run.

These issues are being compared in a philosophical context in the quest to draw meaningful comparisons between theory and practice. This work sets up a conceptual apparatus that is needed to uncover the prospects for the digital initiative as it is ongoing in Denmark and internationally. Semiotics is used to be able to structure and distinguish the ways in which architecture's various analogue and digital representation of processes and their relationships emerge. Examining how C. S. Peirce and G. Deleuze relate to the 'diagram' in a theoretical understanding, can establish a conceptual framework, in which architectural terms' relation to a digital work process can be discussed.

Research on implementation of the digital media is important for several reasons. The most obvious is probably the governmental requirements on the use of digital tools in construction. The complexity of the construction industry, requires that the implementation is examined at several levels to create a broad understanding of the possibilities and difficulties of such a large-scale vision of efficiency and better architecture. Another consideration that makes this research relevant is about design and the early architectural sketching phase. Understanding of how we create is essential. Especially in a situation where the digital media and design tools are so extensively important to the way our world is perceived. Architecture is inextricably linked with the worldview we have, in an ongoing symbiotic continuous (digital) stream.

Creating good architecture contains besides all the quantitative elements also a qualitative aspect, which may be harder to measure, and therefore more difficult to understand in a world solely engaged in calculation. So how to secure that the creative part of the architectural practice remains an important part of the digital future? What is it, in other words, the architect can do that no one else can do?

Linking the crucial architectural sketching phase with the vision inherent in BIM, as a tool to manage expenses for the entire building life cycle, is not something that happens in a completely smooth transition. By looking at the idea of BIM more as a mindset than as a mere optimization toolbox, it would be possible to see new connections between the design and the subsequent digital handling of the project. With the diagram as the overall concept I use the idea of a 'parametric diagram' as a working method to identify some of the processes taking place in the design phase. The point is that the parametric diagram can represent a bridge between the rigid qualities and soft qualities within a building in its conceptual phase. The idea is that the diagram in its nature can accommodate qualities which, without being reduced to quantities, can be included in the design. This is what the architect can do. The diagram is also part of the architectural practice as a tool that has been used since time immemorial to explain and understand contexts. The diagram - or the abstract machine - is in philosophy a way the world can be understood as operational. There must be an input to generate an output. Exactly this ambiguity of the diagram makes it interesting as a hub for working with digital media in conceptual phase of an architectural project. Many of the most modern types of architectural 3D modelling software are in their basic essence parametric and diagrammatic.



APPLIED 3D MODELLING AND PARAMETRIC DESIGN

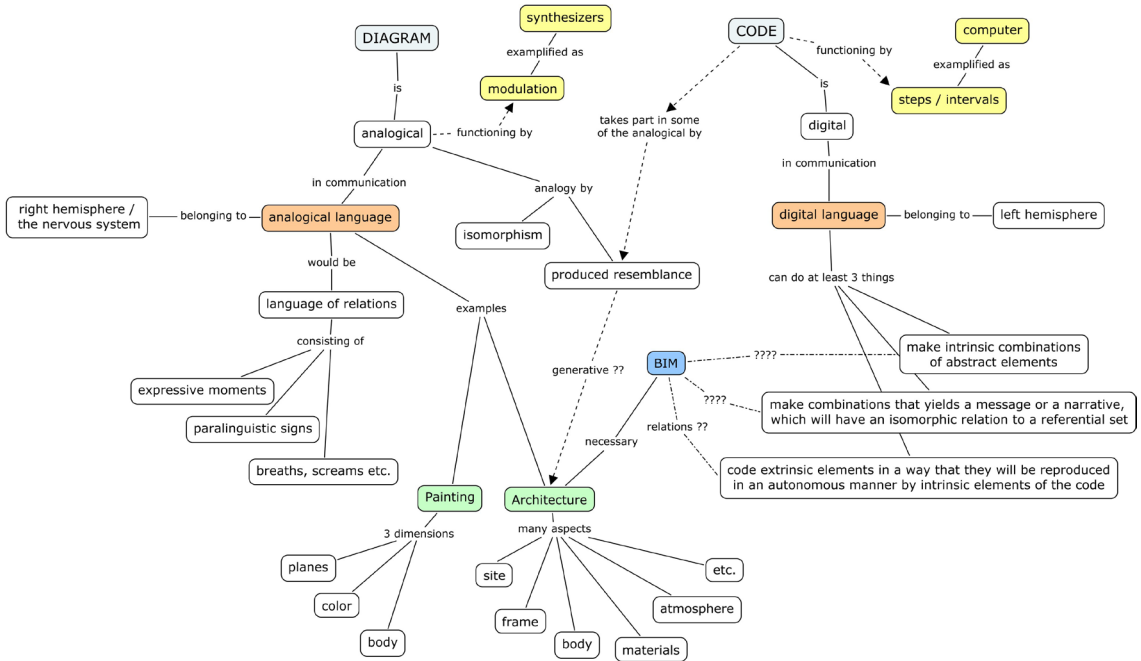
Anders Hermund, Phd-student

Since 2007, the Danish government demands all public clients to implement information modelling and digital working methods that follow the Danish BIM standards (DBK). This requirement motivated this PhD project into “Applied 3D modelling and parametric design”.

Where the idea of parametric design has been discussed as a possibility for developing the building industry it is only within recent years that it has gained real ground in architectural design practice. The increasing computational capacity allows architects to deal with the complex data that characterizes their projects. This move changes the rela-

tionship between the architectural sketching phase and the following construction process radically.

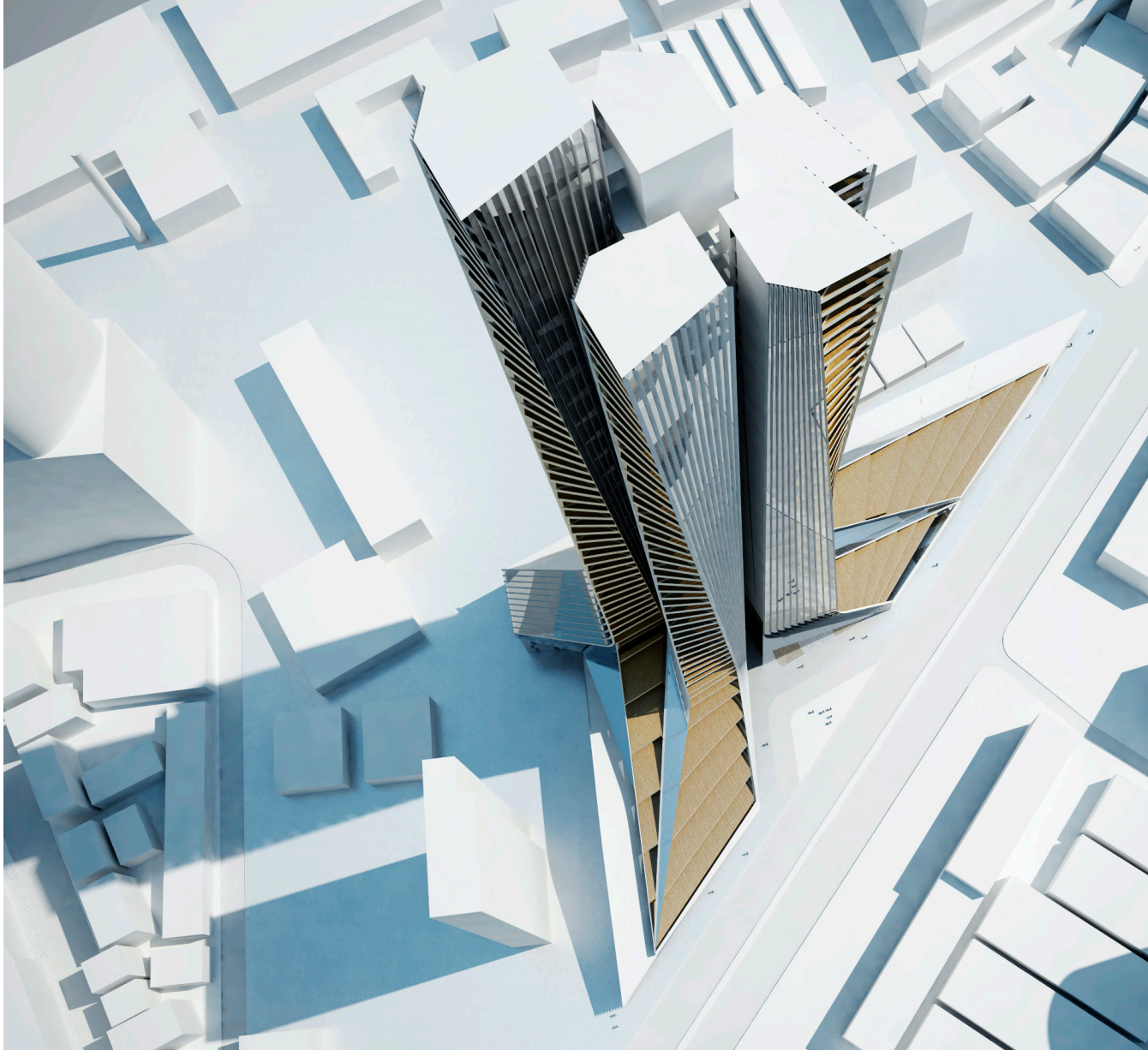
The emerging practice is based on networked BIM systems that link the design phase directly to planning and fabrication. As a consequence of the inherent high degree of interdependency the initial stages of a design process gain enormously in importance. It is here where the crucial decisions are taken that will affect a buildings performance and cost over its entire lifecycle. The PhD project focuses therefore on how the sketching phase can be included in a digital BIM context.



The research takes point of departure in an investigation how building information modelling (BIM) and parametric systems are applied in a number of architectural firms in Denmark and abroad. By associating the implementation of digital tools in the professional context with a theoretical framework, it is sought to highlight opportunities and challenges for the way we design architecture in the long run.

The project describes a potential link between the sketching phase and BIM processes. These are often solely thought as tool to manage the expenses

for the building life cycle. By considering BIM as a mindset rather than a mere tool for optimisation, it is possible to establish connections between design and the subsequent digital planning phases. In his PhD project Anders Hermund positions the diagram as overall concept and uses the idea of a 'parametric diagram' as working method to identify crucial steps in the design phase. This allows the parametric diagram to create a bridge between the rigid and soft qualities of a building in its conceptual phase.



PARAMETRIC APPROACHES IN THE PROFESSION, GENERATIVE PERFORMANCE IN ARCHITECTURE

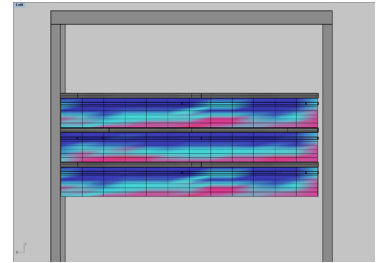
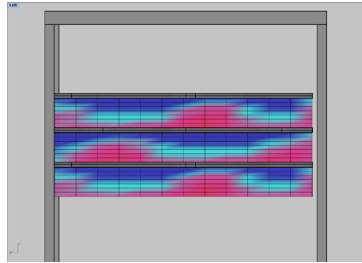
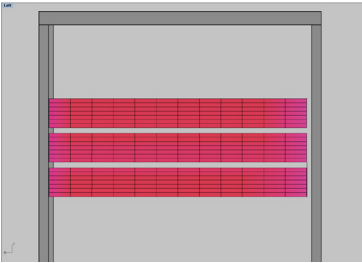
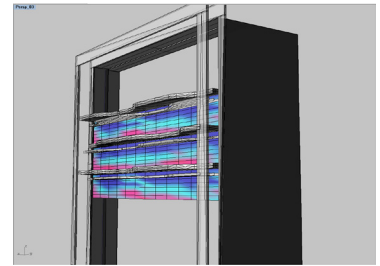
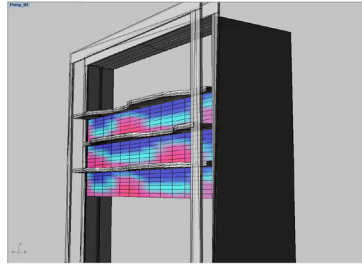
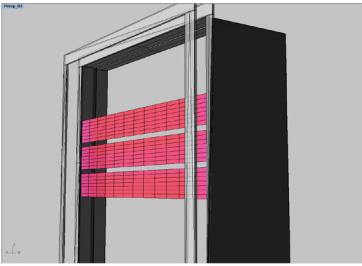
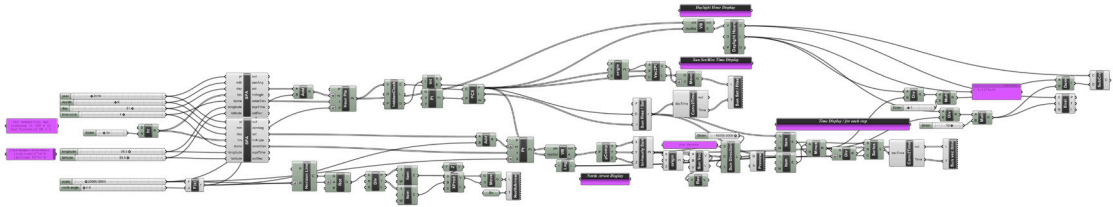
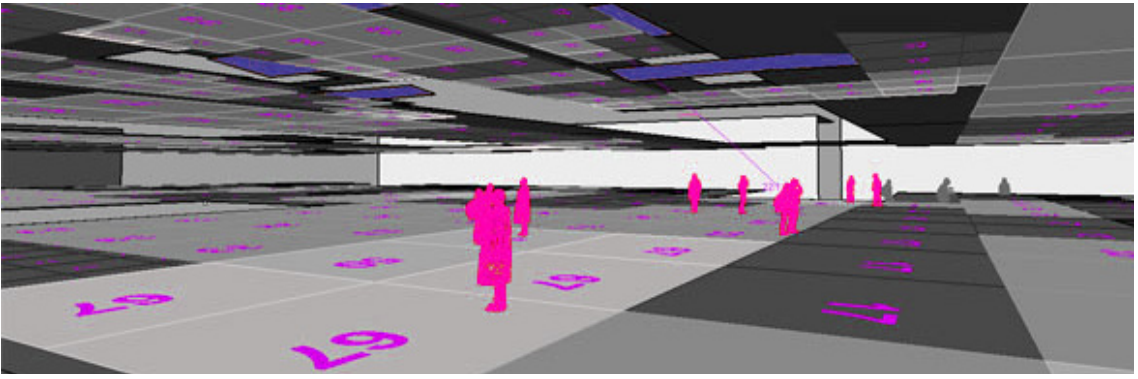
Tore Banke, Industrial PhD Student

The project examines the development of parametric sketch tools that integrate day light simulation into the architectural design process. The project is done in collaboration between the Danish architectural practice 3XN and CITA.

Today, 80% of the decisions impacting energy consumption are made during the first 20% of the design process. Yet current BIM environments lack design tools that can provide quick feedback between a particular design intent and its consequent light and energy consumption. This means that these fundamental design decisions frequent-

ly are corrected much later in the design process where it is often too late or very costly to change the overall design.

The project investigates how daylight can be a design parameter in the initial design phase. Based on 3XNs design practice the aim is to develop parametric sketch tools for the early design phase. The project asks what are the relevant tools for daylight simulation? What is the necessary level of precision and how can these early stage calculations support later stage energy calculations?



The initial stages of a design process elude a standardized approach on tool level. Were the general approach towards a design question might be similar the interacting parameters are different from project to project and change constantly in the process itself. The PhD therefore proposes an approach that takes advantage of small customizable tools that can be quickly adapted to new duties. The reconfigurations on tool and process level are done by architectural designers themselves helping them to overcome the monolithic nature of standard BIM packages.

Funding

The project is funded through the industrial PhD program by the Danish architectural practice 3XN and the Danish Agency for Science Technology and Innovation.



COMPLEX SURFACES - SOUND AND SPACE DEFINING SURFACES FOR ARCHITECTURE

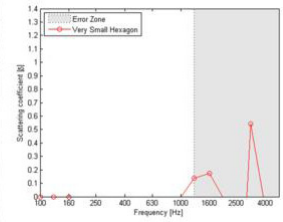
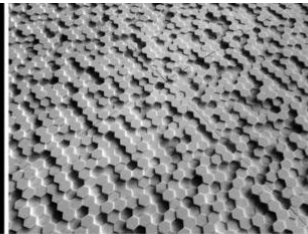
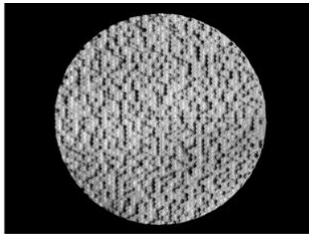
Brady Peters, Industrial Ph.d. student

Building Information models consist of several layers of information. All of these have a direct impact on a building's performance. The lack of feedback channels in our models, prohibit designers from being instantly aware of the consequences of their work on the model. This is especially true for design areas that are not so visceral, such as acoustic design. The aim of this PhD project is to improve the integration of the spatial and sonic dimensions in architectural design by an investigation in new interfaces between acoustic engineering and architectural design. The project is collaborative en-

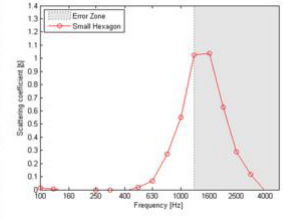
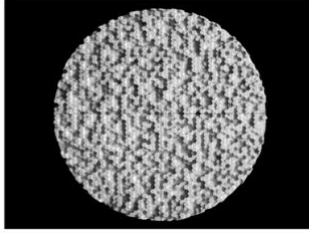
deavour between CITA, the architectural practice JJW and engineering company Grontmij/Carlbro.

The research situates itself between the practice of architecture and that of acoustical engineering. The project seeks to develop new integrated tools and working practices to enable better communication and workflow between design partners. The project attaches itself to the development of new digital practices in both architecture and acoustic engineering.

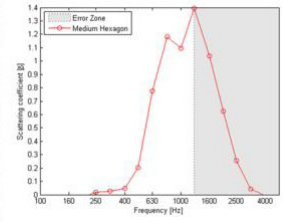
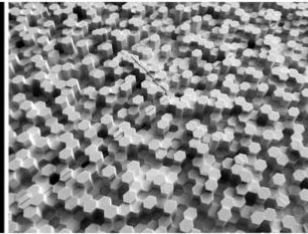
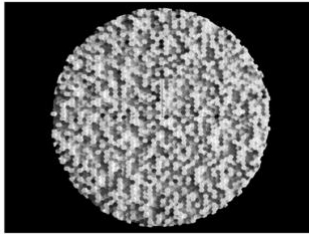
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 length - 0.069 m
 frequency - 4000 Hz



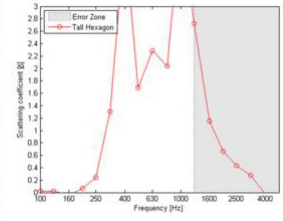
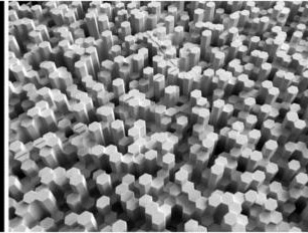
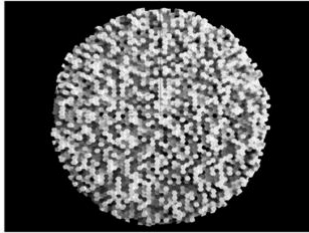
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 length - 0.069 m
 frequency - 2000 Hz



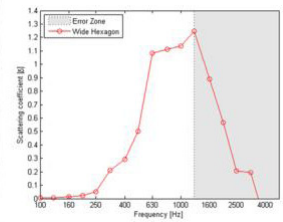
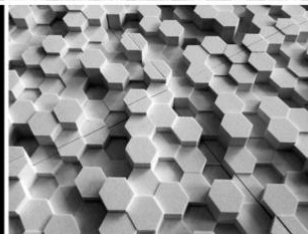
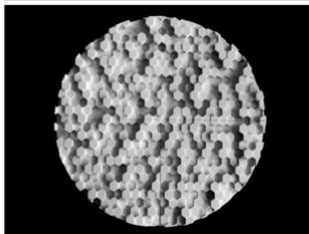
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 length - 0.069 m
 frequency - 1000 Hz



hexagon 04
 max depth - 0.342 m
 width - 0.092 m
 length - 0.069 m
 frequency - 500 Hz



hexagon 05
 max depth - 0.171 m
 width - 0.184 m
 length - 0.139 m
 frequency - 1000 Hz



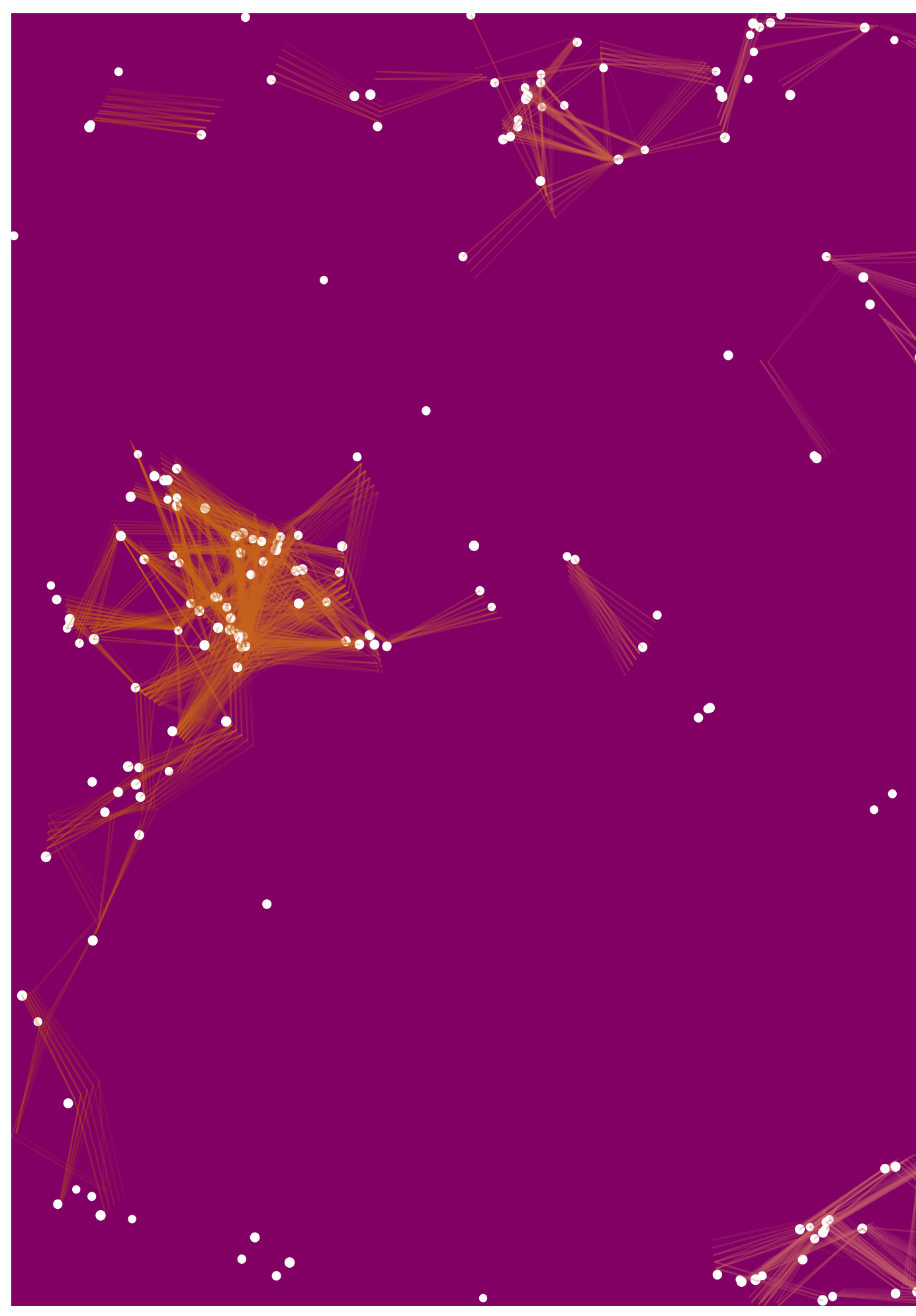
The practice of acoustical engineering has dramatically changed with the proliferation of new digital tools, and the practice of architectural design now takes place uniquely through computer-aided design systems. This creates a shared digital platform that can be exploited to create better interfacing for a joint design and analysis practice.

The last five years have seen great development within digital modelling software for architecture, allowing better communication between design partners through the sharing of highly detailed BIM models, the potential for direct connection to digitized manufacture, and open-ended parametric design practices which are enabling the creation of complex surfaces and variable geometries. These

new digital tools promise an “optimisation” of the architectural design practice where the architectural drawing becomes the interface between environmental data and the implementation of architectural design. The scientific goals for this project are to understand how the integration of acoustical analysis into architectural BIM programs will have consequence for the architectural design of space and surface?

Funding

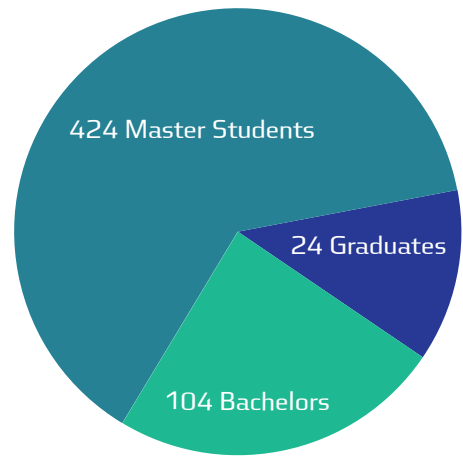
The project is funded through the industrial PhD program by the Danish architectural practice JJW, engineering company Grontmij/Carlbro. and the Danish Agency for Science Technology and Innovation.





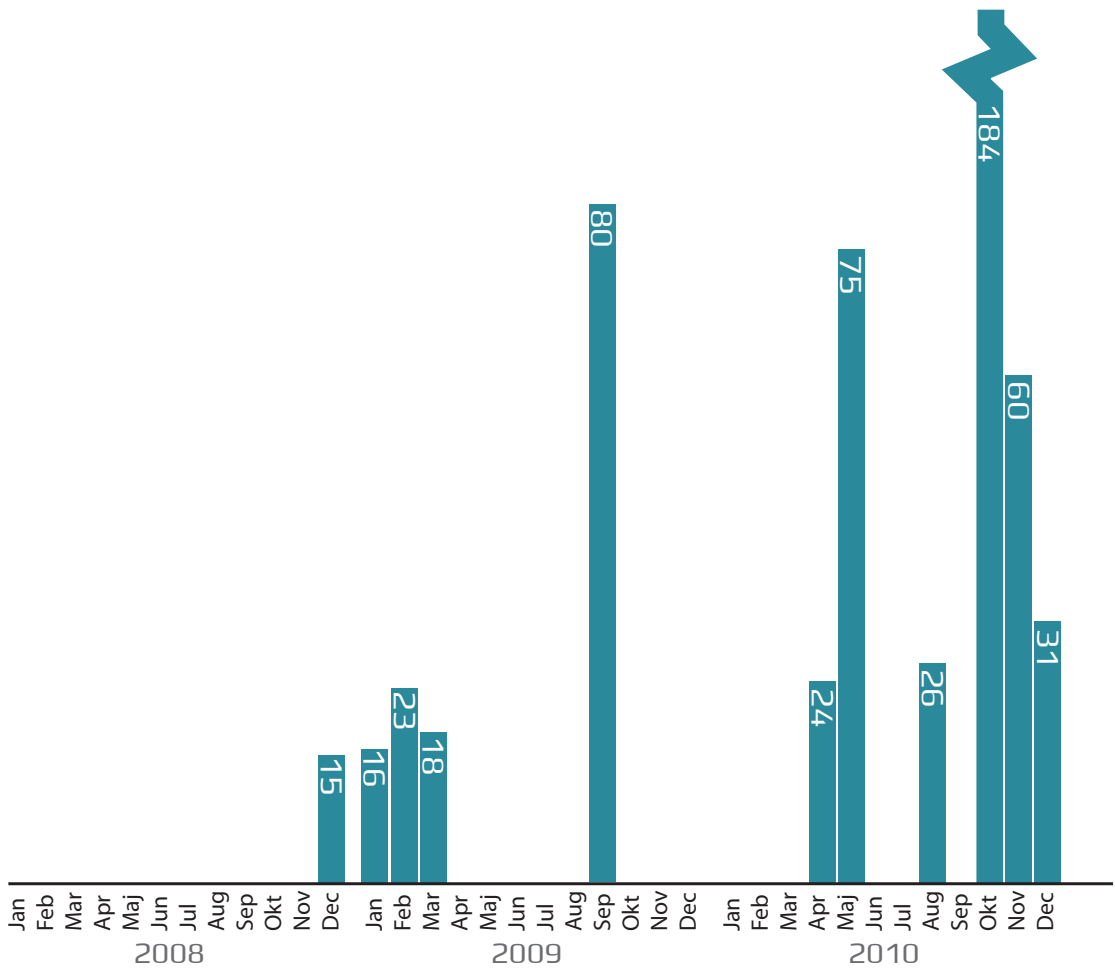
TEACHING

TEACHING



In the three year period of the research grant CITA has undertaken a host of different teaching activities into BIM and information modelling. Our teaching aim has been to develop a broad approach to information modelling allowing students and professionals to explore and learn about the many different impacts that BIM has on the design process. We have wanted to give students a grounded understanding of the tool and a creative freedom with its use and implementation. The courses have addressed different levels of study including bachelor, masters and PhD students as well as recent graduates and professionals.

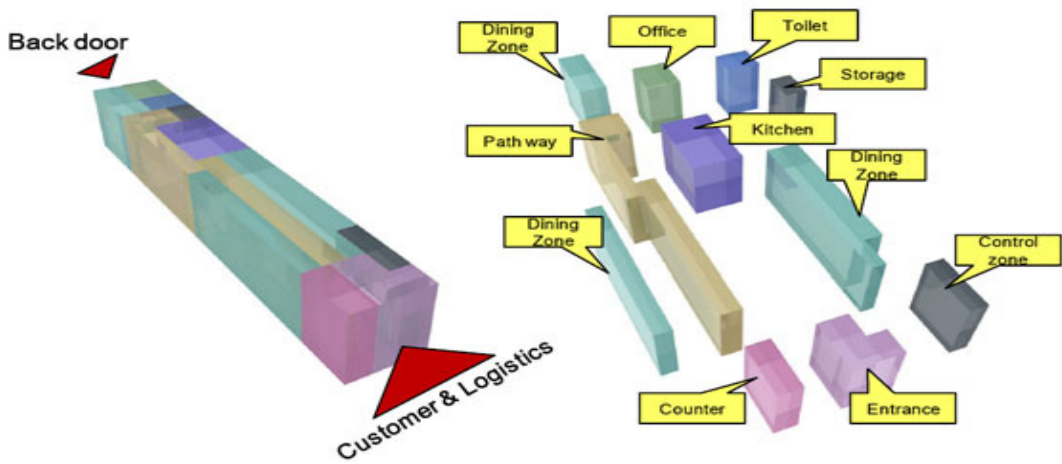
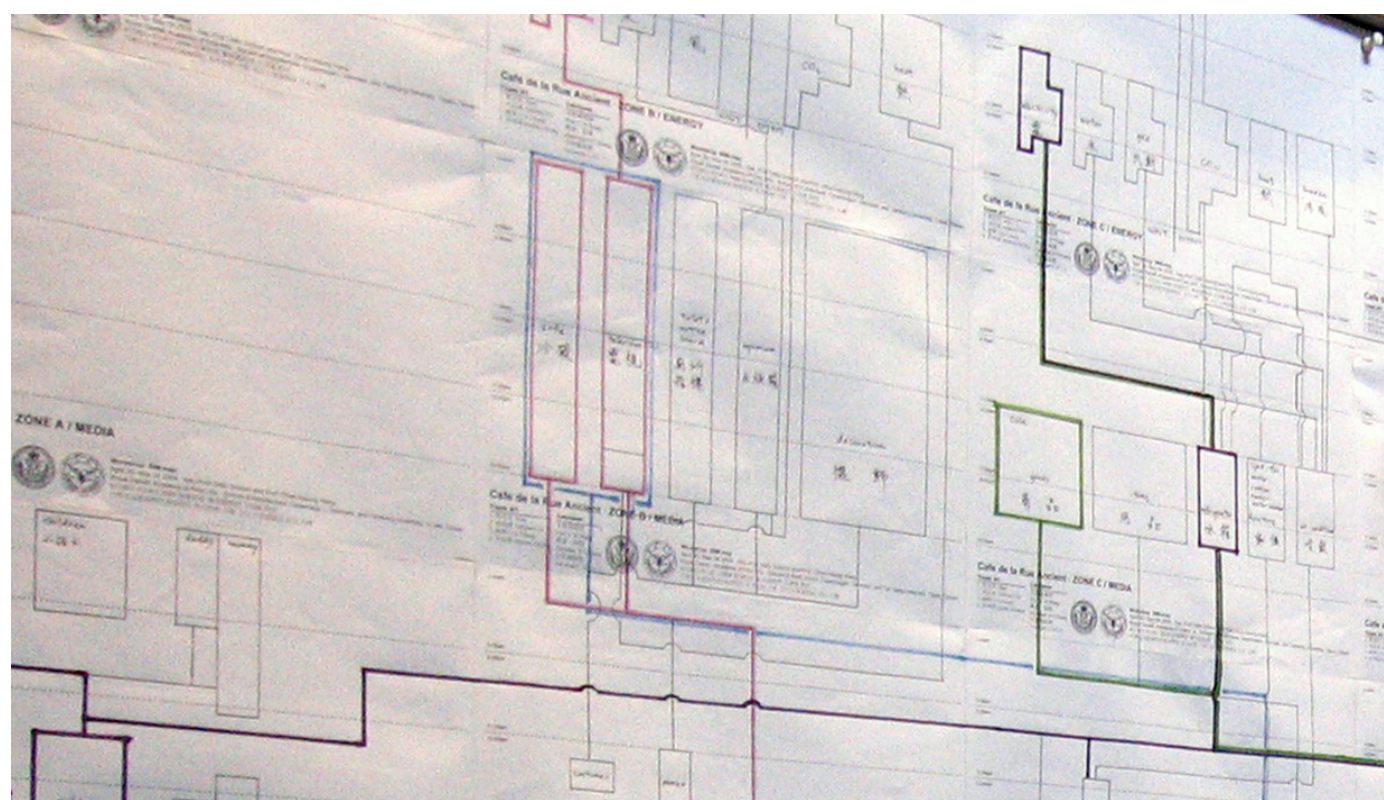
The objective has been to allow students and participants direct hands-on experiences providing a teaching environment with a problem-led practical approach to learning while at the same time giving a solid understanding of the conceptual potentials that information modelling presents. The teaching activities have skilled up students in high-end state-of-the-art tools used in practice such as Revit and Ecotect, while also introducing them to the parallel culture of open source tools and open platform parametric



Number of students taught in BIM tools and - concepts

design tools such as Processing and Grasshopper. This dual focus ensures criticality and creativity in the use and implementation of information models.

During the three years of the research project a total of 552 students took part in the different courses, workshops and seminars on subjects as varied as Urban Mapping, Process Development, Creative Information Design, Green Bim and Revit Design. The teaching activities have in part been integrated into large school-based teaching units creating continuity between learning outcomes.



BIM-MAP WORKSHOPS

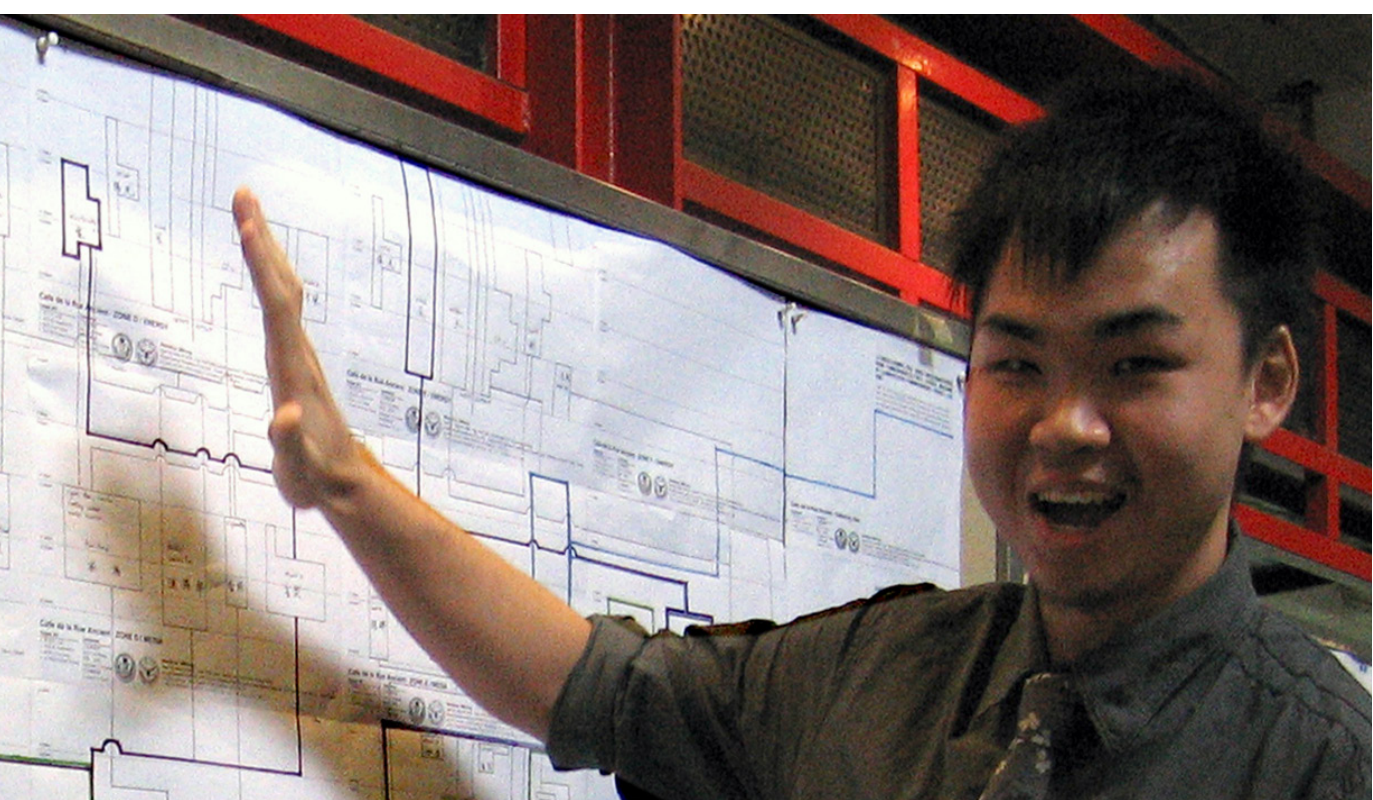
The BIMmap workshops were two one-week workshops for all together 65 students held in April 2009 at Tamkang University, Danshui Campus, Taipei, Taiwan. The first workshop invited 12 Masters- and PhD-students to participate. The second Workshop invited 53 bachelor students at 1st year level.

The two workshops investigated new ways for architects to represent the manifold relations between the programmatic elements in an architectural project. Abandoning drawings and illustrative pictures, a diagrammatic way of communication was chosen in order to reveal direct relations be-

tween form-giving elements.

The workshops introduced the students to an understanding that our environment is based on systems and networks. The strong spatial relationship in traditional Sichuan restaurants where customers are exposed to the food and its preparation through the chef served as case for the workshop.

Participants were asked to describe the underlying relations of the physical processes in digital media. Here the potential of BIM tools to accumulate vast amount of data was introduced. The mapping should not only include functional relations but es-



Beef Noodle Store, Student work: Ching-Hang Lee, Ching-Tse Jiang, Wan-Lin Tsai, You-Chung Shiu

pecially the atmospheric and informal levels that are characteristic for the restaurants. The created maps included hence the chopping sounds, the smell of foods and other messages sent during the cooking activity through the open kitchen and transparent food storing shelf. They describe the complex relationship between customer, cook and personal and simultaneously attempt to translate the excitement and pleasure into an abstract form.

The created maps granted new insights in the potential of BIM tools and question the ways how we usually handle large data sets. The diagrams

were able to inform the later design process of the students. Yet it became as well obvious that the diagrams hierarchical structure limits their ability to describe the atmospheric and activity patterns that ultimately define architecture.

Teacher

Odilo Schoch

Location

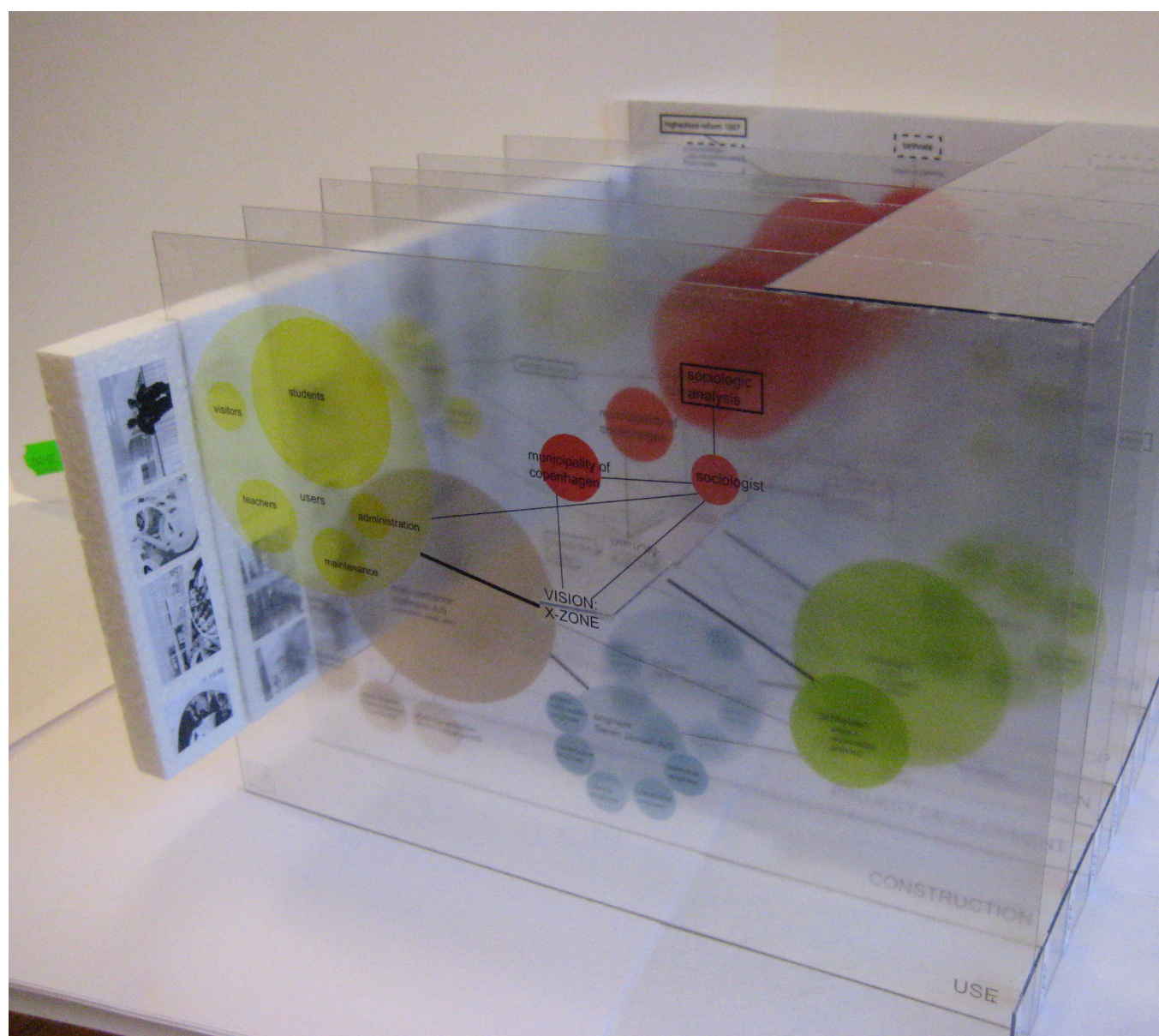
Taiwan

Number of students

65 (bachelor, graduate and PhD)

Date

April 2009



Student work: Marianne Kahr Nielsen

TECHNOLOGY 5 MASTERS COURSES

The Technology 5 (TEK5) courses are a semester long teaching courses held at the Royal Danish Academy of Fine Arts, School of Architecture, focusing on professional building processes. The course is interdisciplinary and research led bringing together expertise from the Institute of Technology, CITA and a wide range of players from practice, educational and public institutions and organisations.

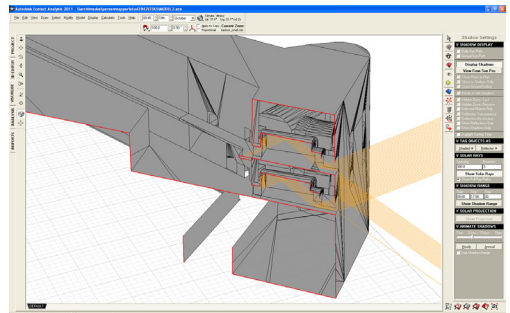
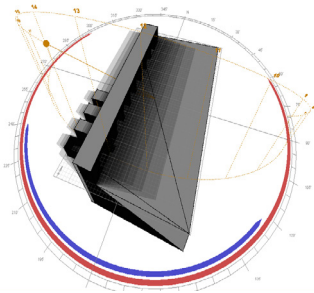
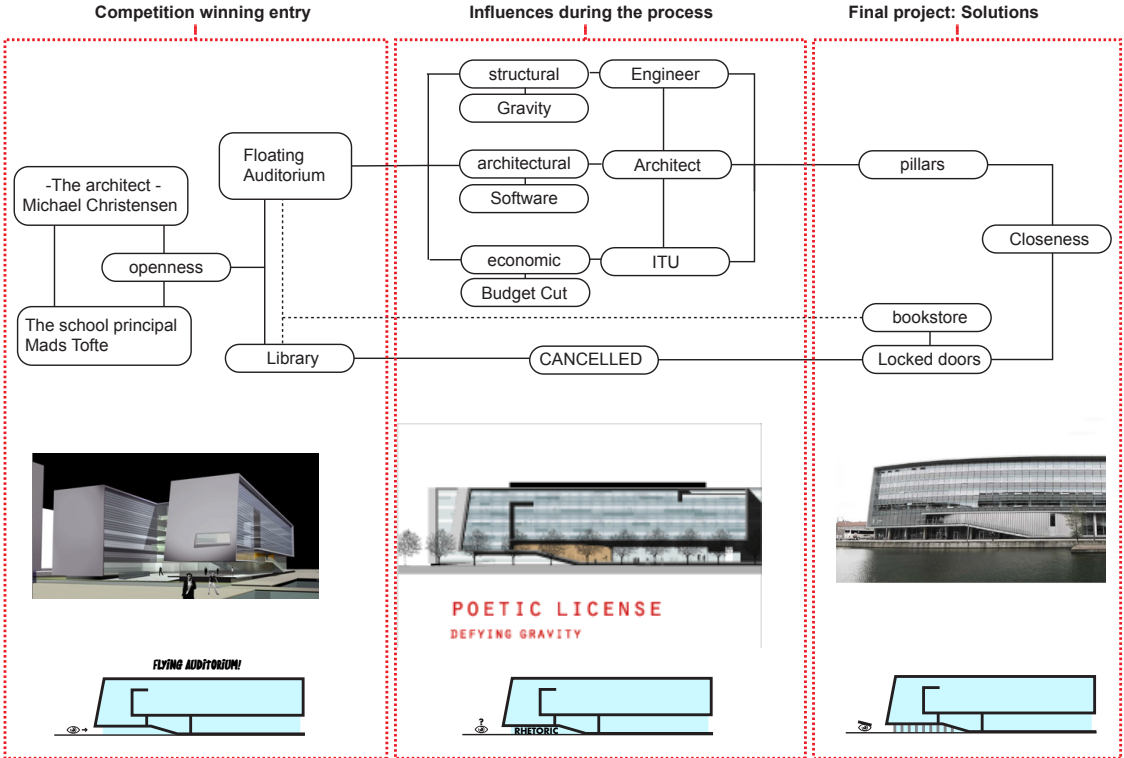
The Technology 5 (TEK5) courses introduce participants to the different stages within a building process. It shows the interrelation between design, construction, fabrication and occupation and how the planning of these levels is today integrated in

architectural practice. This includes knowledge on organisational structures, as well as on the possibilities offered within existing BIM methods as multidimensional modelling and national and international initiatives such as buildingSMART, Det Digitale Byggeri, BIPS and DBK.

The course consists of 3 main phases

The analysis phase creates an understanding of the stakeholders in a building project. Following the principles of the Actor-Network Theory (ANT) the students used structured interviews to get an insight into selected projects in Copenhagen.

The role play phase includes discussions with ar-



Student work: Tina Lyneborg Jensen

chitects, engineers and clients. In particular the search for controversies within the projects helped to recognize the highly networked system of a real world project.

The integration phase introduced the principles of BIM for structuring information. This resulted in coherent presentations and precise mapping of processes and findings.

Teachers

Odilo Schoch (Institute 4), Anne Beim, Kasper Sánchez Vibæk, Katrine Lotz (all Institute 2)

Guests

Chrstian Lerche - Danske Ark, Søren Nielsen - Vandkunsten Arkitekter, Asbjørn Levring - Teknologisk Institut, Bruno Tournay - Institute 3, Claus Bjarrum - Department 3, Tina Saaby - Witraz Arkitekter, Gunnar Friberg - BIPS and others.

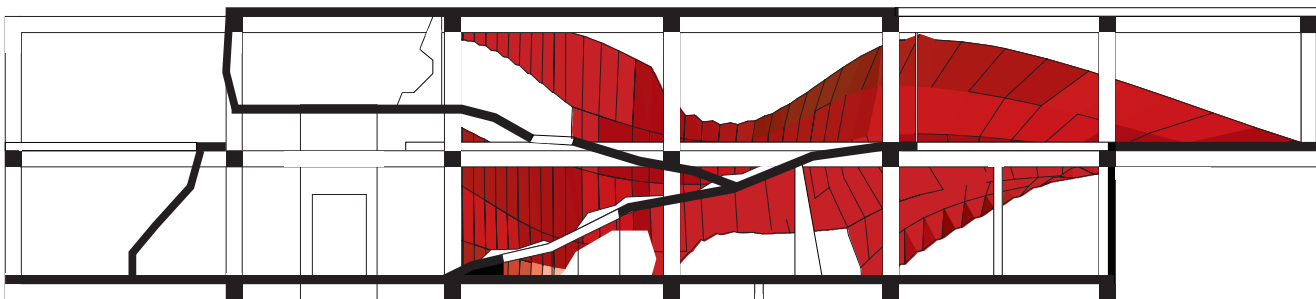
Location The Royal Danish Academy of Fine Arts School of Architecture, Copenhagen

Number of students

80 (candidate level)

Date

November 2009 and September 2010



BIM2bim: AN INTRODUCTION TO INFORMATION MODELLING WITHIN ARCHITECTURAL DESIGN

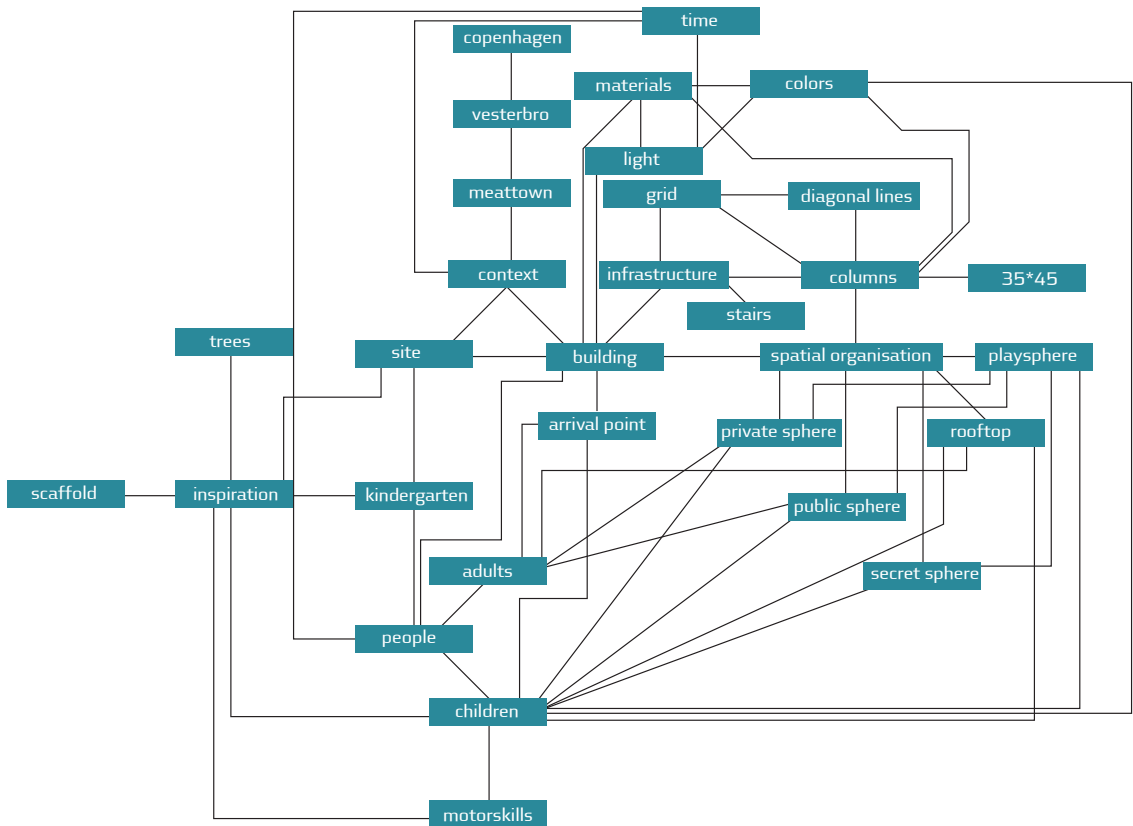
Design is a highly individual process. BIM has been criticised for pre-determining design. In order to start negotiating this position the BIM2bim course asks students to critically evaluate the design methods they employ. Building up this understanding is seen as the prerequisite by which to shape individualized BIM environments that answer the individual needs of designers and architectural offices on a bigger scale.

In BIM2bim, students were asked to analyse one of their recent projects. In a first step attributes and design decisions were mapped. The following

steps concentrated on the underlying program and site, and introduced methods and techniques for representation of data in diagrams.

Students learnt to analyse and understand their individual design process and the inherent intuitive decisions they take on their way to the projects delivery.

The course was based on tools that are familiar to the students as picture or illustration programs, text- or spreadsheet applications. The introduction of new methods of using and linking the



Model and Diagram Kindergarten 2d/3d, Student work: Mikkel Schebye Johnsen

well-known software created an environment that was suddenly driven towards analysis and reflection rather than description and representation. An approach using mixed media, geo tagging and diagramming gave students means to creatively model with the information of their future designs.

Discussions in plenum and assessment through multiple teachers opened a space for reflection and guidance for an individualized yet aware design process.

Teachers

Odilo Schoch and Anders Hermund

Location

The Royal Danish Academy of Fine Arts School of Architecture, Copenhagen

Number of students

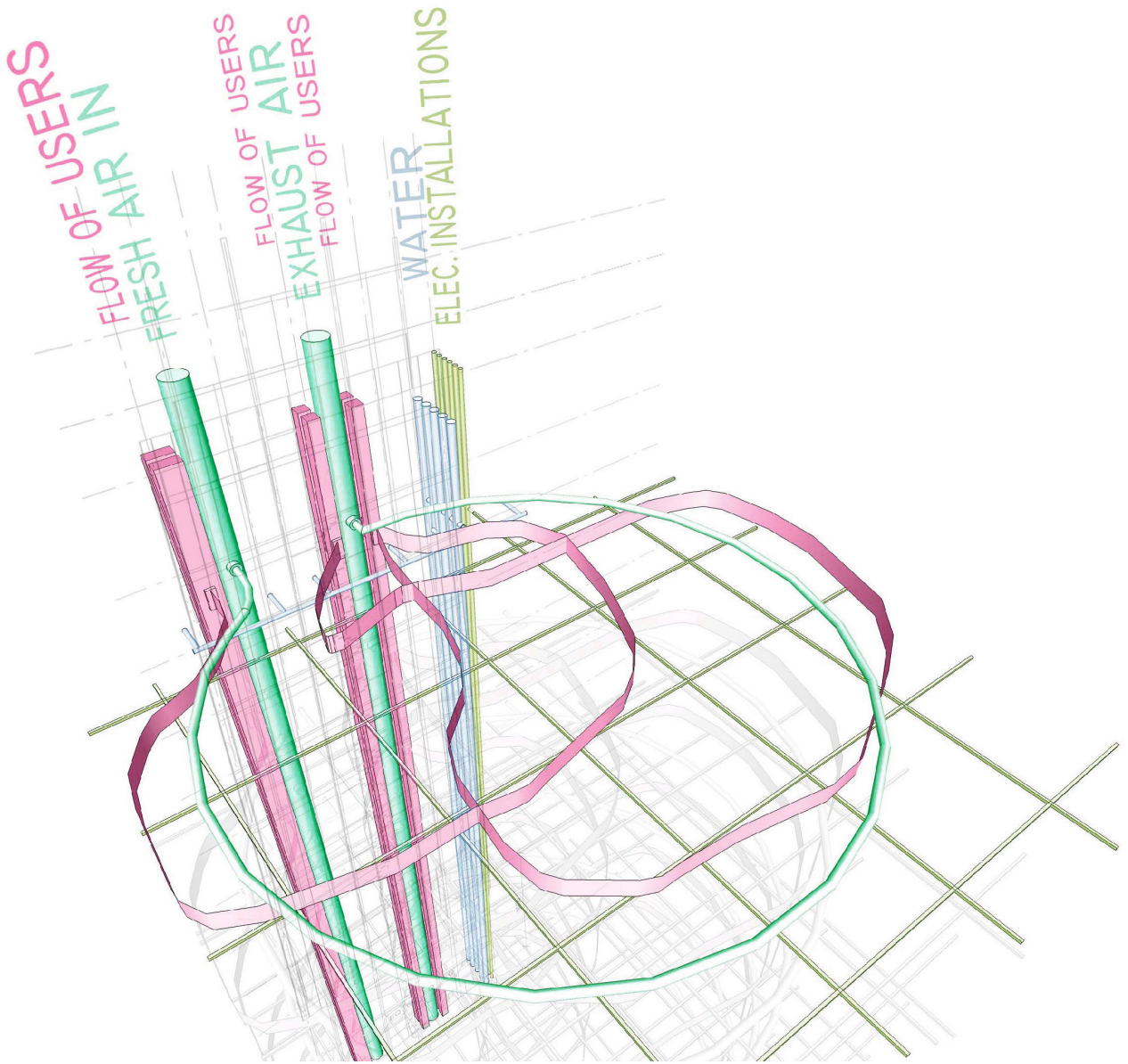
23

Collaboration partner

Department 8

Date

February 2009

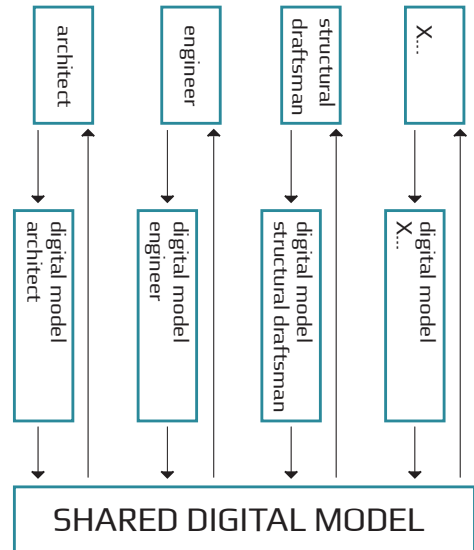
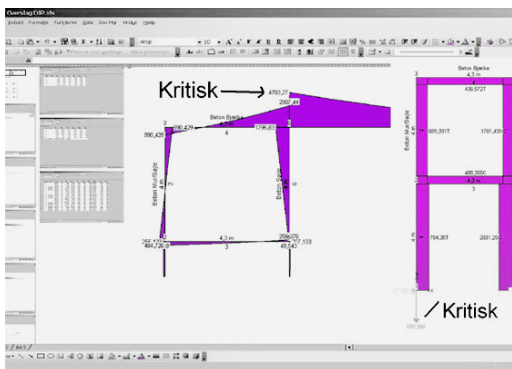
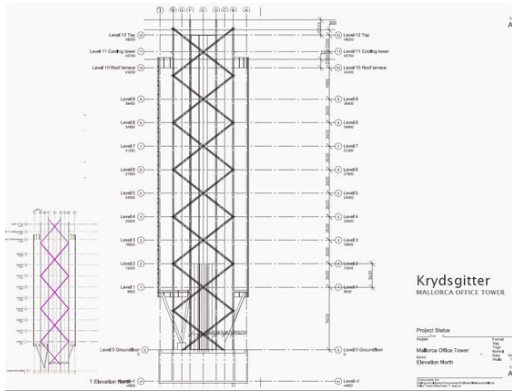
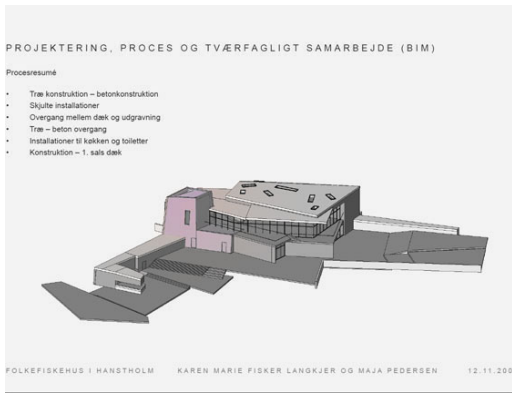


INTERDISCIPLINARY BIM COLLABORATION COURSES

Since 2006 an annual interdisciplinary BIM course is offered at the Royal Danish Academy of Fine Arts, School of Architecture in collaboration with Ingeniørhøjskolen i København (IHK), Byggeteknisk Højskole Haslev (BTH), and Syddansk Universitet in Odense (SDU). The collaborative courses provide students with an understanding of concepts and techniques in BIM and the Digital Construction process in Denmark (Det Digitale Byggeri). The courses further collaborations across the professional disciplines of architecture, engineering and constructing architects and allow the

different students understand the changing roles of the professions in digital collaborative environments.

The students work in mixed groups with at least one student from each field. The courses span a whole semester and are designed to resemble a building process from early design, to construction and documentation. As the participants are located in different locations, their first task is to create a virtual work environment. Here participants learn to establish a good working internal communication by use of different digital media platforms



Students work: Karen Marie Fisker Langkjer og Maja Pedersen

and personal meetings. BIM supporting software is taught alongside presentations on the conceptual level of building information modelling.

Teachers

Odilo Schoch, Maya Grøn, Erik Falck Jørgensen and Anders Hermund

Location: The Royal Danish Academy of Fine Arts School of Architecture, Copenhagen

Number of students

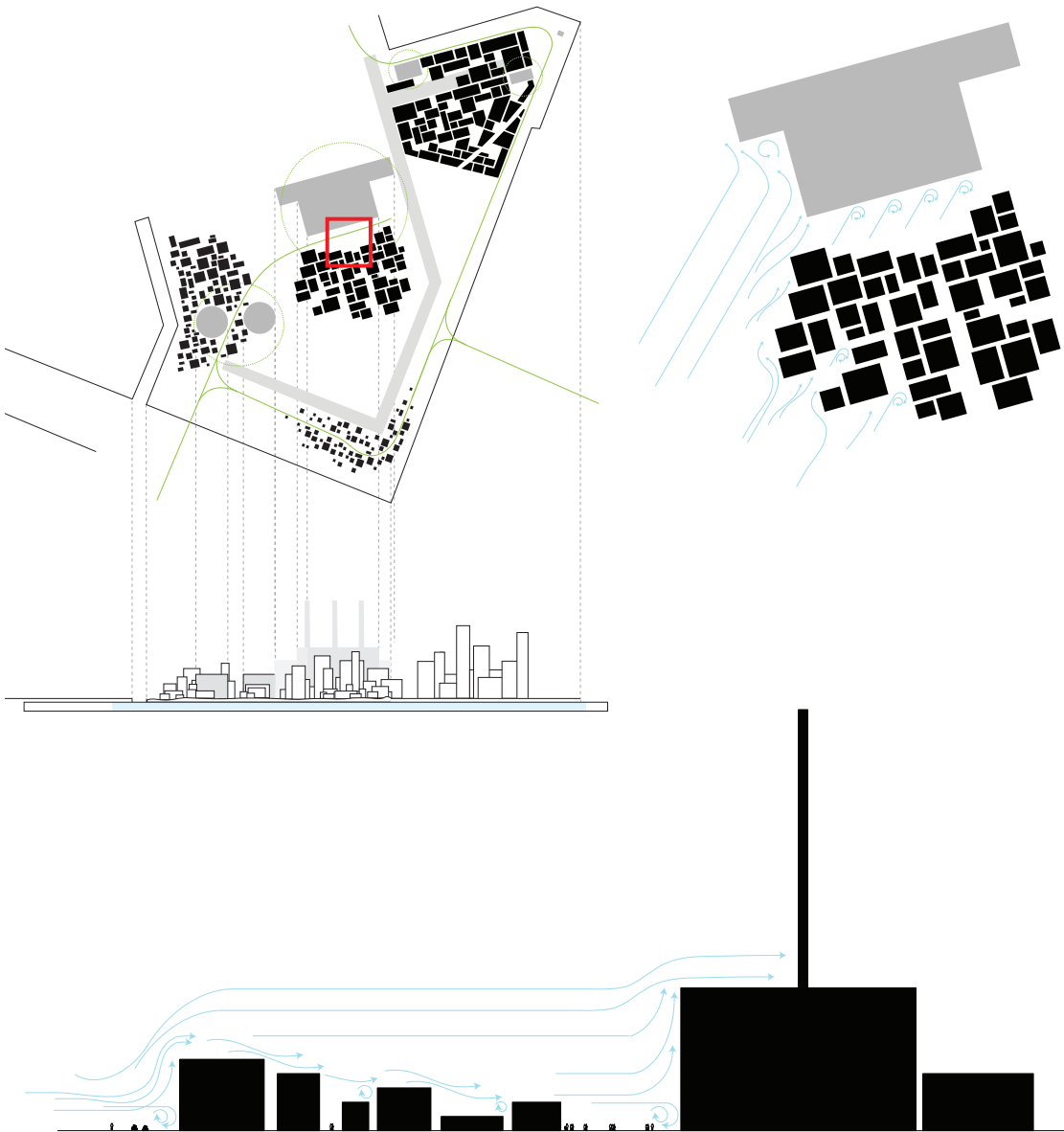
32

Collaboration partners

Syddansk Universitet (SDU) i Odense, Ingeniørhøjskolen i København (IHK)

Date

September November 2009 and 2010



Student work; Sarah Wriedt, Maja Hansen og Shabana Yasmin

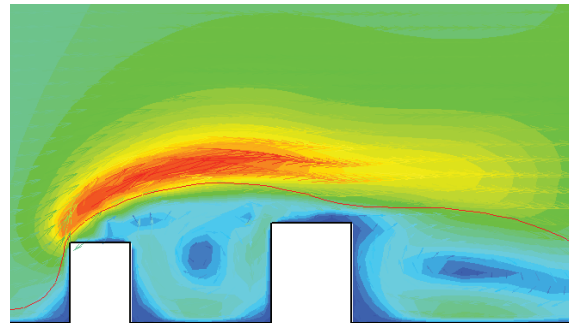
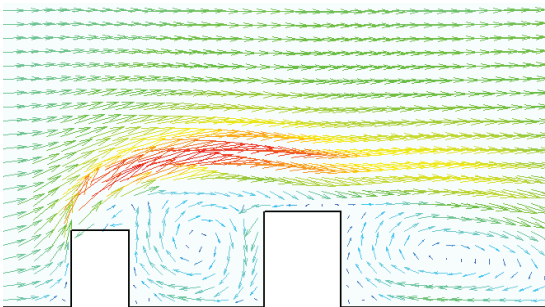
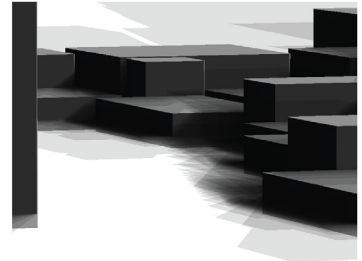
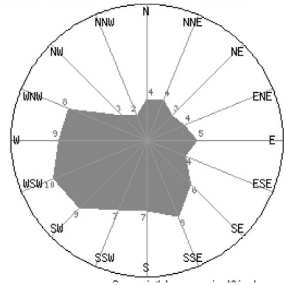
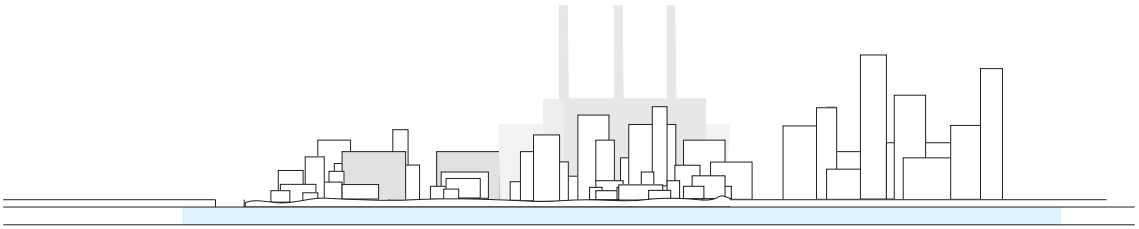
URBAN-BIM

The urban-BIM course focuses on the use of digital simulation for the early design stages of renovation, conservation and enhancement projects of existing urban structures and buildings.

The course first introduced analysis tools and stressed site specific strategies and the connection of climate and urban morphology. The course then sought to further students of this via hands-on experiments. For this, design oriented simulation tools like Ecotect were introduced. This endeavour ran in parallel to staged assignments. These allowed the course to touch both conceptual as well

as technical questions. Here participants gained a personal understanding of otherwise abstract questions as the level of detail that a 3D model has to have for specific energy and environmental simulations.

In its progress the UrbanBIM course focused on architectural qualities and how these can be established and maintained through BIM methods when existing buildings have to meet low emission demands. The planning of a zero-energy building served here as case for testing and reflection.



Student work; Anne-Mette Hjøllund Madsen

Teachers

Odilo Schoch and Lars Klint

Date

18 January - 22 January 2010

Location

The Royal Danish Academy of Fine Arts School of Architecture, Copenhagen

Number of students

17

Collaboration partners

Department 3

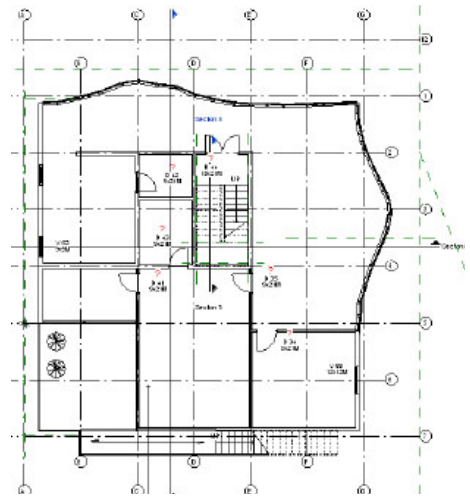
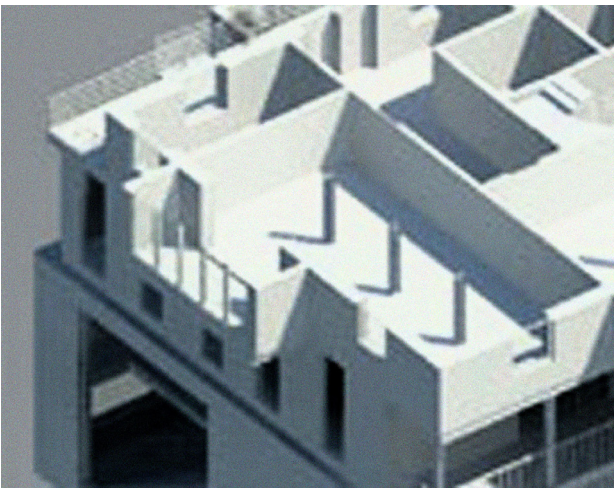


REVIT INTRODUCTION

The course introduced the parametric 3D modeling and construction software AutoDesk Revit. Revit is widely used in Danish and international architectural offices and often taken as synonym for BIM. Gaining knowledge in this software environment enables students to meet market demands. The course familiarizes the functionalities of Revit and how it can be integrated into an architectural design project.

The course was open to students from all level of studies and was taught for 3 hours per day. This

allowed participants to work in parallel in their design studios and enabled the transfer of revit based techniques into their semester projects. Using a problem based method, the course started with students working on a collaborative project. A high-rise building was taken as case. As each student worked on a single floor Revit's ability to collaborate within teams was used to share the individual designs in the group. This allowed the students to create interfaces as stairs between the architectural elements.



Collected student work

In the second part of the course, the students were asked to build up their current studio project in Revit as a 3D model. This allowed to question their approach and eventually make it meet real world constrains in a better way.

Teacher

Odilo Schoch and Maya Grøn

Location

The Royal Danish Academy of Fine Arts School of Architecture, Copenhagen

Number of students

56 (bachelor and candidate)

Date

April - May 2010

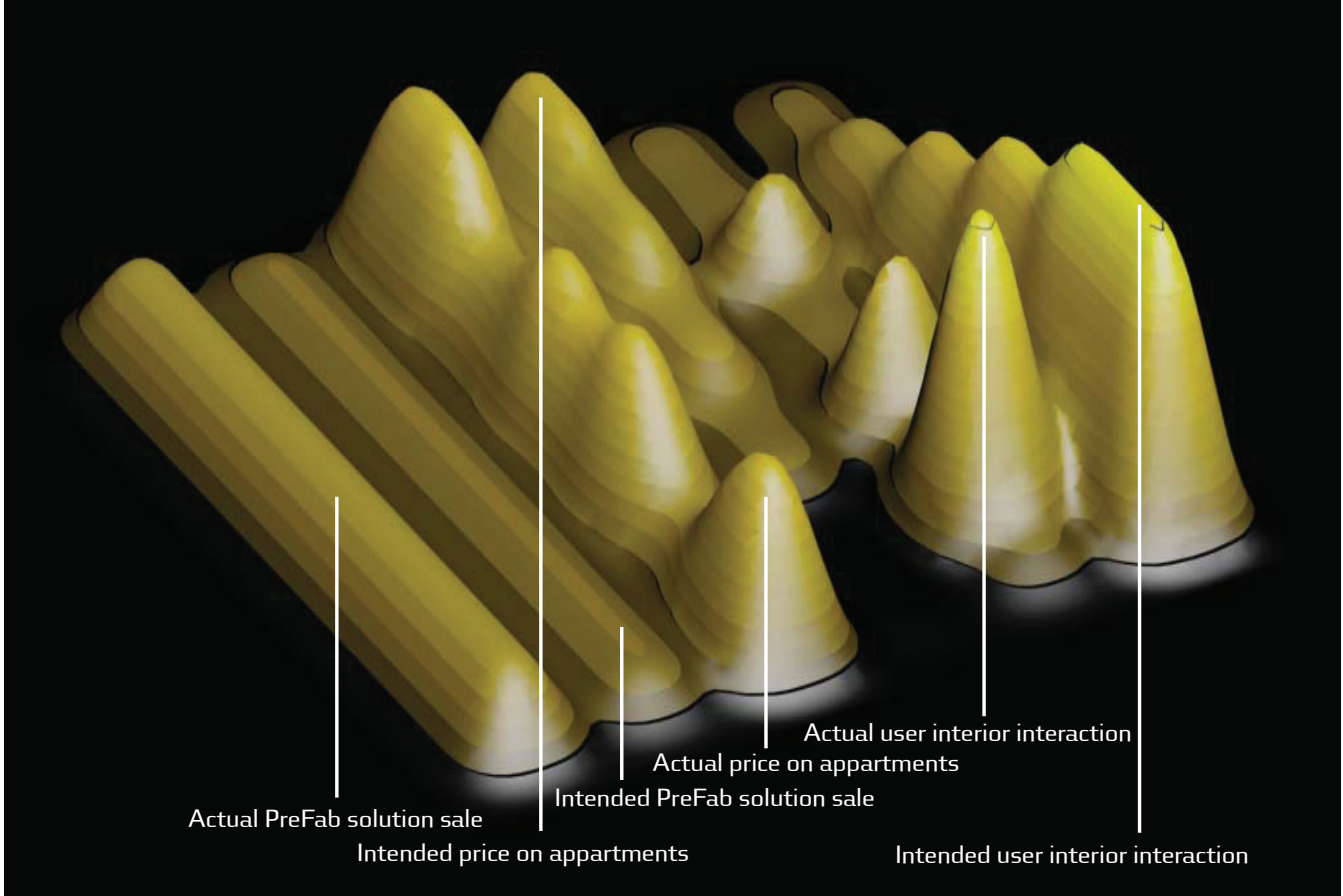


Diagram shows the implications of the crisis on the user interactive project 'Æblelunden' by Vandkunsten
Student Work; Per Winbladh Carlsen

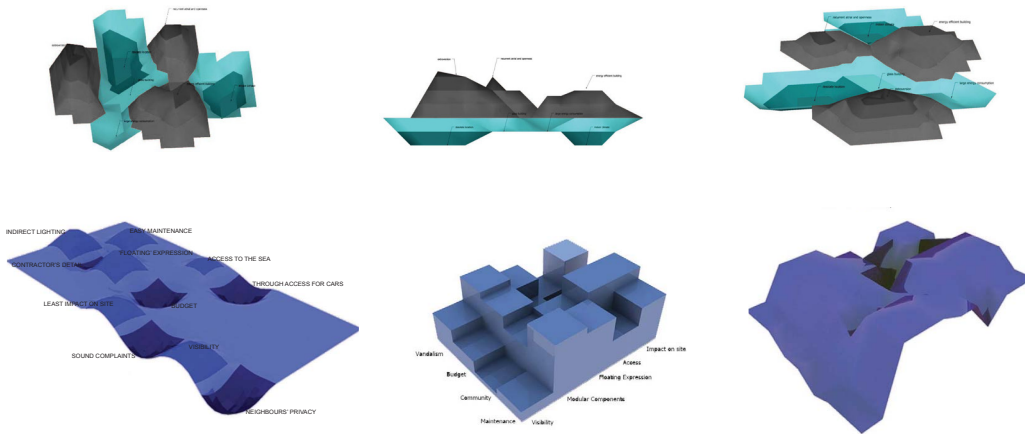
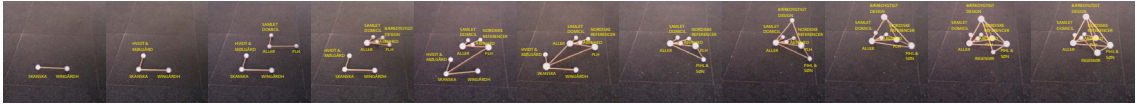
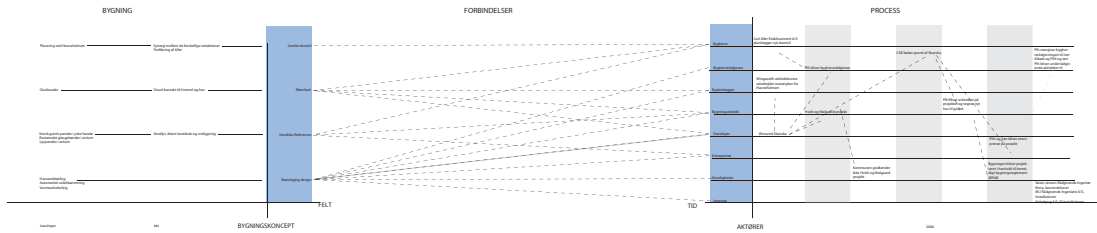
BIM-DOCUMENTATION

The course introduced BIM methods as means for self-evaluation within a design process. Like in other creative processes, a critical assessment of one's own path of creation creates potential for improvement.

The method chosen in the BIM documentation course was a detailed self-documentation of process and activities, in order to create a personal awareness of one's own creative approach. While this approach might lead to more success in later design tasks, the introduction of BIM environments create an immediate necessity to know

one's own creative processes as BIM software often prescribes certain ways of working on architectural processes. These processes lend towards the administrative and technical and are observed as hermetic. A clear understanding on one's own design process empowers designers to question the given and subsequently start to restructure the given so that it fits their needs.

The BIM documentation course ran in two parallel design studios and included weekly counselling. A compact 5-day workshop taught ways of segmenting complex tasks in architectural design



Student work: Jesper B. Andreasen, Anders H. Jelstrup, Nicolas T. Harrison, Main Schaedel, Christoffer B. Weile, Marie R. Langballe, Tina T. Torggrimsby Asdis Andersdottir

into elementary operations. Lectures introduced semantic processing of spatially related user data in a building and state-of-the-art processes within architectural design. Guest lectures were held by the award winning office 'Architecture and Vision' that pursue highly integrated and parametric and design work and by Mizuki Oka from the Center for Knowledge Management, University of Japan, on 'Supporting Collaborative Design Work'.

In order to strengthen the tool basis participants had as well access to parallel BIM related courses such as the introduction into Autodesk's Revit Architecture.

Teachers

Odilo Schoch, Merete Ahnfeldt-Møllerup

Guests

Andreas Vogler, Arturo Vittori, Mizuki Oka.

Location

The Royal Danish Academy of Fine Arts School of Architecture, Copenhagen

Number of students

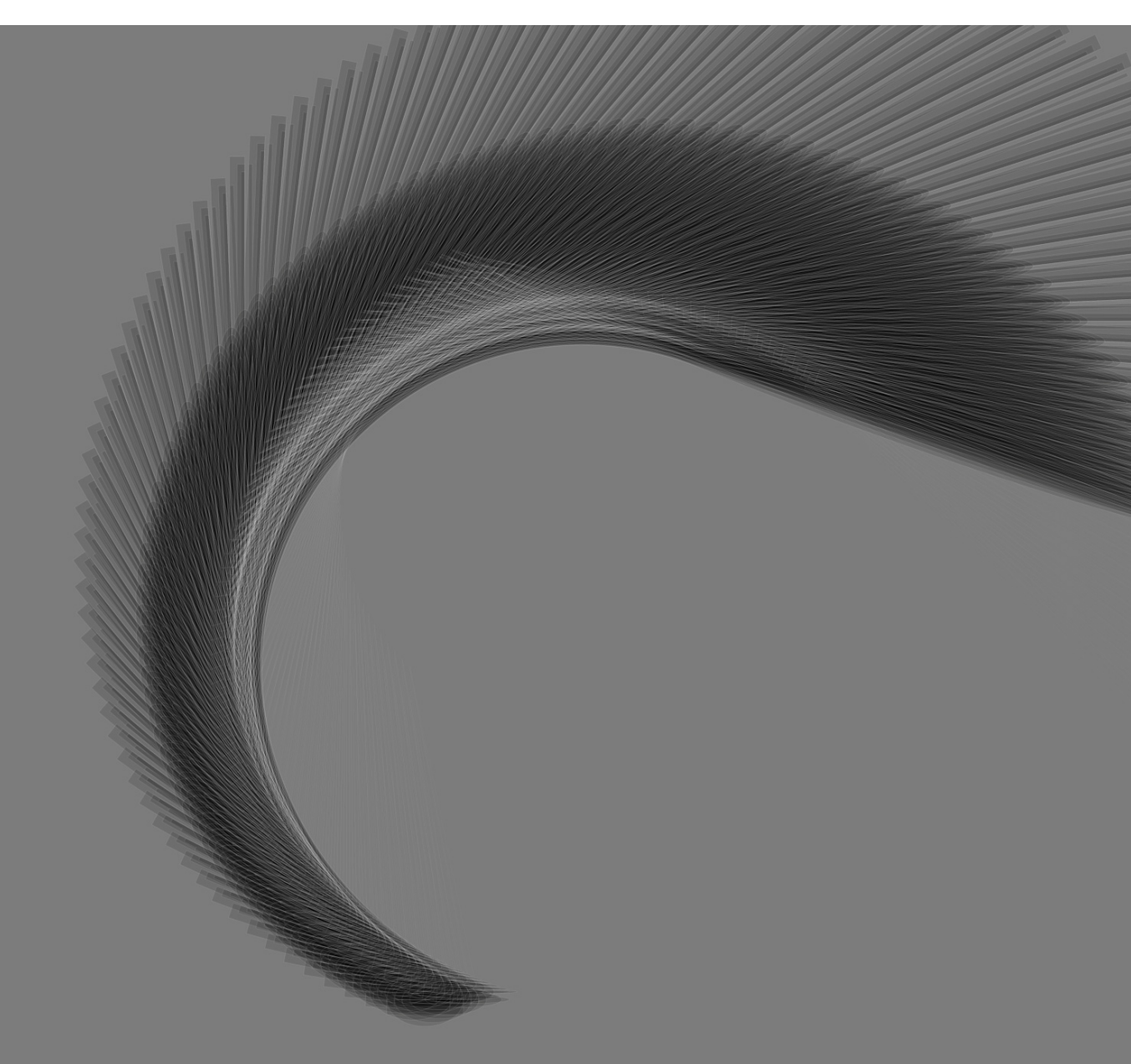
14 (bachelor)

Collaboration partners

Department 11

Date

March - June 2010



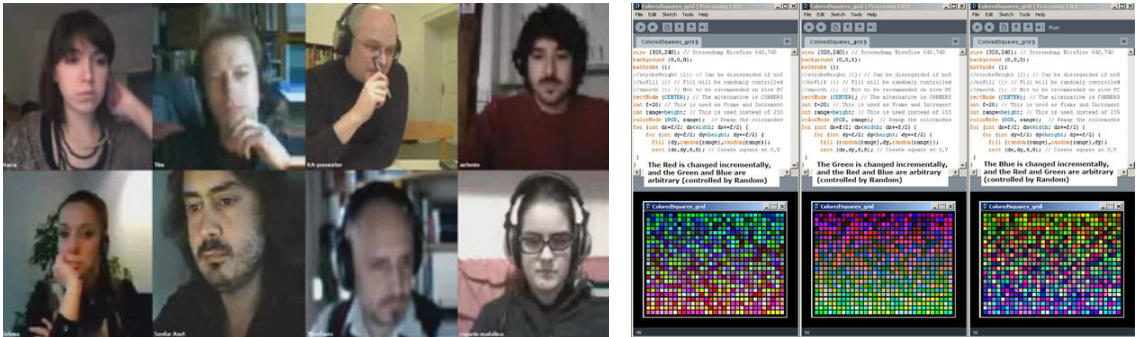
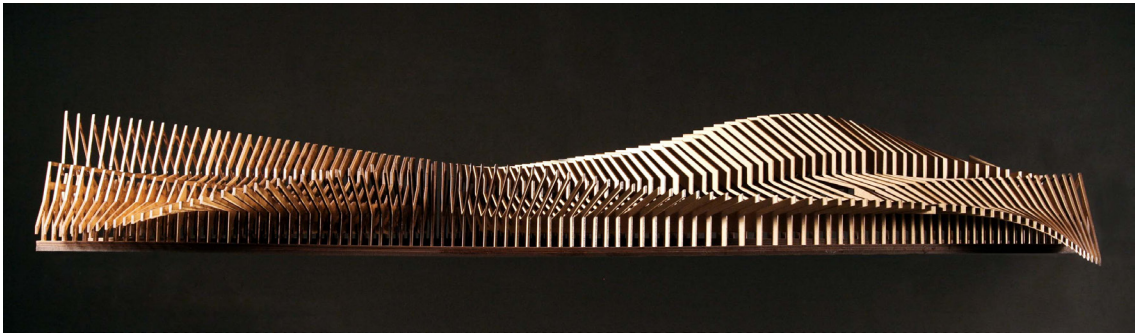
2010 E-ARCHIDOCT DIGITAL DESIGN AND PRODUCTION IN ARCHITECTURE

E-archidoct is a European initiative that aims to create a virtual environment for post-master educational collaboration within architecture. Within this frame CITA offered the two courses 'Digital Design Practice' (DDP). The course emphasised four key areas: Digital Tectonics, Programming and BIM concepts, Control of Geometry and Open Code. It combined theory with application of digital tools within architectural design.

The courses introduced key concepts and tools based on international cases as well as CITA's own research projects. Tutorials and cases range from

parametric software for CAD and CAM, scripting to machinic production within architecture. Introduced international cases were work of 'Renzo Piano Building Workshop', 'Zaha Hadid Architects' or 'UN studio' as well as the work of consultants to architect such as the office 'designtoproduction'. Due to the direct contact to some of those practises, CITA was able to give first hand information to the participants.

The participating students originated from 5 different countries. The teachers were located in Copenhagen, Denmark and partly in Izmir, Turkey.



Collected participants work

Typically, architectural design, BIM thinking and related techniques are usually taught via a direct interaction between student and teacher over longer periods of time, however the e-archidcot setup required a new set of communication methods. Several tools were introduced in order to establish interaction over distance. Among those were life sessions using the AdobeConnect platform offered by Danish Forskningsnettet.dk and fee on-line collaboration platforms.

Teachers

Mette Ramsgard Thomsen, Martin Tamke, Serdar Asut, Odilo Schoch

Collaboration partners

The project 'e-archidcot' is operated by a partnership of 15 European Schools of Architecture.

Date

Spring 2008/2009 and winter 2009/2010



Student work: Elias Lindhoff

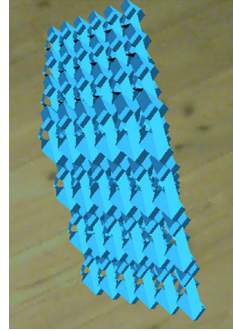
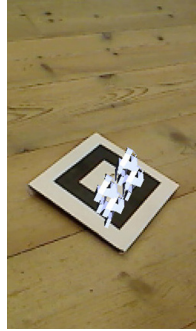
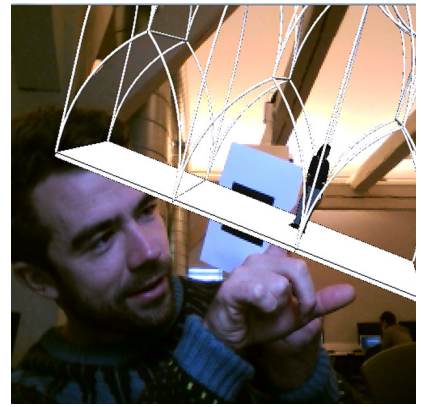
AUGMENTED-BIM

Augmented Reality (AR) is "...a term for a live direct or indirect view of a physical real-world environment whose elements are augmented by virtual computer-generated sensory input such as sound or graphics." (source: http://en.wikipedia.org/wiki/Augmented_reality)

The research-led course investigated new output channels to existing BIM models creating new insights into ongoing design and immediate added value. Participants established a real-time link between a design proposal and its site. Techniques were introduced that allowed a rapid export of de-

sign data into open-source AR software. The tools used were low cost digital cameras and tracking tools for visualisation purposes. We found that these are today a standard part of most digital design environment. AR provides designers with an instant and easy to achieve perspectives to their existing 3D-data and BIM-models.

Through the course, students realized the benefit of designing in a digital workflow. Further elements such as a feedback loop generated via AR techniques, can be easily attached to already existing digital design and planning chains.



Collected student work

Teacher

Odilo Schoch

Location

The Royal Danish Academy of Fine Arts School of Architecture, Copenhagen

Number of students

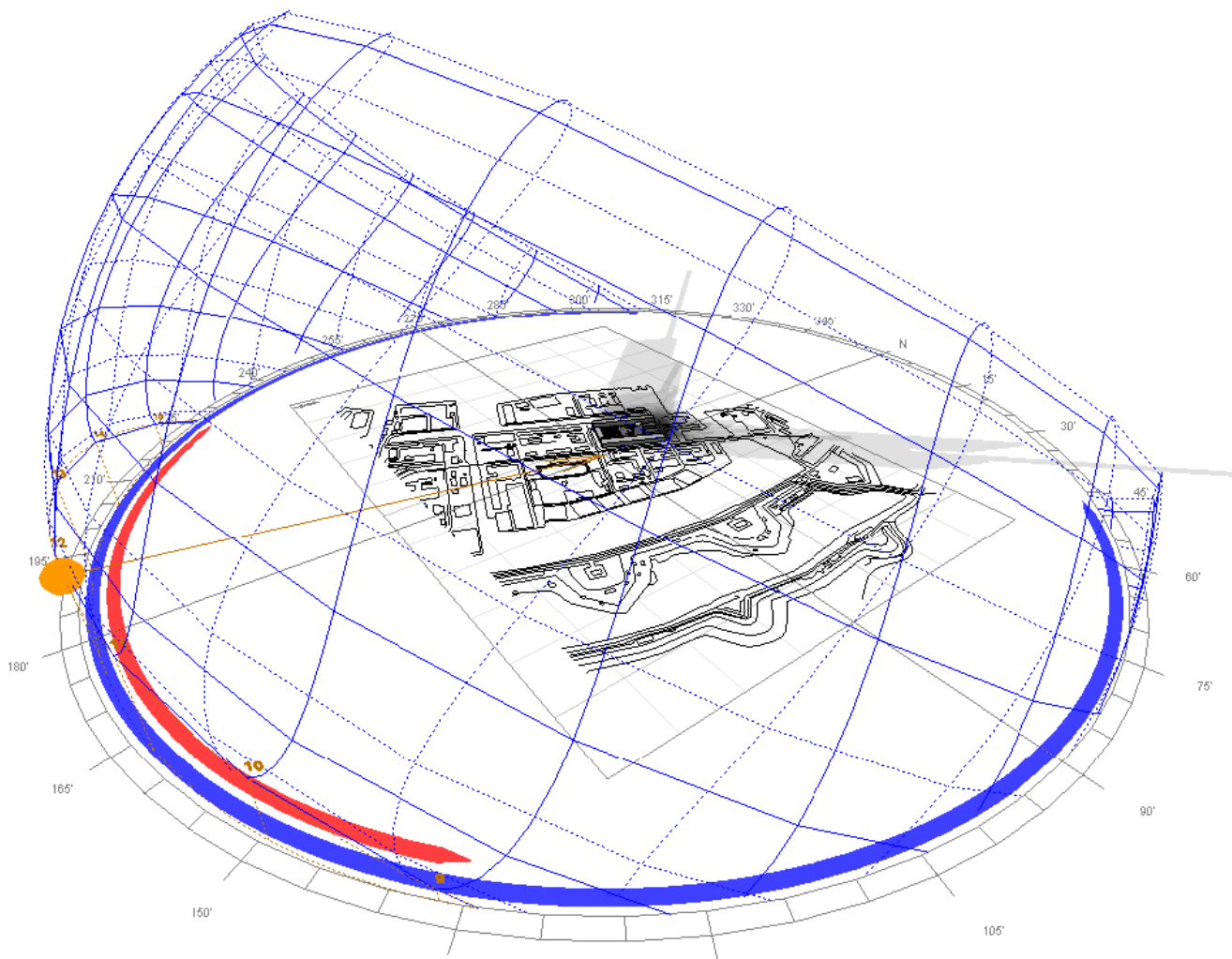
18(candidate)

Collaboration partners

Department 2

Date

November 2010

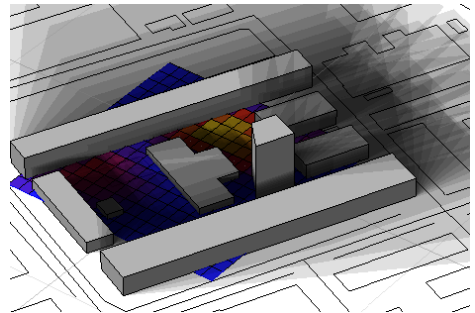
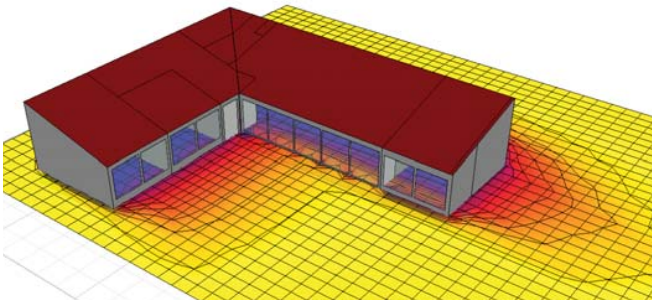
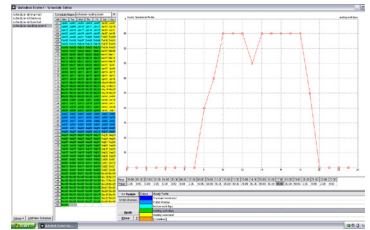
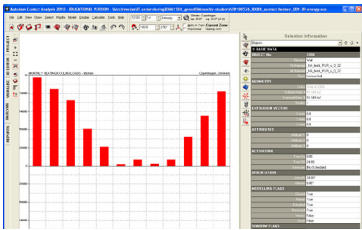
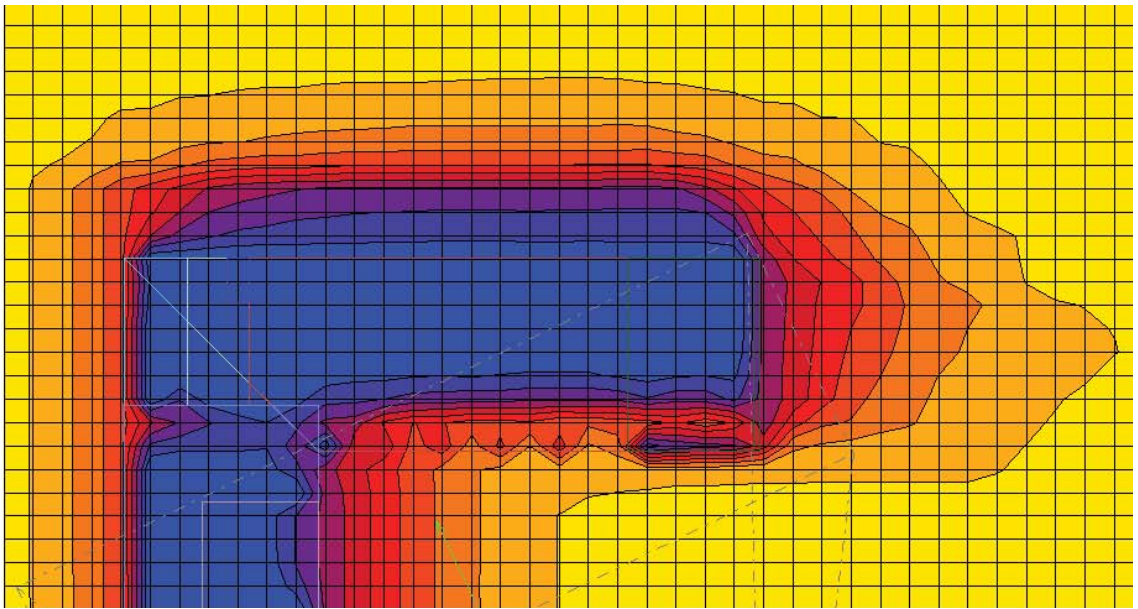


GREEN-BIM-NANO

Contemporary architecture has to respond to highly complex demands concerning usability, functionality and energy. BIM concepts and related techniques for environmental simulation offer means to manage the evolving complex design tasks. The course introduced these methods with a case study. Here students were asked to design a low energy building based on two different spaces with different activities after a short introduction into the environmental simulation software Autodesk Ecotect 2010.

By using design iterations and shifting the timing

of energy loads within Ecotect, the students designed buildings with energy demands as low as 18 kWh/m² for heating and cooling. By improving isolation, positioning and retiming the activities, windows, volumes the students got an understanding of the complex relations within a building and that good design can deal with all aspects of the build environment. The outcome was that participants learned to successfully balance the various aspects of building design; namely, inhabitation, spatial quality and program, with energy concerns such as thermal comfort, heating and cooling.



Collected student work

Teacher

Odilo Schoch

Location

The Royal Danish Academy of Fine Arts School of Architecture, Copenhagen

Number of students

18 (bachelor and candidate)

Date

May 2010



GRADUAND COURSE

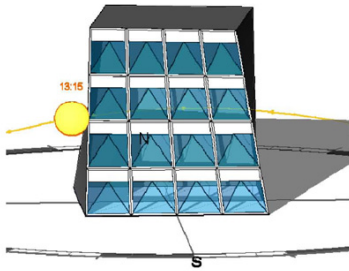
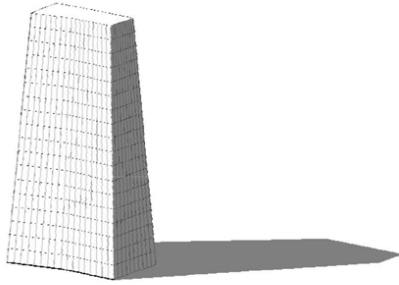
In 2010 the ministry of culture asked its educational institutions to offer courses for newly graduated students in order to increase their employment opportunities through specialist knowledge.

Following this call CITA developed a series of courses in building information modelling for qualified graduates. The four week course taught both on the conceptual as well as on the technological level.

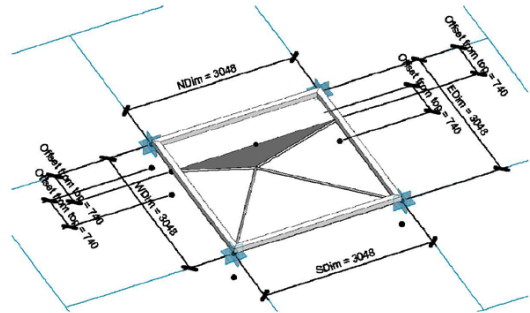
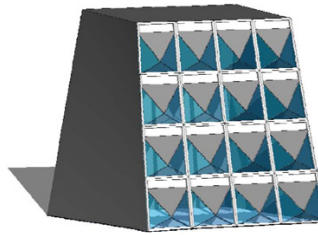
Participants received training in parametric and BIM related software for modelling. A problem-

based approach was chosen, where single family houses from the Danish architectural heritage provided the cases for fictitious renovation and transformation projects.

The course introduced at a concept level, the understanding of 'performative system design', in which buildings are designed to adapt to changes in their environment. Lectures and seminars gave a theoretical background while design led tasks allowed participants to engage directly with the idea of adaptable systems design. The course focused on the teaching of advanced parametric modelling



Michail Golubiev



Student work: Michail Golubjev

techniques in Revit and Rhino and a proposed design was evaluated in relation to energy consumption through the use of the energy simulation software, Ecotect.

Teachers

Odilo Schoch, Morten Myrup

Location

The Royal Danish Academy of Fine Arts School of Architecture, Copenhagen

Number of students

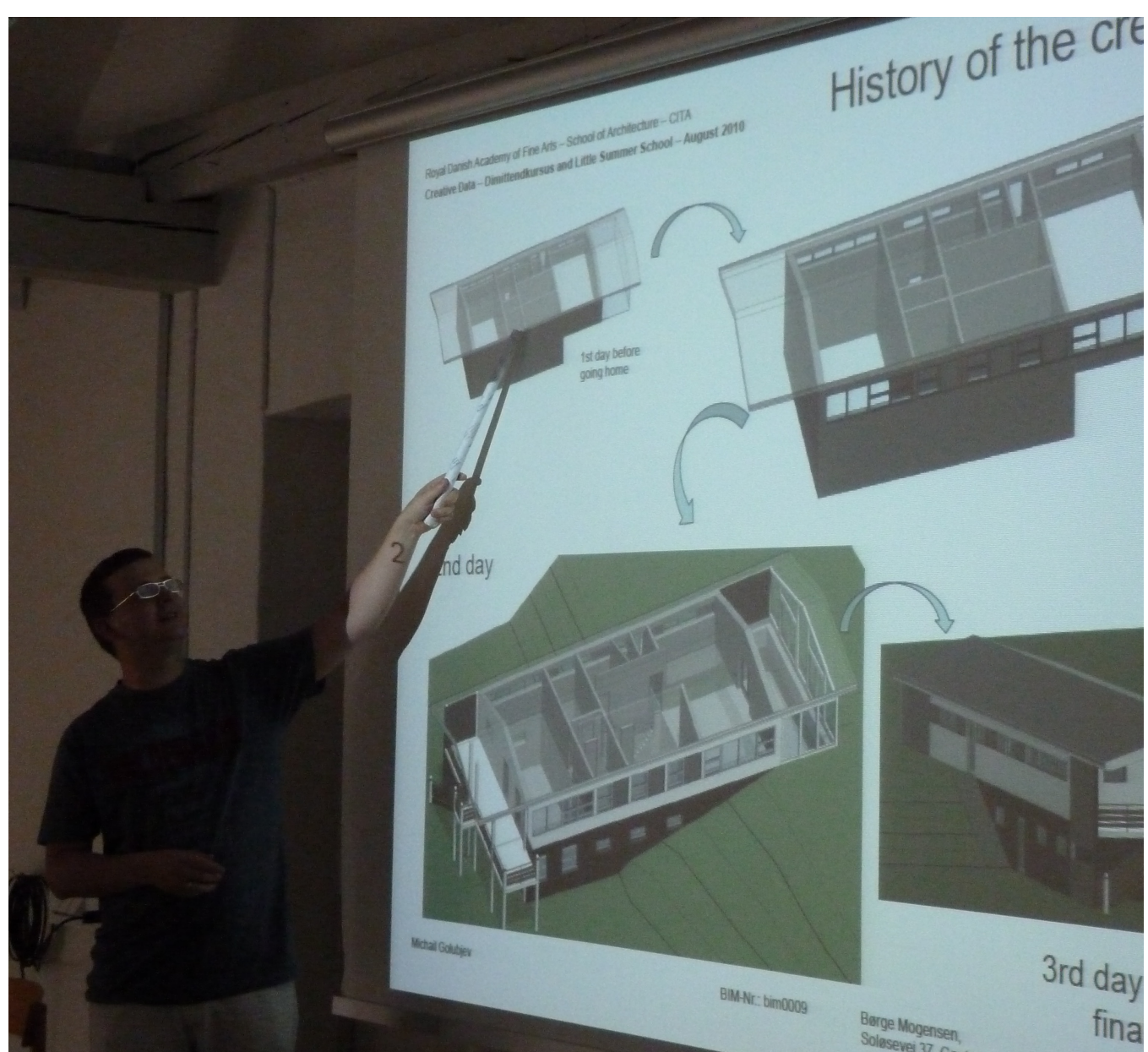
18 (bachelor and candidate)

Participants

Graduates from the Schools of Architecture in Copenhagen and Aarhus, School of Architectural Engineering in Aalborg and The College of Building Engineering in Copenhagen.

Date

2 - 27 August 2010



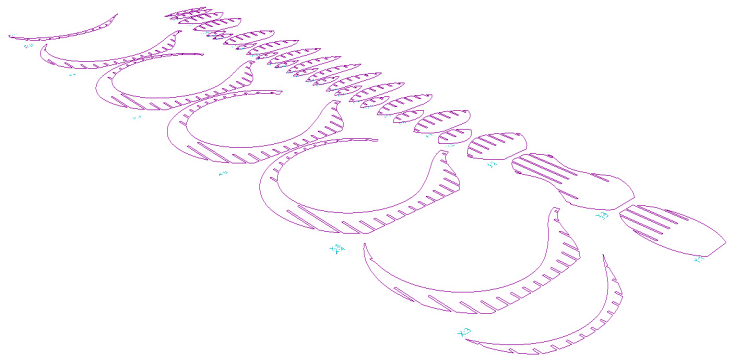
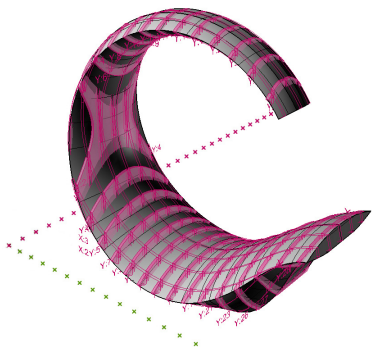
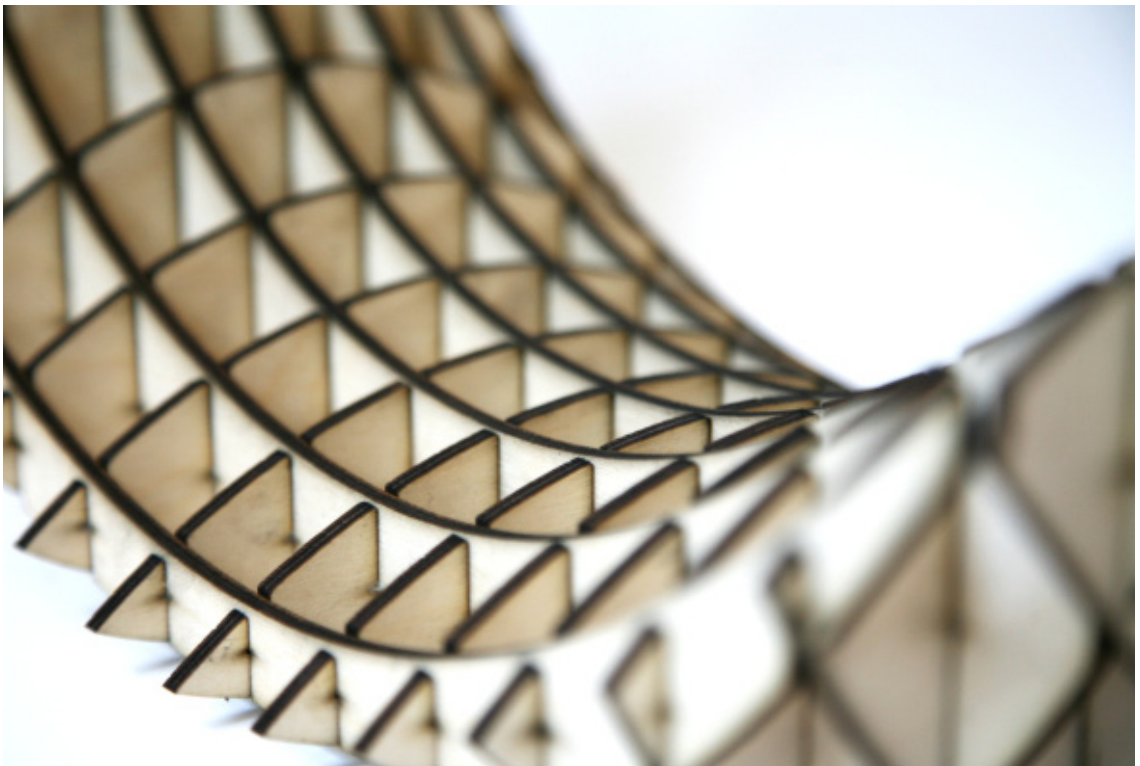
PROFESSIONAL TRAINING AT THE SCHOOL OF ARCHITECTURE 2010

In the summer of 2010 the The Royal Danish Academy of Fine Arts School of Architecture, Copenhagen, initiated further training in specialist fields for architects and other professionals of the building industry. CITA hosted the first course for 18 architects and building engineers.

Digital Design and Fabrication

The aim of the course is to train architects and designers in state-of-the-art BIM related digital design tools and fabrication methods, thereby making them capable of utilizing the cost-effec-

tive and time-saving digital processes in their own studios. In order to make the course effective for the participants, the first course concentrated on area very pertinent field within Building Information Modelling. Digital Design and Fabrication sought to teach techniques that can easily be applied in the field of architectural representation as well as production. The course covered design of models for fabrication with rapid prototyping machines such as lasercutters and a plaster printer. A project-based hand-on approach was chosen that allowed participants to gain skills on every level of



Student work: Ulrik Rosenørn

the digital design and production chain.

The courses are realised in collaboration with the Center for further training at the Copenhagen University College of Engineering and completed after 9 weeks of full time education with 54 participants since 2010.

Teacher

Morten Myrup

Collaborators

3XN, GXN, BIG, Bystrup Arkitekter, Bang & Oluf-

sen, David Lewis Designers, Institute for Design and Communication, KA, CITA - Center for Information Technology and Architecture, KA

Location

The Royal Danish Academy of Fine Arts School of Architecture, Copenhagen

Number of students

54

Date

August & September 2010



PROFESSIONAL TRAINING AT THE SCHOOL OF ARCHITECTURE 2011

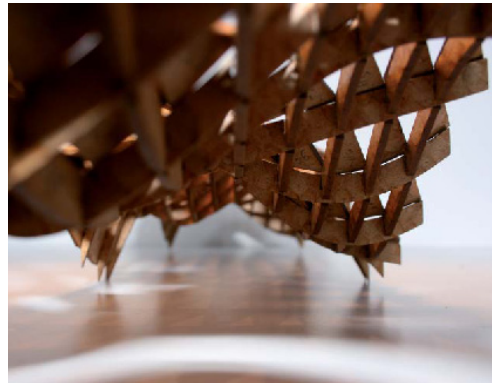
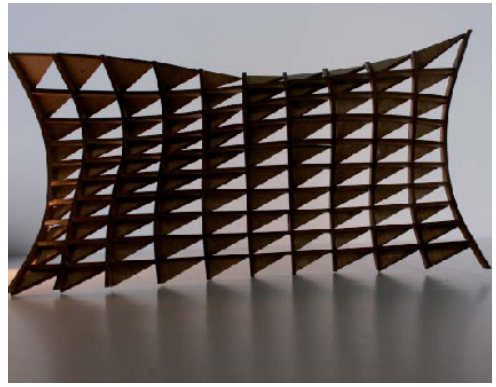
The immediate success of the Professional Training at the School of Architecture in 2010 prompted initiator, organiser and teacher Morten Myrup, to repeat the initiative in February and March, 2011. This time the course was expanded with a 3 week module called Digital Building and Project Design dedicated to BIM.

Digital Building and Project Design

This course introduces architects and building designers to the latest digital design and simulation tools and the concepts behind BIM. Participants learn for example, about the practical implementation of BIM standards in Danish laws and regulations. The goal of course is to give participants an

understanding of the benefits and scope of the implementation of BIM in the construction industry.

The first phase of the course stresses background and implementation of Digital Construction in Denmark. This is followed by an introduction to the 3D design tool, Revit Architecture, which so far is the most commonly used BIM modelling software in Denmark. A single-family home from the Danish heritage was used as a sample project, with which to practice methods associated with a BIM Model, such as the extraction of construction drawings, information on volume and price and the viewing and exchange with collaborators via IFC file format. The final phase focuses on the estimation of



Student work: Karitas Möller, Andreas Munksgaard, Linda Jensen, Vignir Freyr Helgason,

energy use and the feedback of this information into the architectural design process using BIM tools. The course concluded with a conference on entrepreneurship, economics and leadership for architects and designers.

The courses are realised in collaboration of CITA and the School of Architecture with the Centre for further training at the Copenhagen University College of Engineering and completed after 9 weeks of full time education with 54 participants since 2010.

Teacher

Morten Myrup

Collaborators

3XN, GXN, BIG, Bystrup Arkitekter, Bang & Olufsen, David Lewis Designers, Institute for Design and Communication, KA, CITA

Location

The Royal Danish Academy of Fine Arts School of Architecture, Copenhagen

Number of students

54

Date

February & March 2011



The background of the image is a solid, deep purple color. Overlaid on this background is a complex network of white dots (nodes) connected by thin, light orange lines. The lines form a dense web of interconnected paths, with some lines being thicker than others. The overall effect is that of a digital or communication network. The word "COMMUNICATION" is centered in the lower half of the image in a white, sans-serif font.

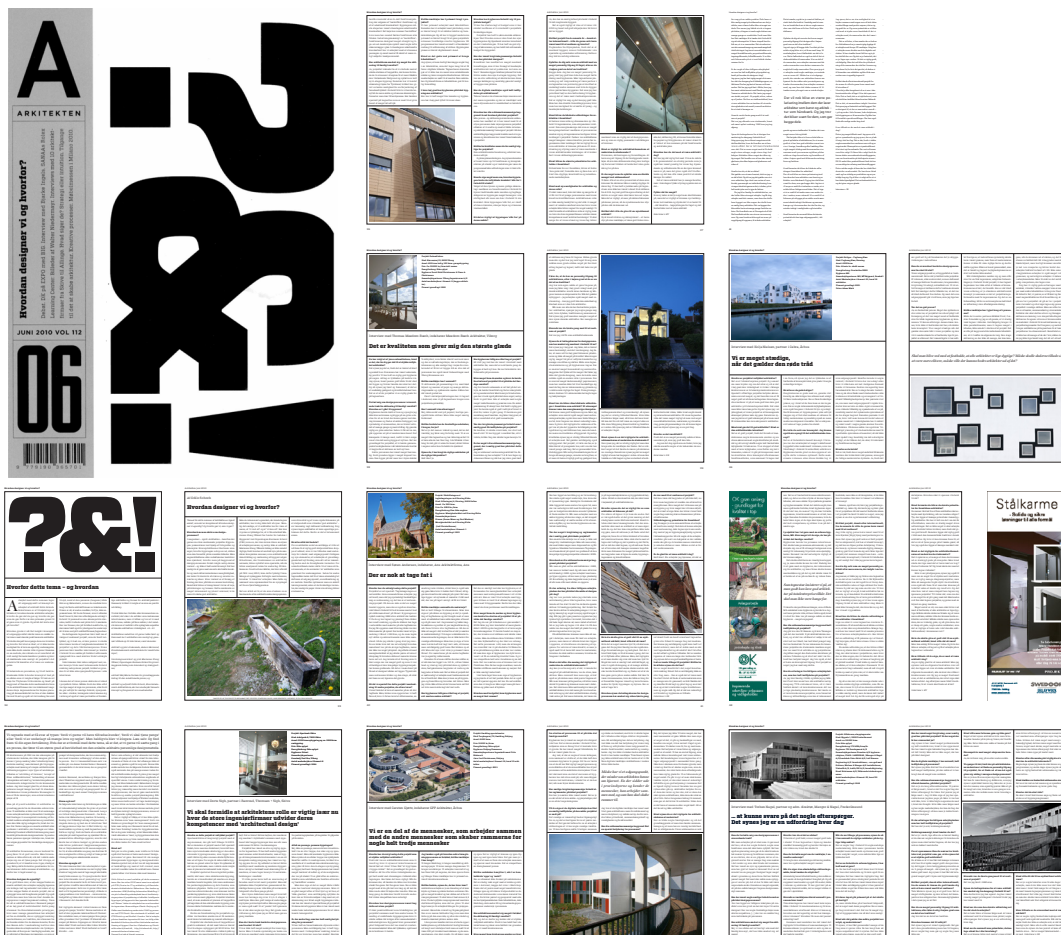
COMMUNICATION

COMMUNICATION

As part of our emphasis on the networking with local and global partners, we have established a broad communication practice. BIM addresses all the partnerships in the building industry and affects their individual practices as well as the way in which they interface and collaborate. The aim for our communication strategy has been to address the wider network of these partnerships through live events such as workshops, seminars and symposia and publications. The live events have focussed on sharing and debate directed to a cross disciplinary partnership of architects and engineers. This has been expanded by an extensive programme of professional talks taking place directly in offices, at organised dissemination events and public lecture spaces.

This focus on community based shared has further been supported by publication in the national architects journals as well as international journals where we have communicated our research finding to a broad professional public. Finally our research results have also been reported in the formal research journals, book chapters and conference presentations.

Our goal has been to create a lasting communication platform on a national as well as international level that allows us to discuss and verify our research findings and generate a context for further research projects.



GUEST-EDITORIAL ON “DESIGN PROCESSES” IN ARKITEKTEN 06 JUNE 2010 VOLUME 112

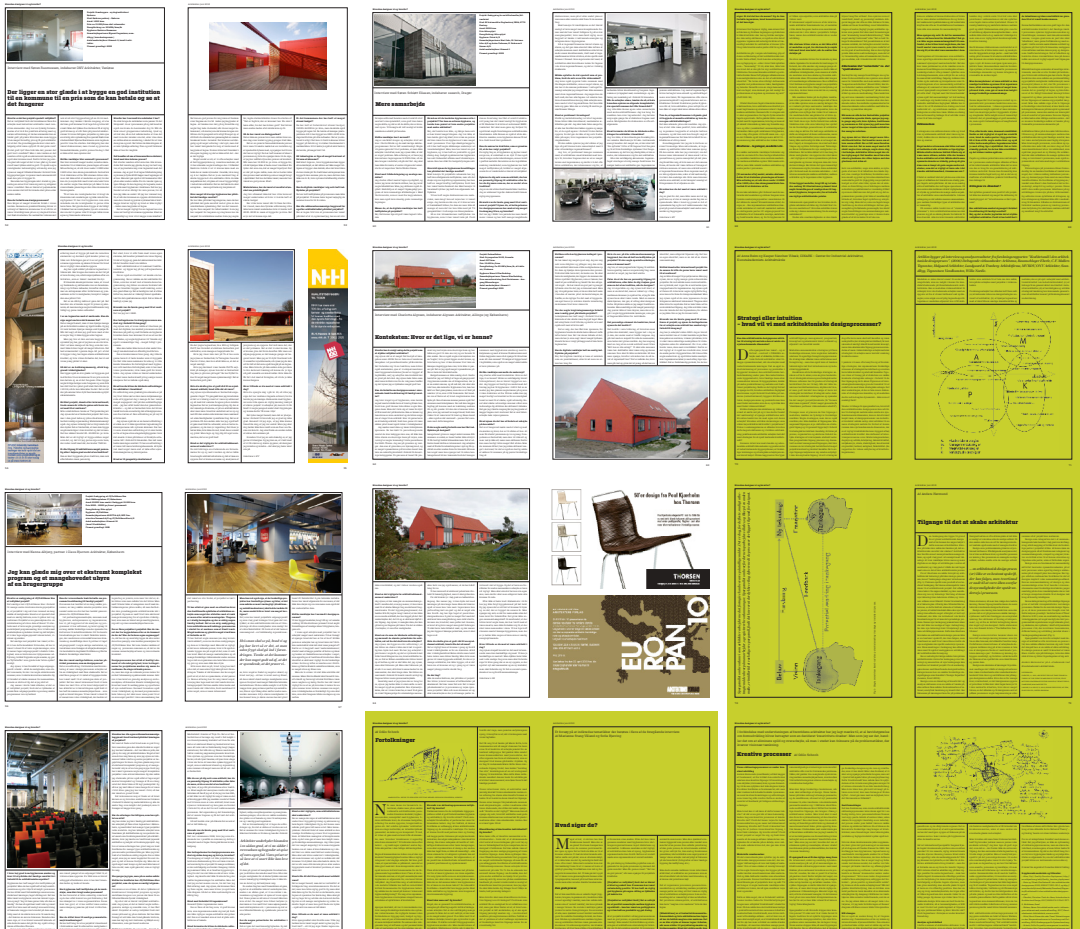
Denmark's leading architecture magazine Arkitekten invited CITA member Odilo Schoch in 2010 to be Guest-editor of an issue on methods in architectural practice. This issue, “How we design and why?”, set a focus on design processes in Danish architectural practice.

10 offices were selected for a case study. All of these practices are positioned on a fictitious line through the country and represent enterprises of all sizes positioned in rural as well as urban areas.

Employing an interview based method we gained in-depth knowledge on the way architecture is created today. The interviews showed how practices blend traditional techniques and digital tools, how

they structure their design processes and create their individual case based approaches to come to the best possible architectural solution. Reflecting on their daily practice they offered conclusions for a future practice and education.

The insights gained from the ten offices were analyzed and classified by CITA. Articles by leading players in the field reflected on the insights gained and contributed to the ongoing discussion on the proceeding changes in contemporary design practice. It became obvious that generic solutions and strategies are not at hand. Contrary to the suggestions by BIM software manufacturers and standardisation agencies each office should rather shape



his individual approach and collaborations into custom made processes. Were tools and methods for doing so are still under research a future practice emerges in which offices position themselves on a competitive market with individual tuned profiles, knowledge and skills.

Publications

2009:

"Ubicomp-Kaized" paper

- Schoch, O. 22 April 2009

Skønhed og usynlige værdier

- Schoch, O. 2009: Arkitekten. 111, 15, p. 8.

En anden modularisering - underopdeling...

- Schoch, O. 2009: Arkitekten. 111, 11, p. 44-45.

... og sætte sammen på en ny måde

- Schoch, O. 2009: Arkitekten. 111, 11, p. 46-47.

SIM SA LA BIM

- Schoch, O. 2009: Arkitekten. 111, 8, p. 32-35.

Baumschlager - Eberle: laboratoriebygning, Zürich 2009

- Schoch, O. 2009: Arkitektur Magasinet. 1, 5, p. 61.

Form, liv og cyklus: en skitseringsmetode

- Schoch, O. 2009: Arkitektur Magasinet. 1, 5, p. 56-57.

Efflorescence of mirabilite, epsomite and gypsum traced by automated monitoring on-site

- Zehnder, K. & Schoch, O. 2009: Journal of Cultural Heritage. 10, p. 319-330.

BIM og parametriske formgivning

Hermund, A. 2009 I : Arkitekten. 8, s. 25-29. 5 s.

Building information modeling in the architectural design phases

- Hermund, A. 2009 in COMPUTATION: the new realm of architectural design: Proceedings of the 27th Conference on Education and Research in Computer Aided Architectural Design in Europe. red. / Gülen Cagdas ; Birgül Colakoglu. Vol. 27 2009. s. 75-81

Digital wood craft

-Tamke, M. & Ramsgaard Thomsen, M. 2009 CAAD Futures 09. s. 673-683. 11 s.

Implementing digital crafting : developing: it's a SMALL world

-Tamke, M. & Ramsgaard Thomsen, M. 2009

Non_standard Wood: A practice based design research in the fabrication of complex wood construction

-Tamke, M. 2009

Whispering wind: Digital practice and the sustainable agenda

-Barlieb, C., Richter, C., Greschner, B. & Tamke, M. 2009

eCAADe 2009: 27th eCAADe Conference. 26. s. 543-550.

Behaving architecture

-Ramsgaard Thomsen, M. 2009 Sensing space: future architecture by technology. Heinich, N. & Eidner, F. (red.). Berlin : Jovis s. 126-131. 6 s. (a:p arkitektur:positionen).

Implementing digital crafting: developing: it's a SMALL world

-Tamke, M. & Ramsgaard Thomsen, M. 2009 Design Modelling Symposium Berlin: concepts beyond geometry. Gengnagel, C. (red.). Berlin : University of the Arts s. 321-329. 9 s.

Smart surfaces – and their application in architecture and design

-Ramsgaard Thomsen, M. 2009 Basel.

"Greg Lynn: Interview with Mette Ramsgard Thomsen"

-Ramsgard Thomsen, M. , in ArkitekturM VOL 1, Nr 3, 2009

2010:

International Journal on Architectural Computing (IJAC)

- Tamke, M, 2009 - 2010

Brikker til en "bimmet" skitsering

- Schoch, O. 2011: Bips nyt. 1/2011, p. 24-27

Dänisches Datenmanagement

- Schoch, O. 30 July 2010: Tec21. 18/2010, 31-32, p.16-20

Hvordan designer vi og hvorfor?

- Schoch, O. 01 June 2010: Arkitekten. 112, 6, p. 33-35.

Fortolkninger

- Schoch, O. 01 June 2010: Arkitekten. 112, 6, p. 66-69.

Kreative processer

- Schoch, O. 01 June 2010: Arkitekten. 112, 6, p. 74-75.

Byggeriets fælles sprog tidligst klar i 2013

-Hermund, A. December 2010: Arkitekten. 112, 11, p. 8-9.

Tilgange til det at skabe arkitektur

-Hermund, A. 2010: Arkitekten. 112, 6, s. 72-73.

Architecture 10 – "it's not what it looks like it's what it does"

-Ramsgaard Thomsen, M. 2010: Architecture Australia. 99, 3, s. 27-28.

Bofinger, K, "How to Design Exhibitions", presentation of It's A SMALL World, Form: The Making of Design, Vol 230, Jan-Feb 2010.

2011:

Designing with Deformation - Sketching material and aggregate behaviour of actively deforming structures

-Deleuran, A., Tamke, M., Ramsgard Thomsen, in Proceeding of Symposium on Simulation for Architecture and Urban Design, SimAUD 2011, Boston, MA, USA, 4.-7. April 2011

Design environments for material performance

-Tamke, M., Burry, M., Burry, J., Ramsgaard Thomsen, M., in Design Modelling Symposium Berlin 2011, Berlin, Germany, 5. October 2011, p. 321-329.
Ramsgaard Thomsen, M "Digital Material Practices: Adaptive Architectures for an Idealisation of the Soft", Volume, Archis 2011, No 2, p 158-161

"Textile logics for a soft space: The impact of digital technology applied to textile architecture according to CITA".

-Ramsgaard Thomsen, M
Domus Issue 927, Juli 2009

"Generating a scalar logic: producing the "it's a SMALL world" exhibition"

- Ramsgaard Thomsen, M., Tamke, M. in International Journal Architectural Computing Vol. 9-2. To be printed winter 2011.

Professional talks

2008:

"Ambience 08 - Smart Textiles", : Mette Ramsgaard Thomsen præsenterede ved konference "Ambience 08 - Smart Textiles", Borås, 2.6.2009.

Lecture: Mette Ramsgaard Thomsen,
Date: 02 June 2008

Strik som Bygge Materiale

Lecture: Mette Ramsgaard Thomsen,
Date: 01 January 2008
Place: Manchester University, School of Materials,

Building Liveness

Lecture: Mette Ramsgaard Thomsen
Date: 05 February 2008

Digital Art and Culture in the Age of Pervasive Computing

Place: Københavns Universitet
Lecture: Mette Ramsgaard Thomsen
Date: 14 November 2008

Digital Crafting: narratives of making

Lecture: Mette Ramsgaard Thomsen
Date: 29 October 2008

2009:

ARCHITECTURE - DESIGN, QUALITIES, METHODS AND DIGITAL TOOLS

Lecture: Odilo Schoch
Date: 2009

Place: University of Tokyo, Japan

An invited guest lecture at the University of Tokyo, Japan, in 2009 started the closer interaction with their Center for Knowledge Structuring

Keynote: "Hvordan præger digitale redskaber praksis?"

Lecture: Mette Ramsgaard Thomsen
Date: Nov 2009
Place: Arkitekternes Årskonference
"UBICOMP-KAIZED" PAPER
Lecture: Odilo Schoch
Date: 22-25 April 2009
Place: CAADRIA in Yunlin, Taiwan

BIMcamp - teaching future architects the foundations for using BIM

ByggerietsMatch
Lecture: Odilo Schoch
Date: 29 June 2009
Place: Ebeltoft, Denmark

Architecture and Stages in the Experience City

Lecture: Martin Tamke
Date: 04 September 2009

Digital Crafting : Narratives of Making

Lecture: Martin Tamke
Date: 01 May 2009
Place: Denmark

Design Modelling Symposium Berlin 2009

Lecture: Martin Tamke
Date: 05 October 2009
Place: Berlin

Informed Components

Lecture: Martin Tamke
Date: 04 February 2009
Place: Architectural Association School of Architecture

Parametric Woodconstructions : lecture in the frame of the first DigitalCrafting Seminar

Lecture: Martin Tamke
Date: 16 November 2009

Hvordan præger digitale redskaber praksis

Lecture: Mette Ramsgaard Thomsen Arkitekternes Arkitektforeningens Årskonference,
Date: 06 November 2009
Place: IT-Universitet, Copenhagen

Inhabiting a Soft Space: intelligent textiles / textile intelligence

Lecture: Mette Ramsgaard Thomsen
Date: 27 November 2009

Kulturministeriets Forskningsudvalg

Lecture: Mette Ramsgaard Thomsen
Date: 01 July 2009 and 01 July 2012
Place: Medlemskab af udvalg, råd og nævn

Material Computation, Computational Material

Lecture: Mette Ramsgaard Thomsen
Date: 01 February 2009

Practice based research: experimental and reflective investigation

Lecture: Mette Ramsgaard Thomsen
Date: 04 September 2009

Textile Architectures

Lecture: Mette Ramsgaard Thomsen

Date: 04 March 2009

Place: AA Architectural Association, London

Textile architectures: Slow Furl and Knitted Skins Research seminar presentation "Textiles, Ornament, Light and Interior Space"

Lecture: Mette Ramsgaard Thomsen

Date: 27 March 2009

Place: Kolding School of Design,

2010:

BIMloge

Lecture: Odilo Schoch

Date: 3 June 2010

Place: Kunstakademiet Arkitektsskole, Copenhagen

Virtual Buildings and Cityscapes as communication Technologies in the making

Lecture: Odilo Schoch

Date: 29 April 2010

Place: Copenhagen Business School

BIM DAY

Lecture: Anders Hermund and Odilo Schoch

Date: 18 March 2010

Place: KEA, Copenhagen

Aarhus' BIM course - BIM processes, management and projects

Lecture: Odilo Schoch

Date: 23 February 2010

Place: Aarhus School of Architecture

Creative data – a dialogue between physical and virtual architecture

Lecture: Odilo Schoch

Date: 28 April 2010

Place: Copenhagen Business School CBS

Creative Data in Denmark : digital tools and architectural design

Lecture: Odilo Schoch

Date: 29 October 2010

Place: South East University SEU Nanjing

GreenBIM : holistic design approaches

Lecture: Odilo Schoch

Date: 21 May 2010

Place: Teknologisk Institut

Ubicom 2010

Lecture: Odilo Schoch

Date: 26 September 2010

What is kreative about building processes?

Lecture: Odilo Schoch

Date: 09 November 2010

Place: Bern University of Applied Sciences

Generative Formations

Lecture: Martin Tamke

Date: 22 February 2010

Place: Syddansk Universitet Odense

Generative Formations

Lecture: Martin Tamke

Date: 09 September 2010

Place: School of Architecture Aarhus

IASS Conference 2010 "Spatial Structures - Temporarily and permanent"

Lecture: Martin Tamke

Date: 08 November 2010

Parametric Wood constructions

Lecture: Martin Tamke

Date: 05 November 2010

Place: The office of PNY architects

Scalar Formations

Lecture: Martin Tamke

Date: 21 January 2010

Place: HdK Berlin

Scalar Formations

Lecture: Martin Tamke

Date: 03 February 2010

Place: Architectural Association

"Computationally defined materials"

Lecture: Mette Ramsgaard Thomsen

Date: 10 May 2010

Place: CIID Copenhagen Institute of Interaction Design

Architectural Knitted Surfaces

Lecture: Mette Ramsgaard Thomsen

Date: 04 June 2010 - 14 June 2010

Architecture 10

Lecture: Mette Ramsgaard Thomsen

Date: 01 March 2010

Digital Crafting : Seminar Digital Architecture

Lecture: Mette Ramsgaard Thomsen

Date: 17 May 2010

Place: KARCH, Copenhagen

Fremtidens byggematerialer

Lecture: Mette Ramsgaard Thomsen

Date: 08 December 2010

Place: Dansk Arkitektur Center

How would it be to live in a soft space

Lecture: Mette Ramsgaard Thomsen

Date: 02 October 2010

Place: Museu Da Electricidade, Lissabon, Portugal,

Material Thinking

Lecture: Mette Ramsgaard Thomsen

Date: 04 July 2010

Place: Architectural Association, London

Prototypes in Architecture

Lecture: Mette Ramsgaard Thomsen

Date: 05 December 2010

Place: INTERFLEX Vortragsreihe "Stadt & Interaktion"

Technologien für Architekturen der Zukunft? : Sensing

Space: from robotics to material behaviour

Lecture: Mette Ramsgaard Thomsen

Date: 22 June 2010

ACADIA 2010

Lecture: Martin Tamke

Date: 24 October 2010

Place: The Cooper Union, NY

Advances in Architectural Geometry 2010

Lecture: Martin Tamke (Arrangør)

Date: 2010

Place: Vienna, Austria

BIPS conference

Lecture: Martin Tamke

Date: 06 September 2010

Place: Nyborg Strand

Digital Crafting lecture

Lecture: Martin Tamke

Date: 05 November 2010

Place: Architectural Association (AA), London

Digital Crafting lecture

Lecture: Martin Tamke

Date: 21 October 2010

Place: Skidmore Owens Merrill (SOM), New York

Digital Crafting Lecture

Lecture: Martin Tamke

Date: 04 November 2010

Place: Grimshaw Architects, London

2011:

Invited chair Fabricate International Reviewed Conference

Lecture: Mette Ramsgard Thomsen

Date: April 2011

Place: Bartlett School of Architecture, London,

Keynote Smart Geometry Conference

Lecture: Mette Ramsgard Thomsen

Date: 2 April 2011

Place: IT-Universitet, Copenhagen

Keynote "The Material Relation", Design Life Symposium

Lecture: Mette Ramsgard Thomsen and Martin Tamke

Date: May 2011

Place: Dassault Systems, Paris

Sensing Home Seminar, "A Sensitive Architecture"

Lecture: Mette Ramsgard Thomsen

Place: Museum of Applied Arts, Køl, n,

Active Models, 4. Digital Crafting workshop,

Lecture: Martin Tamke

Place: Architectural School Aarhus Denmark

Date: January 2011

Digital Crafting

Lecture: Martin Tamke

Place: Aalborg University Denmark

Date: February 2011

Digital Crafting

Lecture: Martin Tamke

Place: Chalmers Gothenburg,

Date: March 2011

Integrating Active Deformation into Design environments, talk in the frame of the SmartGeometry conference 2011,

Lecture: Martin Tamke

Place: Copenhagen Denmark

Date: March 2011

Material and Structure – A new nearness through Computation at the 2nd International Conference on Architecture & Structure

Keynote: Martin Tamke,

Place: Tehran, Iran,

Date: May 15-16, 2011

EROSIONS: designing for material performance

Lecture: Mette Ramsgard Thomsen and Martin Tamke

Place: NTU Trondheim,

Date: September 2011

Dermoid – designing for Material Performance, at the Design Modelling Symposium

Lecture: Martin Tamke

Place: Berlin, Germany

Date: October 2011

Bespoke Formations, at the Digital Printing symposium at Materia,

Place: Amsterdam

Date: October 2011

Component Logics

Lecture: Martin Tamke

Place: The AA London, United Kingdom

Date: November 2011

Digital Material

Place: EPFL Lausanne, Switzerland

Date: November 2011

Inbetween the digital and material

Lecture: Martin Tamke

Place: The Ecole Speciale d'Architecture, Paris, France

Date: November 2011

BIM 08-11

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Royal Academy of Fine Arts, Schools of
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