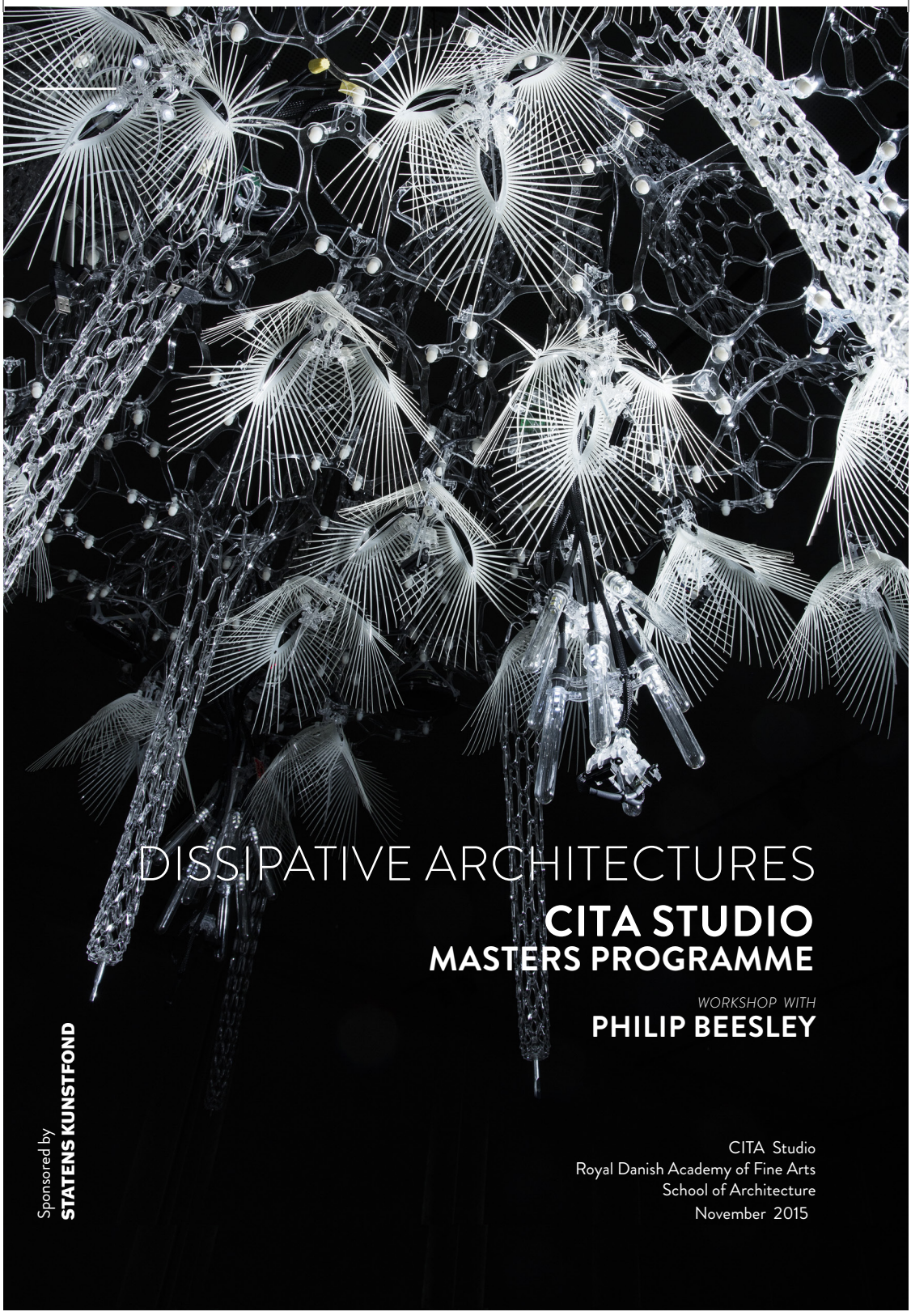

DISSIPATIVE ARCHITECTURES

CITA STUDIO
MASTERS PROGRAMME

WORKSHOP WITH

PHILIP BEESLEY

CITA Studio
Royal Danish Academy of Fine Arts
School of Architecture
November 2015

Sponsored by
STATENS KUNSTFOND

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November 2015

CITAstudio and A&EE cross course workshop:
Designing dynamic responsive architectural systems
Workshop leader: Philip Beesley
Oct 30th – Nov 2nd 2015

Sponsored by
STATENS KUNSTFOND

INTRODUCTION

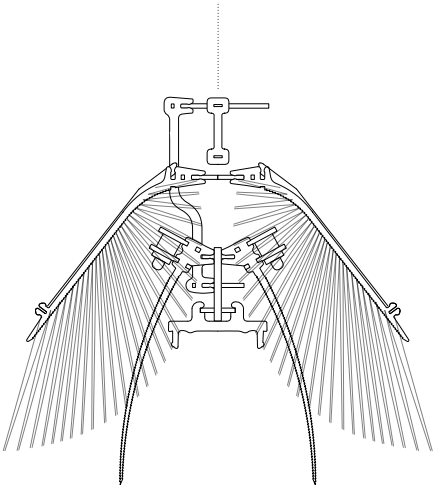
Increasingly, the surfaces, buildings and environments that surround us embedded with interactive potentials. Capable of sensing and actuation, they make it possible to rethink architecture not as something static, but rather as entities and environments able to respond and adapt to changing conditions, and to engage in active conversations and mutual exchange with their occupants. This research poses new considerations and opportunities for architectural design - how can these 'living' systems function, and how can they be designed and adapted within architecture? A collaboration between CITA Studio and Extreme Environments masters program

PHILIP BEESLEY

CONTEXT

To date, much of the associated architectural thinking and conceptualization has been restricted to a relatively narrow field of potential spatial and experiential implications, in particular around the notion of smart homes driven by preprogrammed behaviours. However an alternative point of departure is to consider a living system like a densely layered forest, where diffusive, deeply interwoven material expands and interacts with its surroundings. An architecture capable of handling unstable conditions might look like a forest. It could possess agency to modulate its environment, be aware of its occupancy, and be capable of affect through kinetic mechanisms that use dense arrays of microprocessors and sensors. Rather than be pre-programmed with behaviour beforehand, it could learn behaviours that are meaningful and interesting over a longer time.

The most recent generations of these works feature interactive lighting systems and kinetic mechanisms that use dense arrays of microprocessors and sensors. The company follows research-creation methods, in which each built architectural project is accompanied by research probes focusing on innovative craft including advanced fabrication, component design and structural systems. The advanced construction detailing and innovative fabrication developed within short-term experimental projects are directly integrated within architectural project designs, supporting lyrical structural systems, custom lighting and fitments, and expressive envelope detailing.



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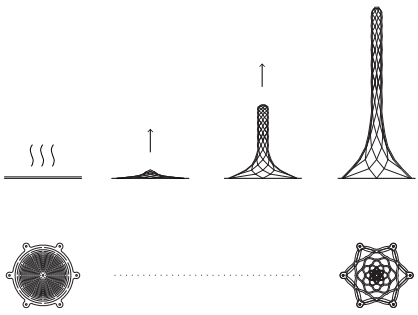

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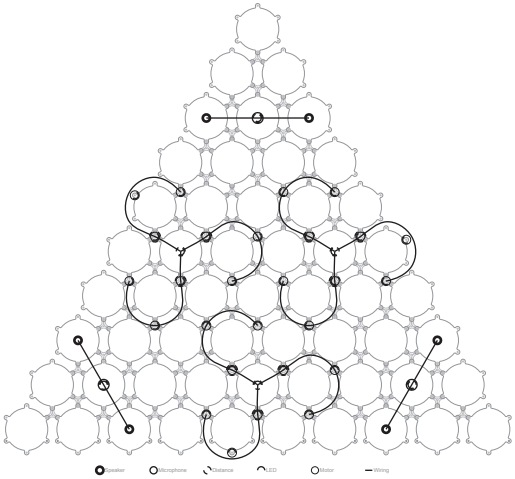
INSTALLATION

PRODUCTION OF A TEST-BED

The workshop was led by Philip Beesley into designing dynamic responsive architectural systems.

The aim of the workshop was to implement emerging technologies for responsive architecture, through the making of kinetic mechanisms and an installation 'test-bed', which would include LED lighting, IR and acoustic sensors, and actuators. Within the test-bed, kinetic mechanisms are capable of pulling and twisting in response to occupancy and localised acoustic variation.

1 Frond, vibration component, made from mylar and acrylic
2 Fabrication and assemply drawings for the Frond component
3 Illustration of thermoforming



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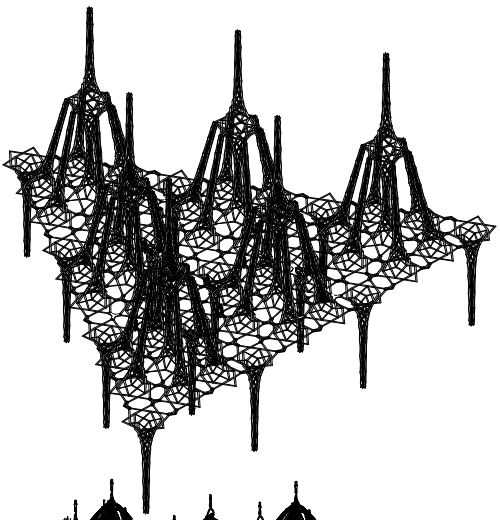

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Through a primary focus on the physical construction of the installation piece, the workshop developed four sub-themes of exploration:

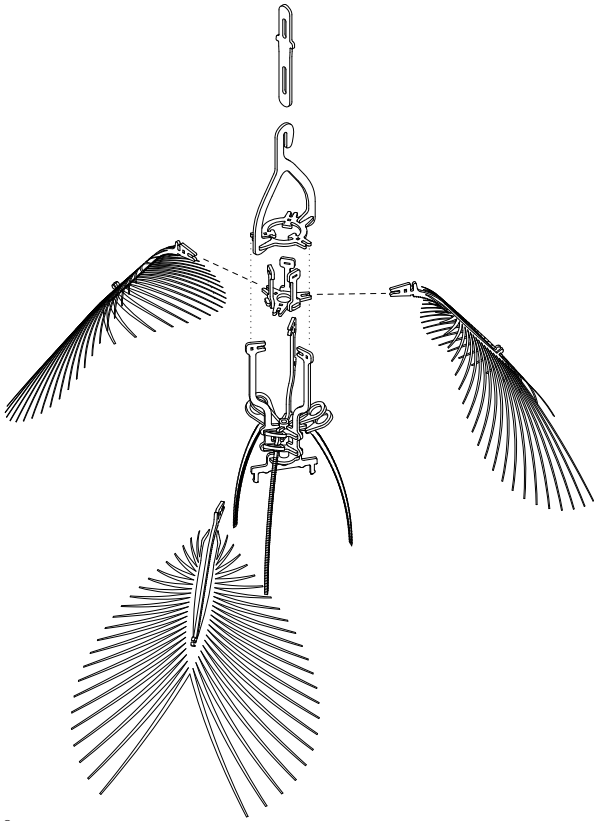
ASSEMBLY OF KINETIC MECHANISMS AND ASSEMBLIES.
Kinetic mechanisms fabricated from a family of components, using thermoforming and snap-fit techniques. Exploration of their associated behaviours, and how these can be distributed into interactive networks.

ACTUATION BEHAVIOUR FOR KINETIC MECHANISMS.
Clarification and refinment of new possibilities for movement and response, which emerge from the temporal performance of plastics.

NETWORK SENSING
Making of sensor, actuator and microcroller networks.

VISUALISING AND CONCEPTUALISING
Curiosity Based Learning. Touch upon a new machine learning algorithm that allow for constantly evolving responses to occupants exploring the environment, by examining data visualization techniques and through design charrette.

1 Electronical system
2 Thermoformed components made of acrylic
3 Kenetic mechanims, a vibrating and sersoring component



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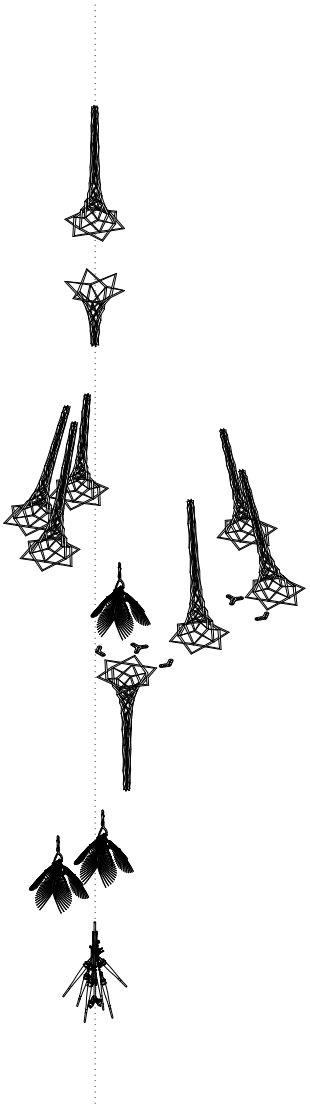


3

1 Kinetic component
2 Assemply illustration
3 Installation

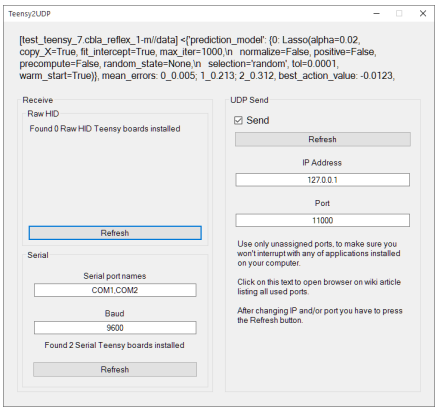
1 Thermoforming
2 Electronic assembly
3 Workshop space
4 Assemply of installation

DIGITAL

MACHINE LEARNING

Machine learning explores the study and construction of algorithms that can learn from and make predictions on data. Such algorithms operate by building a model from example inputs in order to make data-driven predictions or decisions, rather than following strictly static program instructions.

The dynamic responsive architectural systems works both as an instrument as well as a physical representative of machine learning. The installation registers and responds to real-time data from occupant behaviour and evolves a self-constructed behaviour.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Baud
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Use only unassigned ports, to make sure you won't interrupt with any of applications installed on your computer.
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After changing IP and/or port you have to press the Refresh button.

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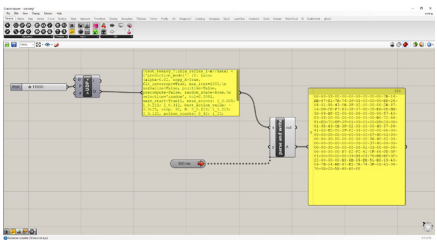

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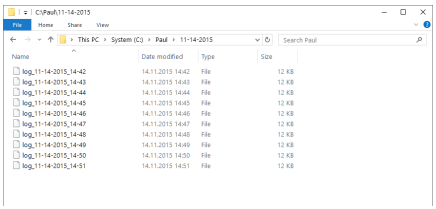
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3

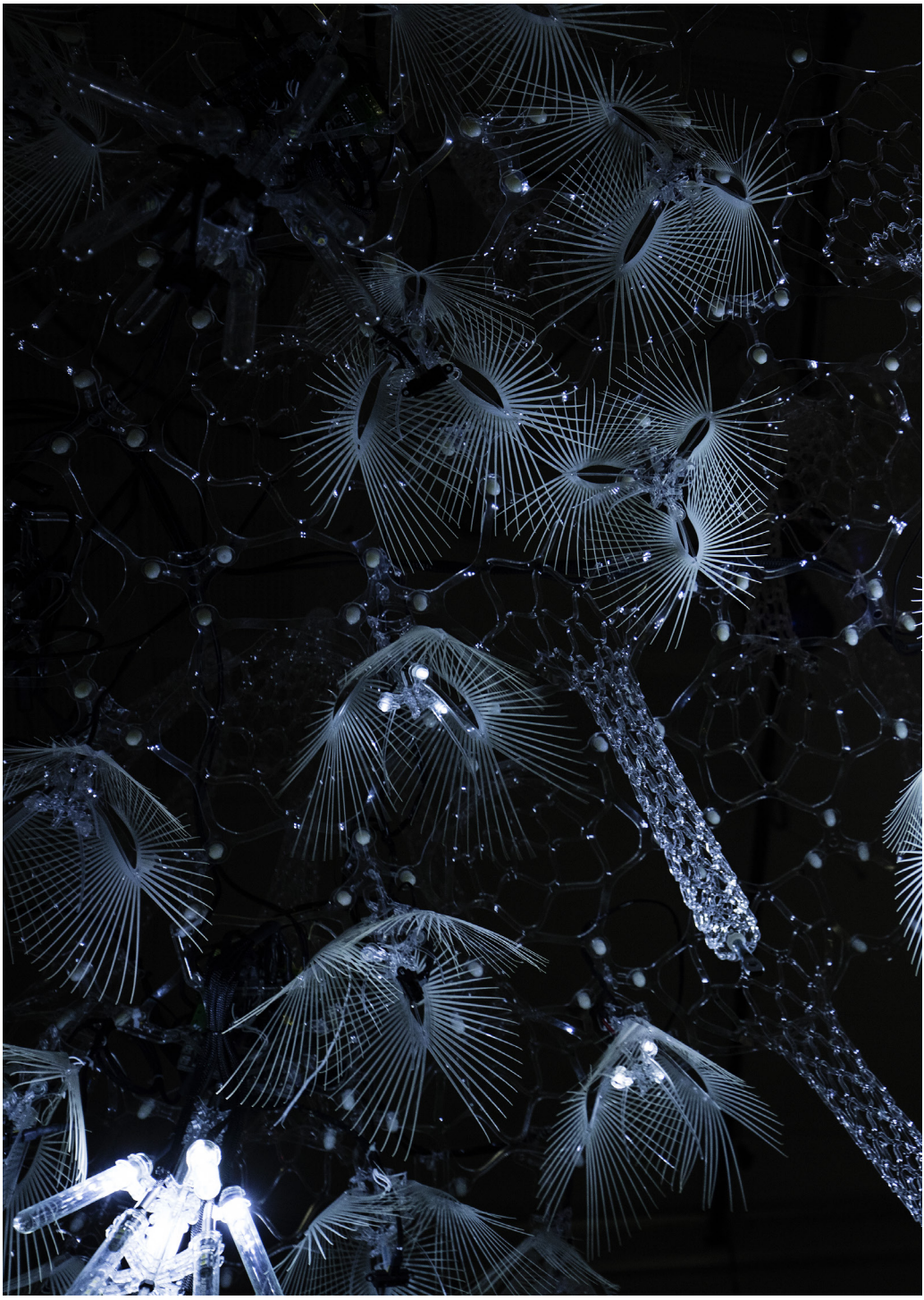
REAL-TIME REGISTRATION OF BEHAVIOUR

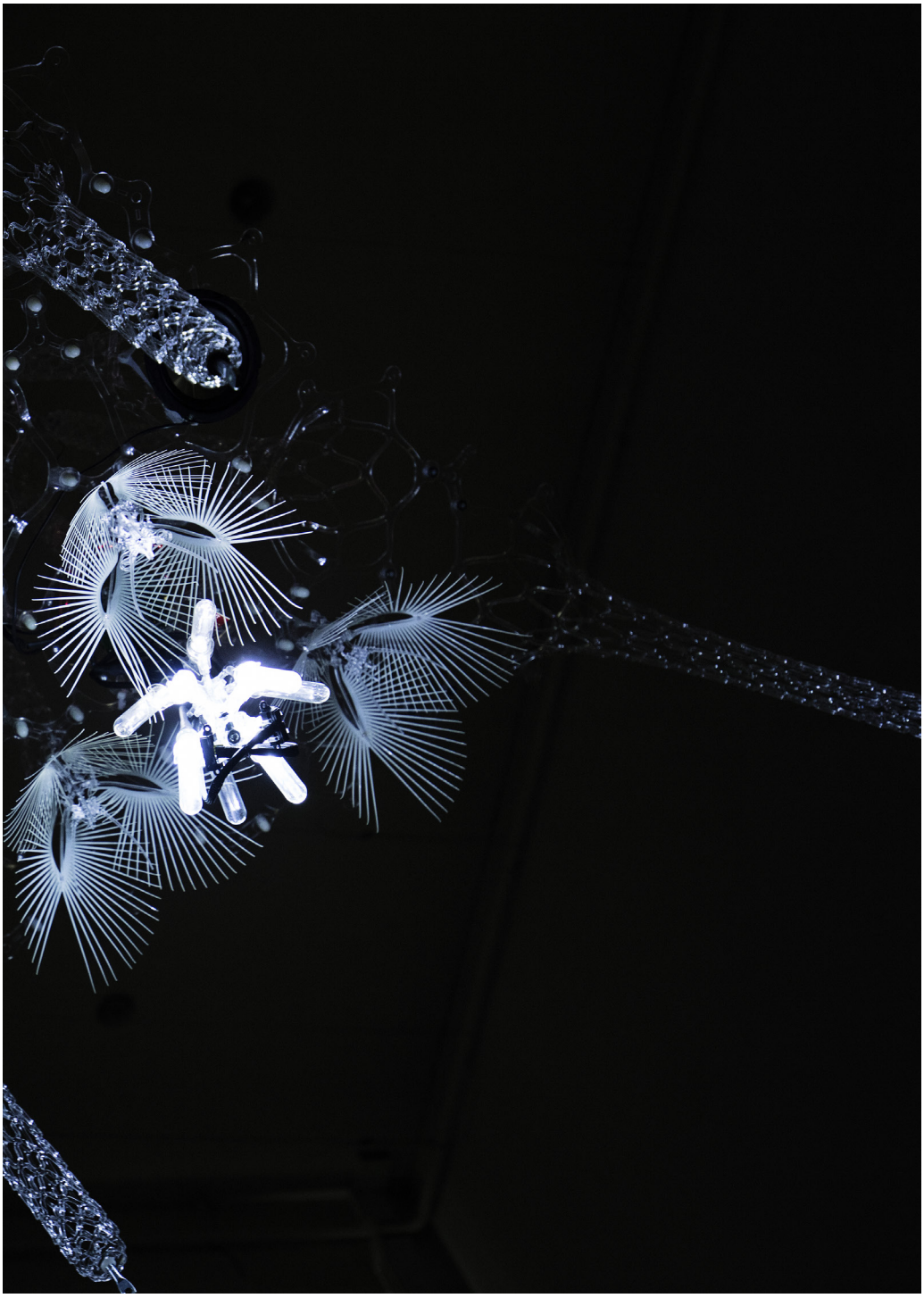
TEENSY2UDP:
This is a custom background application which is running on a PC directly connected to the installation. It can receive messages over Raw HID or Serial connection. Those messages are then send to any other computer in the LAN network via UDP protocol.

GRASSHOPPER:
Using Grasshopper with gHowl plugin (http://www.food4rhino.com/project/ghowl?etx), we listen to the incoming messages from Teensy2UDP. They are parsed and can be used as parameters in Grasshopper. Additionally, the script creates .paul files (custom binary files storing message values with identifiers) every minute.

folder:
This image shows a list of .paul files stored in a folder.

1 Teensy2UDP
2 Grasshopper
3 Folder





Exhibition at KADK Library December 2015
Sponsored by Statens Kunstfond

Photographic credits: Anders Ingvartsen

CITA

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