1. Research Intentions
   1.1 Intentions
   1.2 Location Analysis
   1.3 Design Intentions

2. Parametric Design

3. Data to Geometry

4. Construction & Materials

5. Visualizations & Conclusions
1. Research Intentions

2. Parametric Design

3. Data to Geometry

4. Construction & Materials

5. Visualizations & Conclusions
1. Research Intentions

2. Parametric Design

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5. Visualizations & Conclusions
1. RESEARCH INTENTIONS

How can a Traditional Environment benefit from Modern Design & Building Technologies Preserving “small scale” Rural Characteristics...
Kunsthaus Graz in Austria “The friendly alien” (by Peter Cook & Colin Fornier)
The Netherlands

Lochem
Small rural city, 12,000 inhabitants
Discussion about new library & theatre
City Council “Public Functions outside center”

Source: Master plan Lochem “Etalage naar de toekomst”
Location has lot of potential for an interesting project

- edge of old city centre (1300 A.D.)
- busy road
The most of the public functions are already there

- canal & edge of old city center
- shopping street
Orientation

NATIONAL - REGIONAL - VILLAGE - CENTRE - FUNCTIONAL

LOCATION ANALYSIS || RESEARCH INTENTIONS || 1
how can a Traditional Environment benefit from modern Design & Building Technologies preserving “small scale” Rural Characteristics...

- Interesting Architecture
- Sustainable
- Subtle Intervention
Symbol of community life
DESIGN ASSIGNMENT - DESIGN OUTLINE - ARCHITECTURAL SYSTEM

Sustainable & Subtle intervention
DESIGN ASSIGNMENT - DESIGN OUTLINE - ARCHITECTURAL SYSTEM

In detail

3D VIEW

DESIGN INTENTIONS || RESEARCH INTENTIONS ||
- Keep existing functions
- New community centre
Extend existing programs
Add new functions
• Adapt to context
- Fill the gap
- Expose to road
Freeform Design System

1. internal public zones
2. new functions
3. external public zones
Architectural tools for a public building

- balance public & private
- sunlight
- spatial relations
2. COMPUTATIONAL DESIGN

**TRANSLATE** DESIGN INTENTIONS TO

A **PARAMETRIC DESIGN SYSTEM**
1. Reduce every part of the program to generic units

1. tympan
2. architrave
3. column
4. crepidoma
PARAMETRIC DESIGN  =>  A tool to structurize the design proce... 

1. Reduce every part of the program to generic units

   1. tympan
   2. architrave
   3. column
   4. crepidoma

2. Every unit contains information about core values

   - size
   - shape
   - position
   - material
   - ....
INTRODUCTION

PARAMETRIC APPROACH ➔ A tool to structurize the design process...

1. Reduce every part of the program to generic units

   ![Diagram of a classical architectural structure with numbers 1 to 4]

   - 1. tympan
   - 2. architrave
   - 3. column
   - 4. crepidoma

2. Every unit contains information about core values

   ![Diagram with nodes and connections labeled with size, shape, position, and material]

3. Create design rules, relation & behaviour of units

   ![Diagram with connections labeled with digital usage]
outside = expose

inside = hide

theatre

library
PARAMETRIC CONCEPT

OUTSIDE = expose

INSIDE = hide

Public Chain

Library

Theatre
PARAMETRIC CONCEPT || PARAMETRIC APPROACH || 2

OUTSIDE = expose

Public Chain

INSIDE = hide

Cultural Functions

Theatre

Info-Tainment Functions

Library

Public <-> Private

OUTSIDE = expose
UNITs

1. internal public zones
   - Grand Cafe
   - Voiliere
   - ....

2. new functions
   - Library extension
   - music rehearsal rooms
   - cinema
   - ......

3. external public zones
   - terras
   - bike parking
   - information zones
   - ......

Intentions
1. internal public zones
   - Grand Cafe
   - Voiliere
   - ....

2. new functions
   - Library extension
   - music rehearsal rooms
   - cinema
   - ..... 

3. external public zones
   - terras
   - bike parking
   - information zones
   - ..... 

Intentions:  
Forces: 
- public or private
- hide or expose
- zone
- size

UNITS + PROPERTIES
- UP = private
- DOWN = public
- EXPOSE
- HIDE
- CULTURAL
- INFOTAINMENT

PARAMETRIC CONCEPT || PARAMETRIC APPROACH || 2
1. internal public zones
- Grand Cafe
- Voiliere
- ....

2. new functions
- Library extension
- music rehearsal rooms
- cinema
- ....

3. external public zones
- terras
- bike parking
- information zones
- ....

Intentions

Forces
EXISTING ENVIRONMENT - EXTERNAL ROUTE - INTERNAL ROUTE - FUNCTIONS

EXISTING BOWLING LANE

EXISTING THEATRE

EXISTING GALLERY

CONNECTION WITH CITY

EXISTING LIBRARY

EX-LIB 1

EX-LIB 2

EX-THEA 1

EX-THEA 2

EX-THEA 3

EX-THEA 4

EX-GALLERY

CONNECTION WITH ROAD

CULTURAL ZONE

INFOTAINMENT ZONE

ROAD

EXPOSE

HIDE

EXPOSE

HIDE

PARAMETRIC BEHAVIOUR || PARAMETRIC APPROACH || 2
EXISTING ENVIRONMENT - EXTERNAL ROUTE - INTERNAL ROUTE - FUNCTIONS
EXISTING ENVIRONMENT - EXTERNAL ROUTE - INTERNAL ROUTE - FUNCTIONS
Unit Relations + Unit Properties

PARAMETRIC OPERATION || PARAMETRIC APPROACH || 2

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- Internal Public spaces
  - INT Route
    - I-ROU01 voiliere 1
    - I-ROU02 voiliere 2
    - I-ROU03 bleachers 1
    - I-ROU04 bleachers 1
    - I-ROU05 stage 1
    - I-ROU06 stage 2
    - I-ROU07 lounge 1
    - I-ROU08 lounge 2
    - I-ROU09 lounge 3
  - Horeca
    - I-HOR01 grand cafe
    - I-HOR01 bar

- Functional spaces
  - Library
    - F-LIB01 study 1
    - F-LIB02 study 2
    - F-LIB03 lounge
    - F-LIB04 digi room
    - F-LIB05 read room
    - F-LIB06 main lobby
  - Entertain
    - F-EDU01 cinema
    - F-EDU02 lobby 1
    - F-EDU03 lobby 2
    - F-EDU04 wardrobe
  - Music
    - F-MUS01 studio 1
    - F-MUS02 studio 1
    - F-MUS03 studio 3
  - Educational
    - F-EDU01 classroom 1
    - F-EDU02 classroom 2
    - F-EDU03 classroom 3
    - F-EDU04 classroom 4
  - Office
    - F-OFF01 office 1
    - F-OFF02 office 2
    - F-OFF03 pantry
  - Technical
    - F-TEC01 toilets 1
    - F-TEC02 toilets 1
    - F-TEC03 installation

- External Public zones
  - EXT Route
    - E-ROU01 library plaza
    - E-ROU02 info cave
    - E-ROU03 theatre plaza
    - E-ROU04 delivery point
    - E-ROU05 bike parking
    - E-ROU06 outdoor cafe

ARCHITECTURAL UPDAT - UNITSZONES

place in context
Digital Environment

Control: Forces & Strings

PROGRAM OF DEMANDS

INPUT

UNITs

SIZE UNITS

RELATIONS

HIDE | EXPOSE ATTRACTORS

PUBLIC/PRIVATE

DIGITAL ENVIRONMENT

OUTPUT

SIZE

VERTICAL POSITION

HORIZONTAL POSITION

OPENINGS

PARAMETERIC OPERATION || PARAMETRIC APPROACH || 2

VIRTOOLS SOFTWARE
OUTPUT

- organization + relations
- shape intentions
3. DATA TO GEOMETRY

**EXPORT** THE PARAMETRIC RESULTS INTO A **CONTROLLABLE GEOMETRY**
GEOMETRY DOES EVERYTHING!
CONCLUSIONS

- To complex (scripting)
- computer processing power
CONCLUSIONS

- monotome on big scale
- literal use of input
1. data input
2. grid pattern
3. zone the units (sound, control, etc.)
4. draw master curves (around zones & units)
1. data input
2. grid pattern
3. zone the units (sound, control, etc..)
4. draw master curves (around zones & units)
5. convert relations (open, closed, door, stair, etc..)
6. create geometry

RADIAL RIB SYSTEM - CREATE GEOMETRY - FINE TUNING - SPACE & GEOMETRY
Interpolate points

- External line
- Internal line
- Master curve
- Line control unit

GEOMETRICAL CONTROL || DATA TO GEOMETRY || 3
Surface Evolution

Geometrical fluidity over data input!
4. CONSTRUCTION & MATERIALIZATION

CONSTRUCT THIS **COMPLEX GEOMETRY**

IN A **TRADITIONAL** ENVIRONMENT

USING **NON-STANDARD** BUILDING TECHNIQUES
BUILDING ENVELOPE
- blend in context
- surface continuation
- insulation
- watertight

OPEN PARTS

CLOSED PARTS

MAIN CONSTRUCTION
- freestanding
- lightweight
- constructional unity
- quick assembly

FLOORS

RIGID ELEMENTS

STEEL BEAMS STRUCTURE
STEEL BEAMS - FLOORS - FORCES

- freestanding
- lightweight
- prefab assembly & mount on site
- constructional unity

MAIN CONSTRUCTION || CONSTRUCTION || 4
- lightweight
- provide construction stability
1. constructional unity between:
   - main beams
   - support beams
   - shore beams
   - floors

2. thickness beams follows forces
Wind load

LATERAL FORCES

LATERAL FORCES

DIAGONAL SHORES 2

CORNER

DIAGONAL SHORES 1

CORNER

DIAGONAL SHORES 3

LATERAL FORCES

LATERAL FORCES

STEEL BEAMS - FLOORS - FORCES
Overhang segment 1

8 Meter

construction weight

pull

STEEL BEAMS - FLOORS - FORCES
Overhang segment 2

- **16 Meter**
- **7 Meter**
- **Pull**
- **Construction weight**
Facade Material Options

- blend in context
- surface continuation
- lightweight

1. zinc

Poppodium Mezz, Erik van Egeraat

2. artificial (glass, synthetics, ceramics)

Funicular Station, Zaha Hadid

3. wood

BUILDING ENVELOPE || CONSTRUCTION || 4
TOP - Asphalt shingles strips

SIDE - Red Cedar wooden shingles 150 x 400 x 8 mm
Glass System Options

- keep surface continuity

1. double curved glass

2. mesh of triangulated glass panels

3. mesh of quadrangular glass panels

CLOSED PARTS - OPENINGS - DETAILS

BUILDING ENVELOPE || CONSTRUCTION || 4
Shape Openings

- parametrics
- intuitive design

south facade

east facade
1. clean surface
2. ribs
3. openings
4. guiding lines

5. combination (project on surface)

6. grasshopper (planarize tool)

7. planar glass panels
8. double curved glass
9. entrance door (rationalize)

CLOSED PARTS - OPENINGS - DETAILS

Facade Geometry Control
Glass System

- Adjustable connections
- Glass panels
- Steel beams
Building Envelope

- Bitumen covering
- Wooden coping piece
- Mechanical ventilation & heating
- Sound insulation
- Insulation 30 mm (outside steel beams)
- Plywood 18 mm
- Plywood holders h.o.h. 250 mm
- Thermal insulation 180 mm
- Saddle holders for plywood
- Plywood 18 mm
- Vapor barrier
- Wooden shingles
- Wooden window sill
- Mechanical ventilation
- CNC cutted steel elements
- Aluminum strip
- Aluminum window frames 40 x 60 mm
- Adjustable windowframe holders
- Parquet 10 mm
- Pored concrete floor
- Dovetail plates
- Lights
- Fire protective cover
- CNC beams covered with fire protective paint
- Asphalt shingles
- Watertight strip
- Adjustable windowframe holders
Connection Old & New

- distance
- insulation
- foundation
Rooflights
Independent Ventilation System

Balanced Mechanical Ventilation

outside

pre heated fresh air

inside

heat recovery
5. VISUALIZATIONS
1. VIEW FROM ROAD (EAST FACADE)
2. VIEW FROM ROAD (SOUTH FACADE)
3. VIEW FROM HORECA ZONE
6. INFO STREET
7. MAIN HALL (ground level)
9. GRAND CAFE (1st level)
10. OFFICE & CLASSROOM LOBBY (2nd level)
5. CONCLUSIONS
1. INTRODUCTION

Test system in other context

2. COMPUTATIONAL DESIGN

Location
Design Intentions
Parametric System

3. DATA TO GEOMETRY

Geometry

4. CONSTRUCTION & MATERIALS

Construction system
Materials

5. VISUALIZATIONS & CONCLUSIONS
1. INTRODUCTION
Test system in other context

2. COMPUTATIONAL DESIGN
Lack of scripting (ICT) knowledge
More interactive geometry feedback

3. DATA TO GEOMETRY

4. CONSTRUCTION & MATERIALS

5. VISUALIZATIONS & CONCLUSIONS
1. INTRODUCTION
Test system in other context

2. COMPUTATIONAL DESIGN
Lack of scripting (ICT) knowledge
More interactive geometry feedback

3. DATA TO GEOMETRY
Experiment with other geometrical systems
Triangles     Honeycomb

4. CONSTRUCTION & MATERIALS

5. VISUALIZATIONS & CONCLUSIONS
5. VISUALIZATIONS & CONCLUSIONS

Quest for an optimal architectural building system capable of making all possible shapes & spaces in a variety of environments