Spécialité S9

Enjeux de la production d'une enveloppe à modulation de courbures

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introduction

context

Non-standard architecture : a wide concept



Gifu Kitagata - SANAA architects - 1998



Hamburg - LAN architects - 2010

context

...restricted to Non-standard morphogenesis





Jalisco - NOX architects - Guadalajara Mexico - 2005

context

× Sophisticated tools (Rhino, Catia...) providing visual representation of complex geometries



Fondation Arnaud - Gehry Paris - 2009 Oblique World Trade Center NOX - New York - 2001

National Library - Future System - Prague - 2007-2011 4

remarks

- * "complex" geometry means visual representation instead of tool of mental understanding
- × complicated situations



Xefirotarch – San Jose University Art Museum, San Jose, USA, 2003



"Eléments de géométris descriptive" Gaspard Monge

problematic

- × the understanding through representation
- × continuous information flow from "0 to 1"

outline

- introduction
- shape classification
- case study : les Ruralies
- conclusion

3 classes of forms

× analytical forms – geometrically constrained

× mechanical forms – mechanically constrained

× flexible forms – unconstrained

analytical forms

× square, circle, triangle, polygon...

× cube, sphere, cylinder, torus...

× ruled surfaces: hypar, hyperboloid of revolution...



often used in architecture



Taq-I Kesra - Ctesiphon - Sasanian capital city (Iraq) - 3th century - 35m high, 25m span, 50m long - the biggest brick vault in the world.



Schlaich Bergermann & Partners cable net dry cooling tower - 1974 10

analytical forms

complex shapes born from their intersections...



Bazar - Istanbul - Turquie - 1455



Intersection of two cylinders

analytical forms

...and combinations grasped by architects and builders



"A forest of columns ending in a crown of vaults in shape of paraboloïds" Motro 2006.



analytical forms

today, improved by CAD tools





St-Lazare metro station – Paris - 2004

analytical forms

"Form-Force" conceptual schema [Motro 93]



- analytical forms
 - × mastered for ages

- x "analytical" language links "experimental" and "theoretical" knowledge to lead the project from "0 to 1"
- × morphological vocabulary partly exhausted

mechanical forms

× funicular shapes



Mannheim - Mutschler and Langner - Otto Frei – Ove Arup & Partners - Germany - 1971

mechanical forms

× funicular shapes



Tennis de Crissier - Heinz Isler - 1980-1985

mechanical forms

× prestress shapes



Marsyas - Anish Kapoor - Arup - London - England - 2002

mechanical forms

× selfstress shapes



Sleeping Dragon - Kenneth Snelson – 2002-2003

mechanical forms

"Form-Force" conceptual schema



mechanical forms

× require either deep interest in form-finding process or theoretical knowledge on non-linear static equilibrium

× only the boundary conditions are controlled

 without mechanical knowledge, the results range in a restricted family of solutions and lack of flexibility

× physical models generated as sculptures



Fondation Arnaud – Gehry – Paris - 2009



Pompidou two – Nox – Metz – 2003 (competition)

sophisticated numerical tools (Rhino, Catia...) provide
visual representation of complex geometries



Fondation Arnaud – Gehry – Paris - 2009



Pompidou two - Nox - Metz - 2003 (competition)

- complex design generally governed by plastic intention without references to classical building techniques
- geometric objects calculated but not drawn remain hidden in algorithmic languages
- * "complex" geometry means visual representation instead of tool of mental understanding

"Form-Force" conceptual schema



× seductive formal possibilities

× the merely visual predominates over materiality

 traditional techniques exploited to generate new esthetics, which should require new methods and tools

- source of complication and disagreement between partners
- complexity does not mean complication but does accept the whole rather than the parts
- × flexible forms entail new paradigms in the design process

case study

Les Ruralies

× enginery by Marc Malinowsky

thanks for your attention