TECHNISCHE
UNIVERSITÄT
DARMSTADT

Architecture et Algorithmes

Entre Open-Source et Exploitation Commerciale

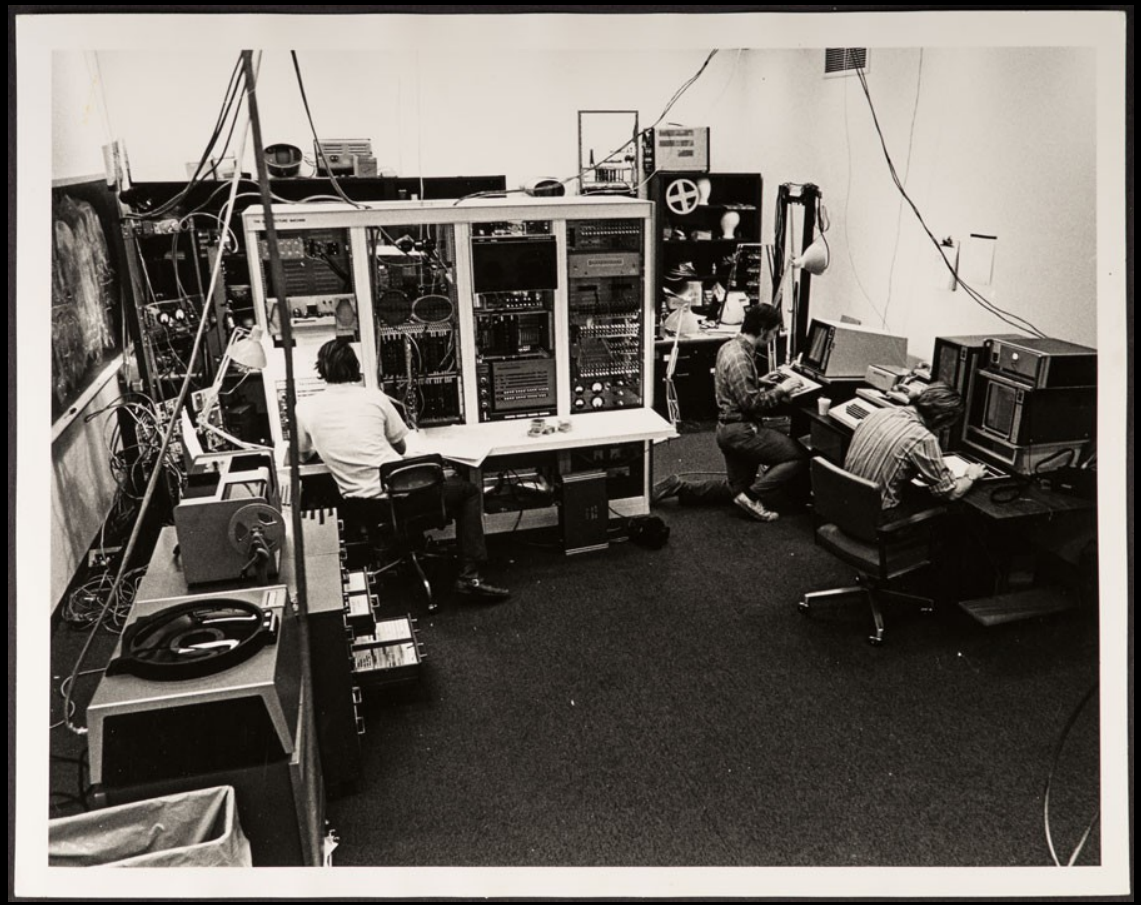
DIGITAL DESIGN UNIT
PROF. DR.-ING. OLIVER TESSMANN

PARTIE 1

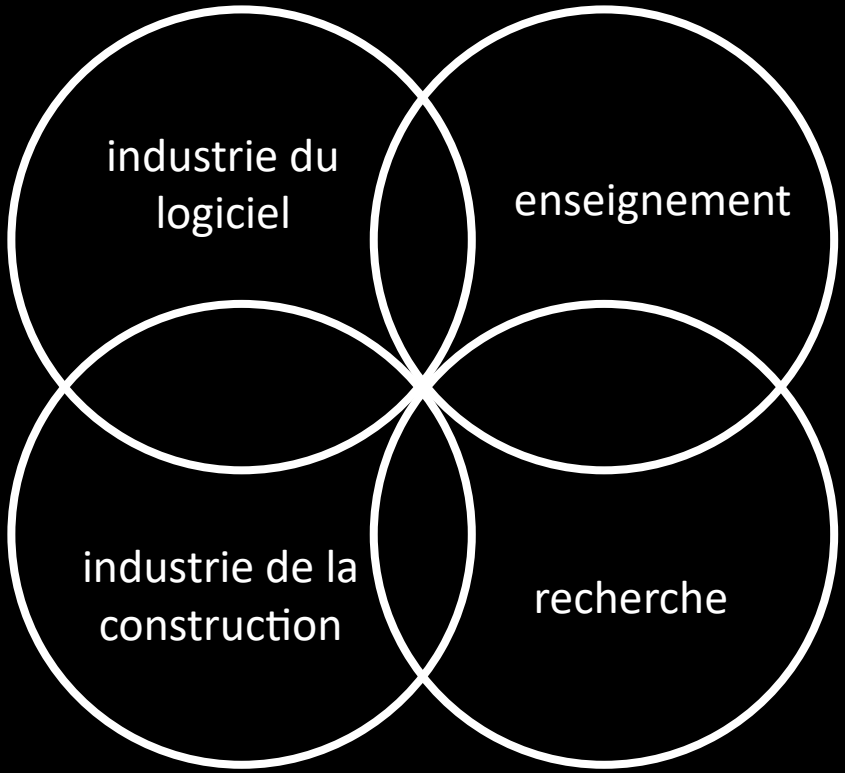
Architecture et algorithmes?
Les courants computationnels en architecture

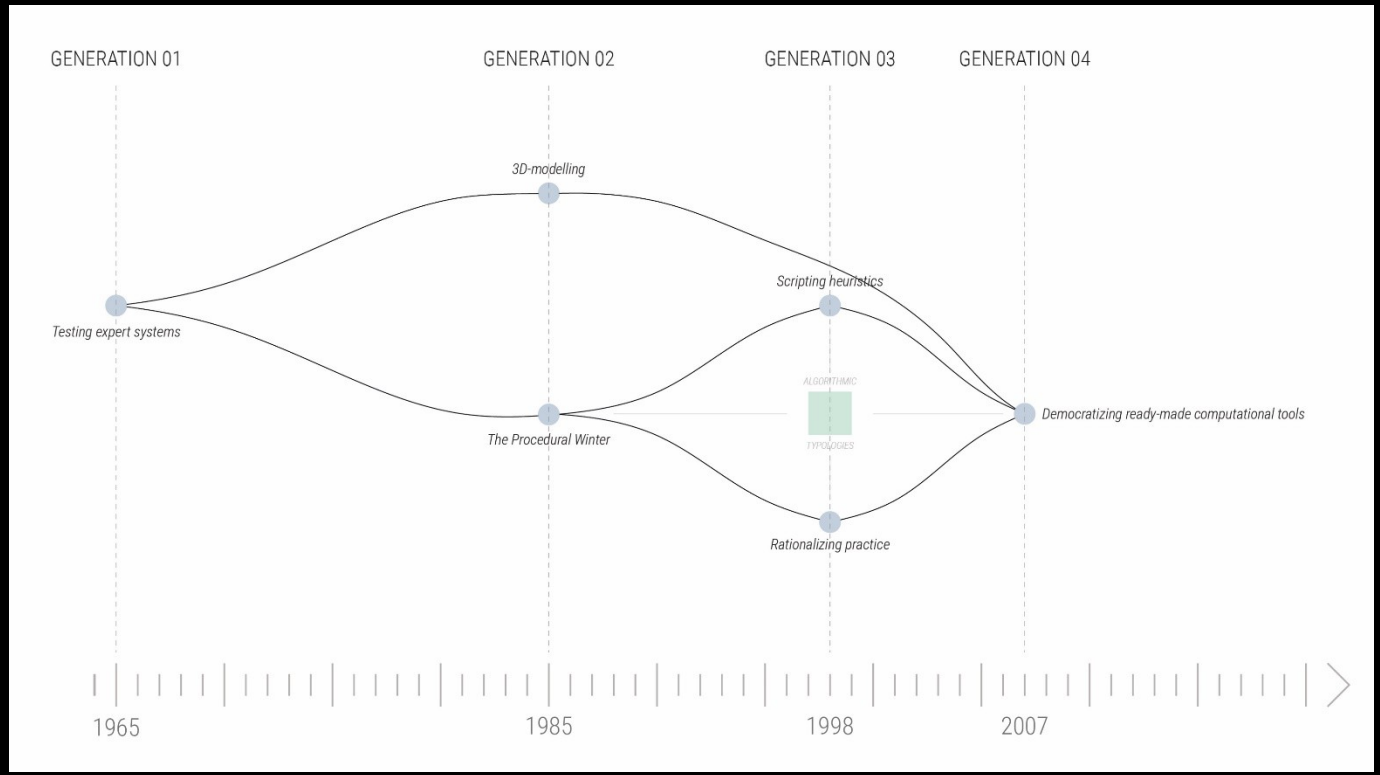

DEH_BEGIN_MAPPING(thing_mapping, mobjinfo_t)
DEH_MAPPING("ID #",
Messages: Build
../src/doom/deh_thing.cpp:62:8: warning: ISO C++11 does not allow conversion from string literal to 'char *' [-Wwritable-strings]
{"TRANSLUCENT", MF_TRANSLUCENT},
../src/doom/deh_thing.cpp:62:21: error: constant expression evaluates to 2147483648 which cannot be narrowed to type 'int' [-Wc++11-narrowing]
{"TRANSLUCENT", MF_TRANSLUCENT},
../src/doom/deh_thing.cpp:62:21: note: insert an explicit cast to silence this issue
{"TRANSLUCENT", MF_TRANSLUCENT},
Constant expression evaluates to 2147483648 ...

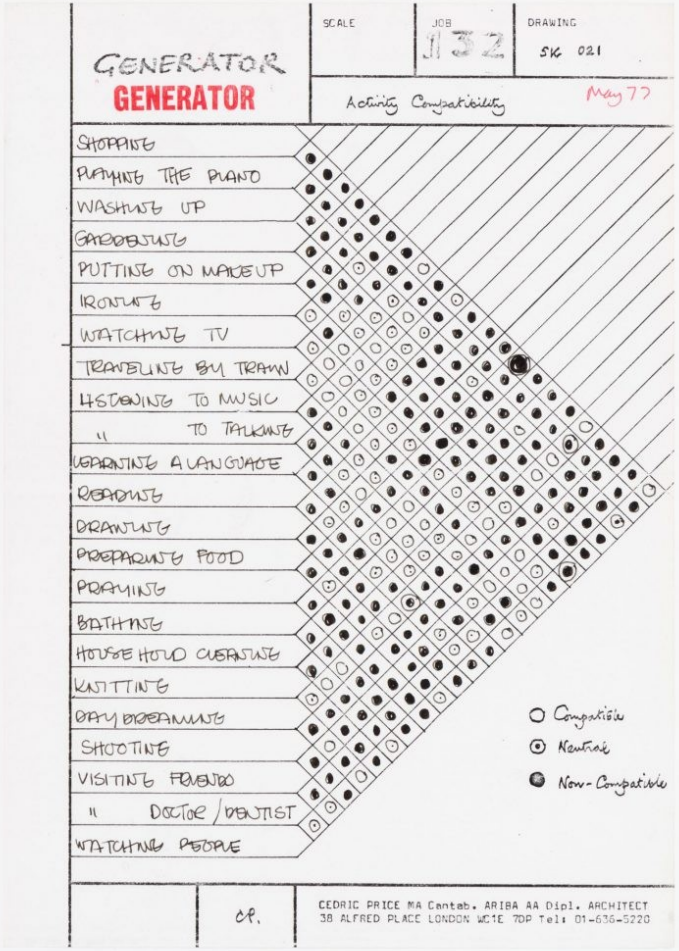
les pratiques computationnelles
c‘est rendre l‘architecture calculable

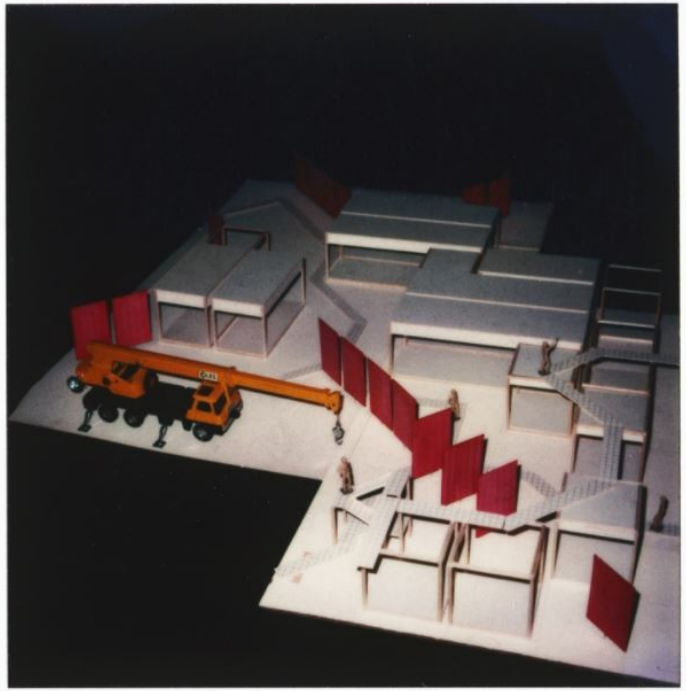


Architecture Machine Group, MIT, 1965


industrie du logiciel
enseignement
industrie de la construction
recherche


GENERATION 01
GENERATION 02
GENERATION 03
GENERATION 04
3D-modelling
Scripting heuristics
Testing expert systems
ALGORITHMIC
TYPOLOGIES
The Procedural Winter
Democratizing ready-made computational tools
Rationalizing practice
1965
1985
1998
2007


GENERATOR
GENERATOR
SCALE
JOB
J32
DRAWING
SK 021
Activity Compatibility
May 77
SHOPPING
PLAYING THE PIANO
WASHING UP
GARDENING
PUTTING ON MAKE UP
IRONING
WATCHING TV
TRAVELING BY TRAIN
LISTENING TO MUSIC
" TO TALKING
LEARNING A LANGUAGE
READING
DRAWING
PREPARING FOOD
PRAYING
BATHING
HOUSE HOLD CLEANING
KNITTING
DAY DREAMING
SHOOTING
VISITING FRIENDS
" DOCTOR / DENTIST
WATCHING PEOPLE
Compatible
Neutral
Non-Compatible
CP.
CEDRIC PRICE MA Cantab. ARIBA AA Dipl. ARCHITECT
38 ALFRED PLACE LONDON WC1E 7DP Tel: 01-636-5220



GENERATOR

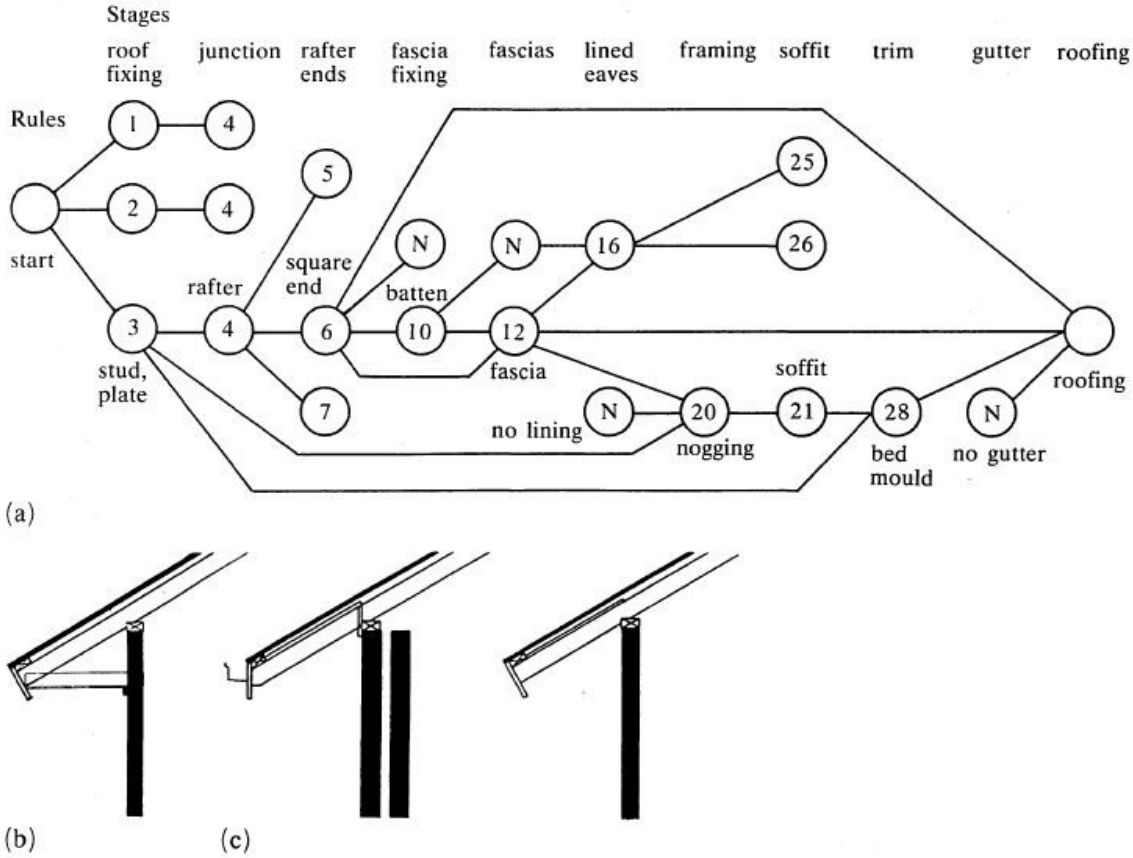


Figure 6. (a) Links between EAVE rules in the generation of design (b). For a rule to fire, the earlier (lower number) rules to which it is linked by a heavy line must also be fired. (c) Two other designs.

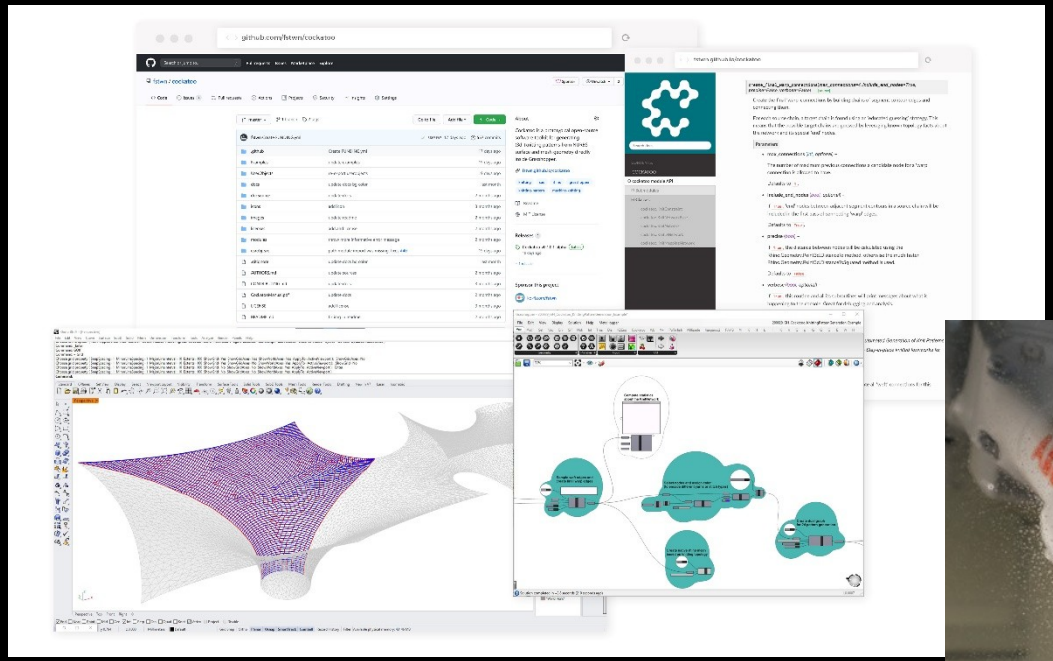
EAVE system
Radford et al.

Babi Yar Memorial Competition Entry, kokkugia

Computational Arrangement of Demolition Debris, Daniel Marshall

PARTIE 2

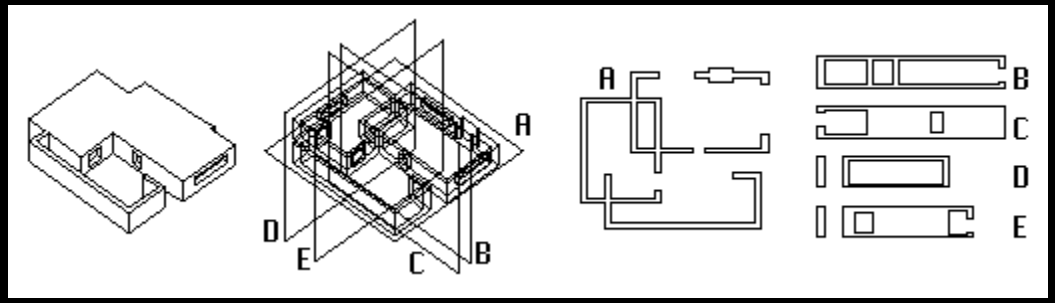
Faire ses propres outils, un passage obligé

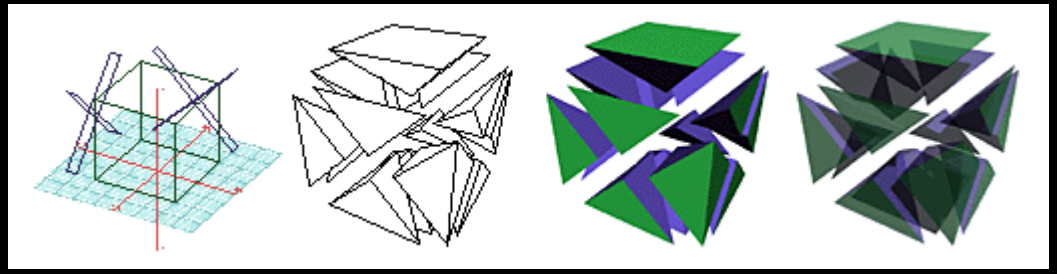


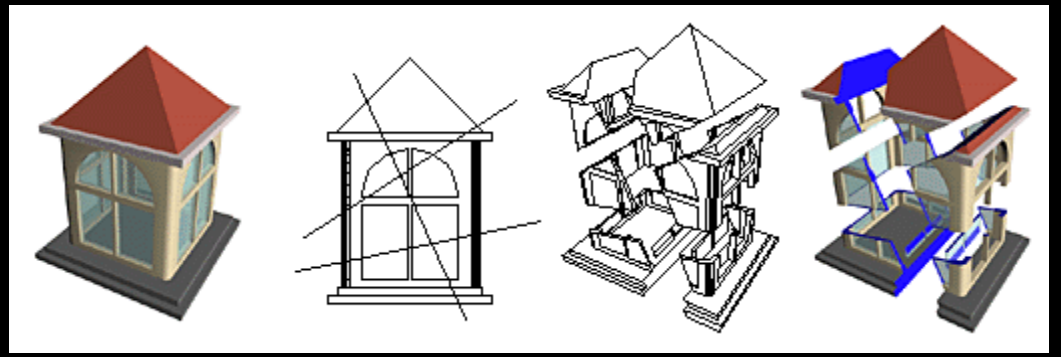
Cockatoo, Max Benjamin Eschenbach

A Bridge Too Far, CITA (KADK)

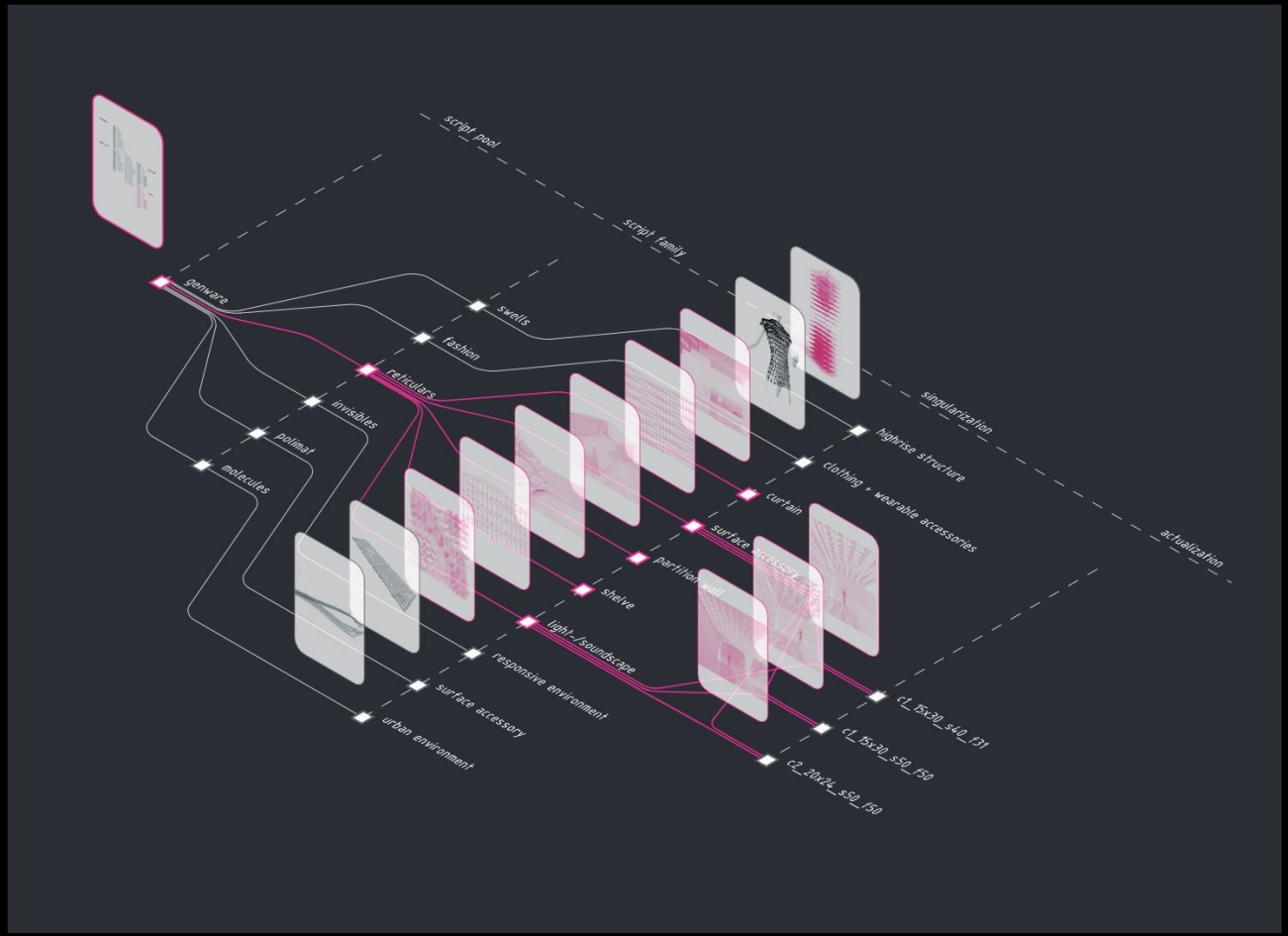
URBAN V
Architecture Machine Group



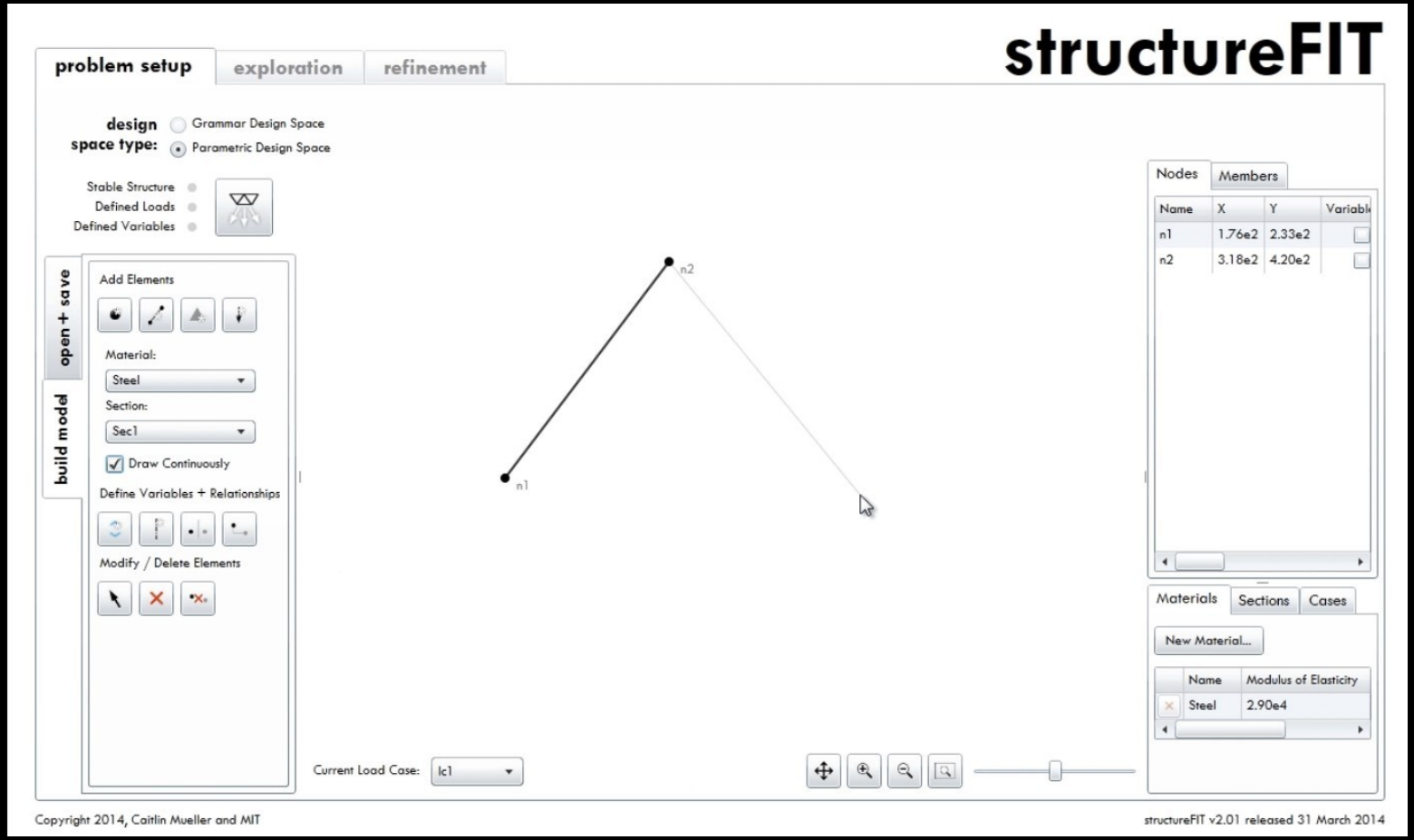




Form*Z
AutoDesSys

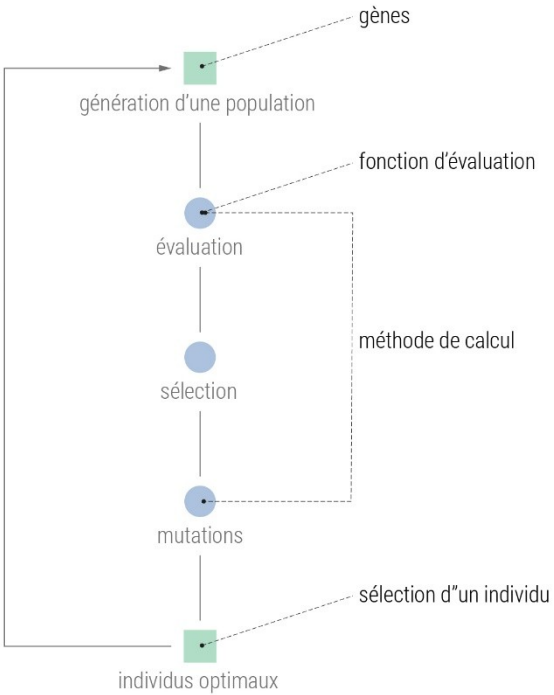


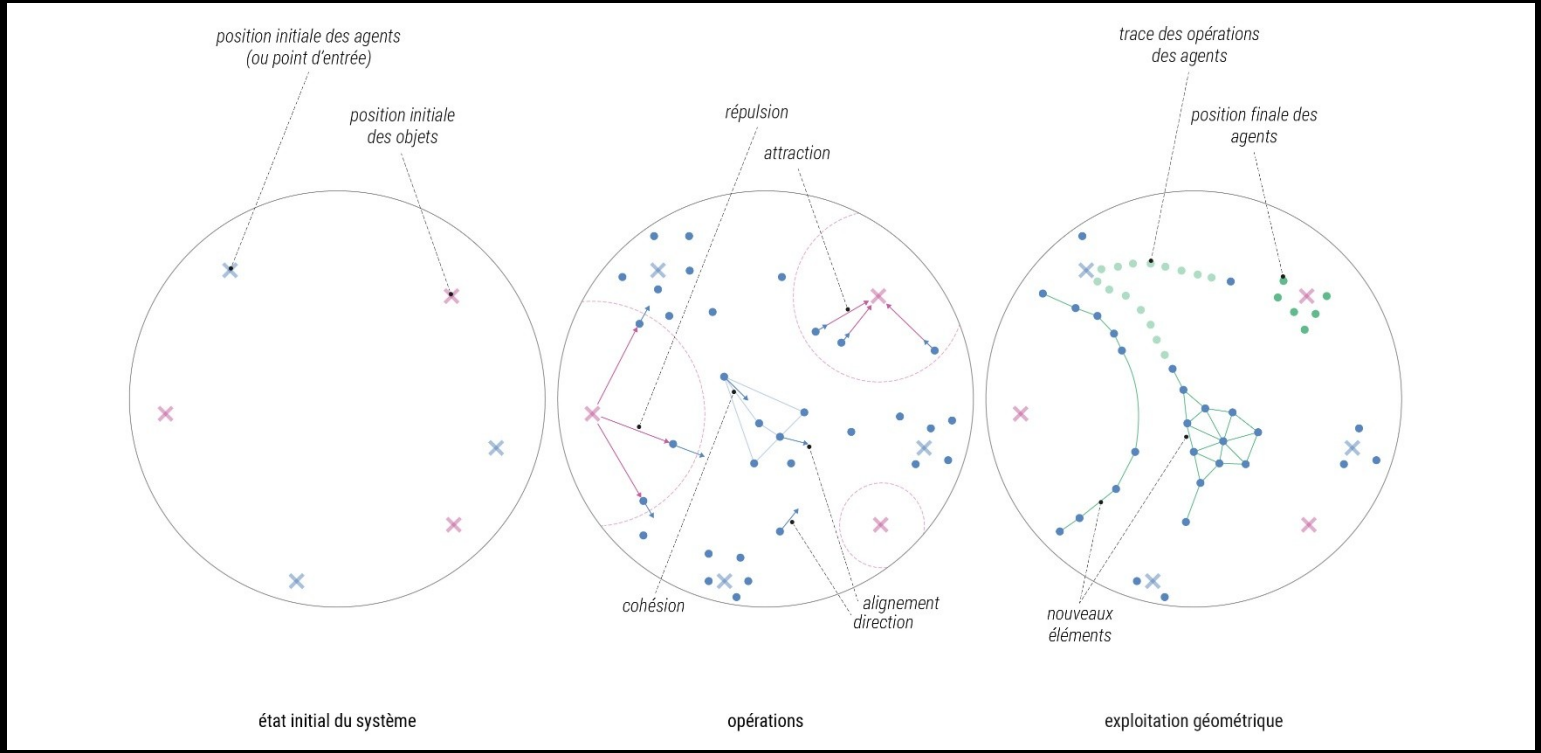
Genware
biothing


structureFIT
problem setup
exploration
refinement
design space type:
Grammar Design Space
Parametric Design Space
Stable Structure
Defined Loads
Defined Variables
open + save
build model
Add Elements
Material:
Steel
Section:
Sec1
Draw Continuously
Define Variables + Relationships
Modify / Delete Elements
n1
n2
Nodes
Members
Name
X
Y
n1
1.76e2
2.33e2
n2
3.18e2
4.20e2
Materials
Sections
Cases
New Material...
Name
Modulus of Elasticity
Steel
2.90e4
Current Load Case:
lc1
Copyright 2014, Caitlin Mueller and MIT
structureFIT v2.01 released 31 March 2014

au fil du temps, un appui sur des typologies répétées

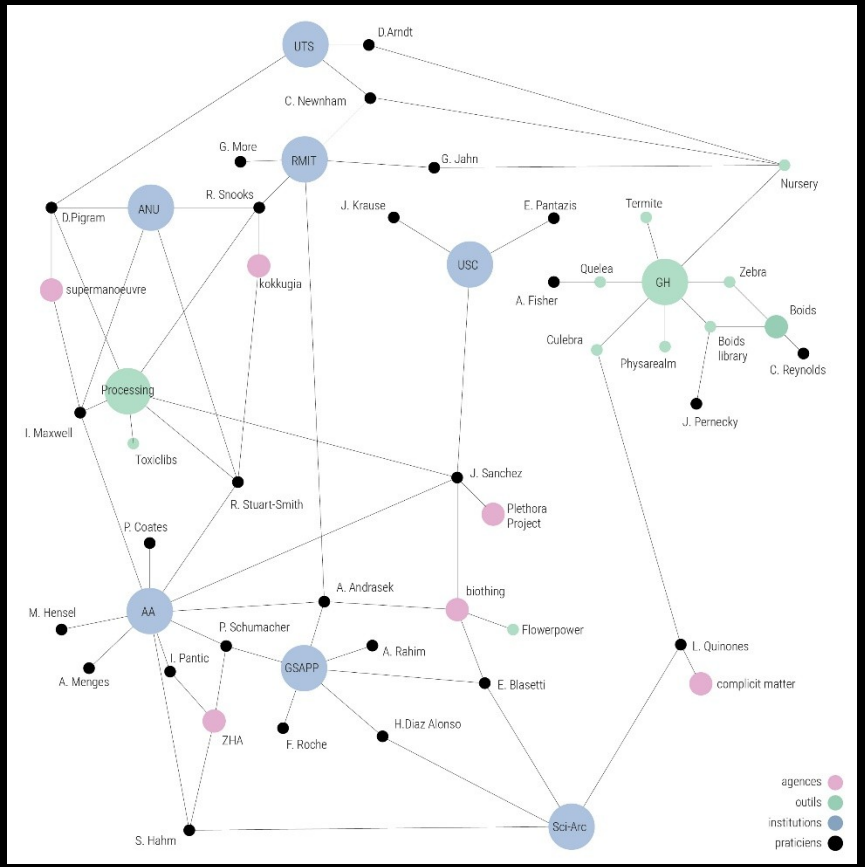
typologies d‘algorithmes:
des familles à la structure commune

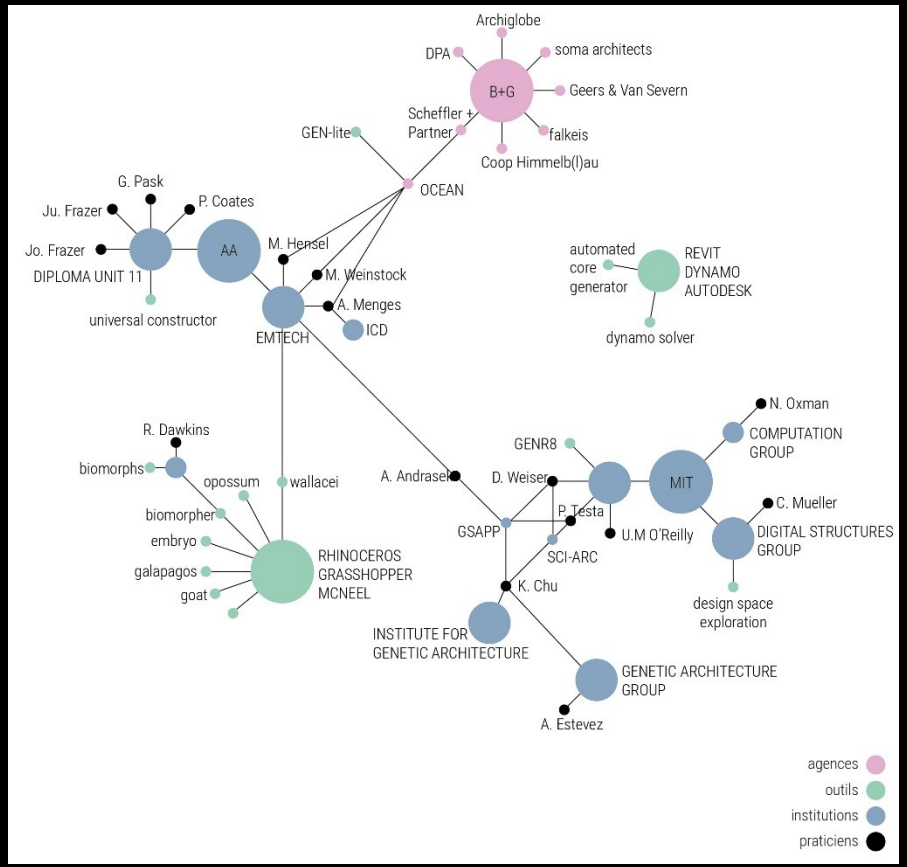

gènes
génération d'une population
fonction d'évaluation
évaluation
méthode de calcul
sélection
mutations
sélection d"un individu
individus optimaux


position initiale des agents
(ou point d'entrée)
position initiale
des objets
répulsion
attraction
cohésion
alignement
direction
trace des opérations
des agents
position finale des
agents
nouveaux
éléments
état initial du système
opérations
exploitation géométrique

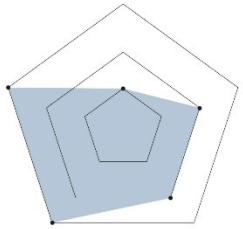
PARTIE 3

L‘open-source, une pratique en filigrane de la fabrique des outils

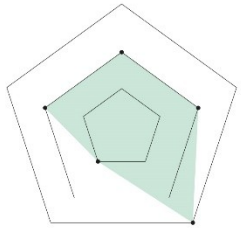

UTS
D.Arndt
C. Newnham
G. More
RMIT
G. Jahn
Nursery
D.Pigram
ANU
R. Snooks
J. Krause
E. Pantazis
Termite
supermanoeuvre
kokkugia
USC
Quelea
GH
Zebra
A. Fisher
Boids
Culebra
Physarealm
Boids library
C. Reynolds
J. Pernecky
Processing
I. Maxwell
Toxiclibs
J. Sanchez
R. Stuart-Smith
Plethora Project
P. Coates
A. Andrasek
biothing
M. Hensel
AA
P. Schumacher
Flowerpower
I. Pantic
GSAPP
A. Rahim
L. Quinones
A. Menges
E. Blasetti
complicit matter
ZHA
F. Roche
H.Diaz Alonso
S. Hahm
Sci-Arc
agences
outils
institutions
praticiens


Archiglobe
DPA
soma architects
B+G
Geers & Van Severn
Scheffler + Partner
falkeis
Coop Himmelb(l)au
GEN-lite
OCEAN
G. Pask
Ju. Frazer
P. Coates
Jo. Frazer
AA
M. Hensel
M. Weinstock
DIPLOMA UNIT 11
A. Menges
universal constructor
EMTECH
ICD
automated core generator
REVIT
DYNAMO
AUTODESK
dynamo solver
R. Dawkins
biomorphs
opossum
wallacei
A. Andrasek
N. Oxman
COMPUTATION GROUP
GENR8
D. Weiser
MIT
biomorpher
P. Testa
C. Mueller
embryo
GSAPP
U.M O'Reilly
DIGITAL STRUCTURES GROUP
galapagos
SCI-ARC
RHINOCEROS
GRASSHOPPER
MCNEEL
goat
K. Chu
design space exploration
INSTITUTE FOR GENETIC ARCHITECTURE
GENETIC ARCHITECTURE GROUP
A. Estevez
agences
outils
institutions
praticiens

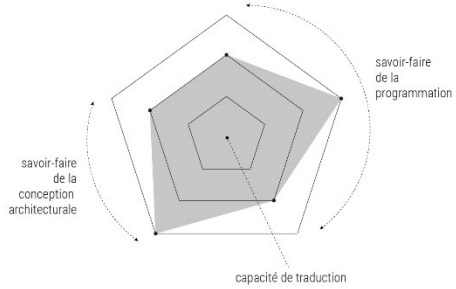
Dates for the workshop:
Monday 9th to Friday 13th of January 2023

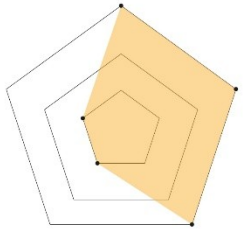


PROFIL A - architecte-programmeur

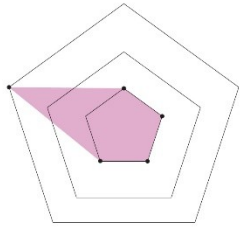


PROFIL B - ingénieur-programmeur

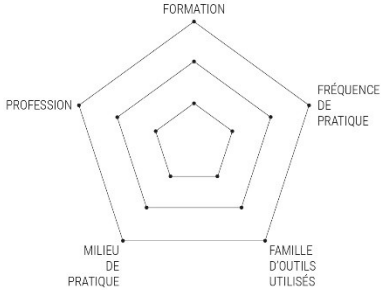


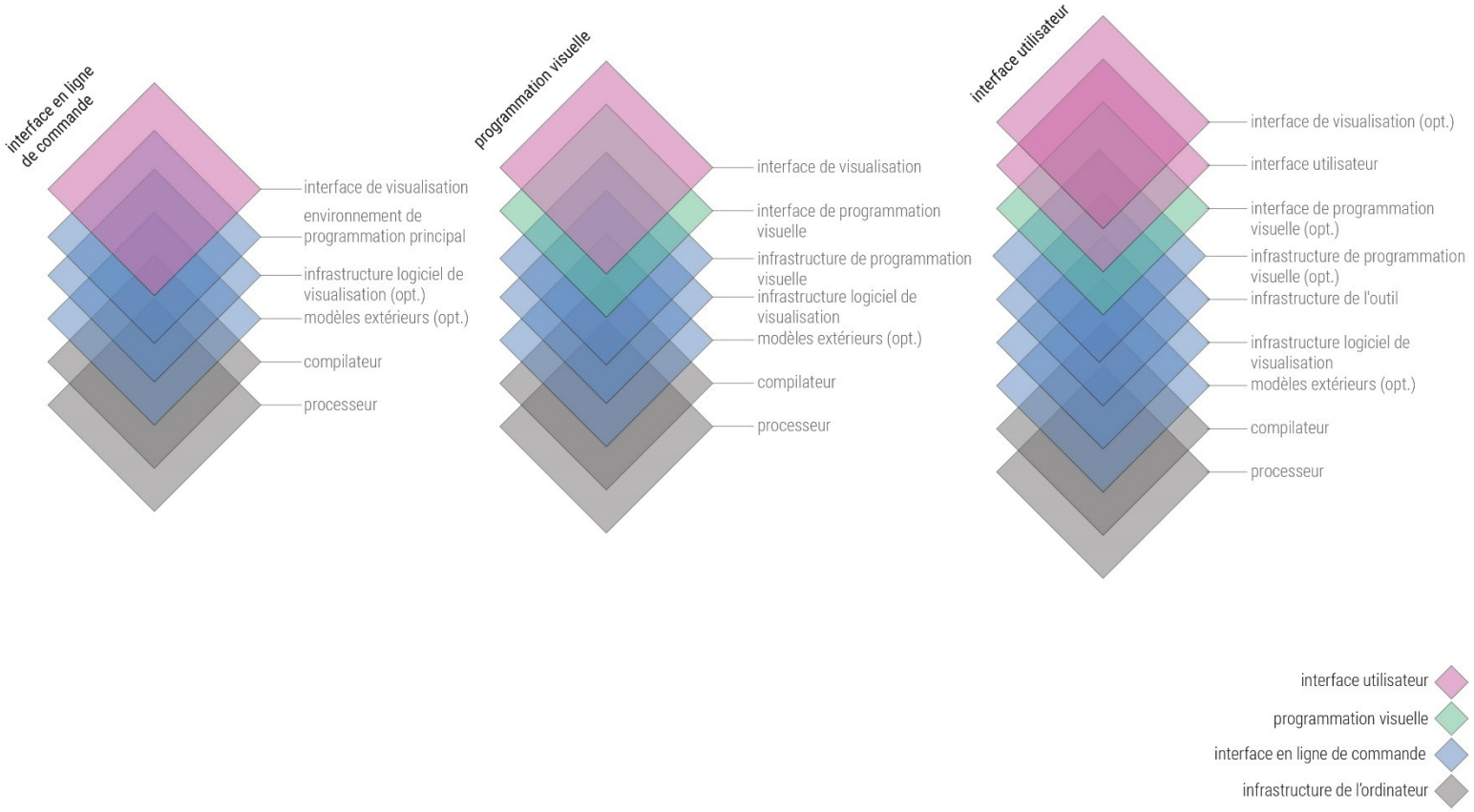


PROFIL C - développeur

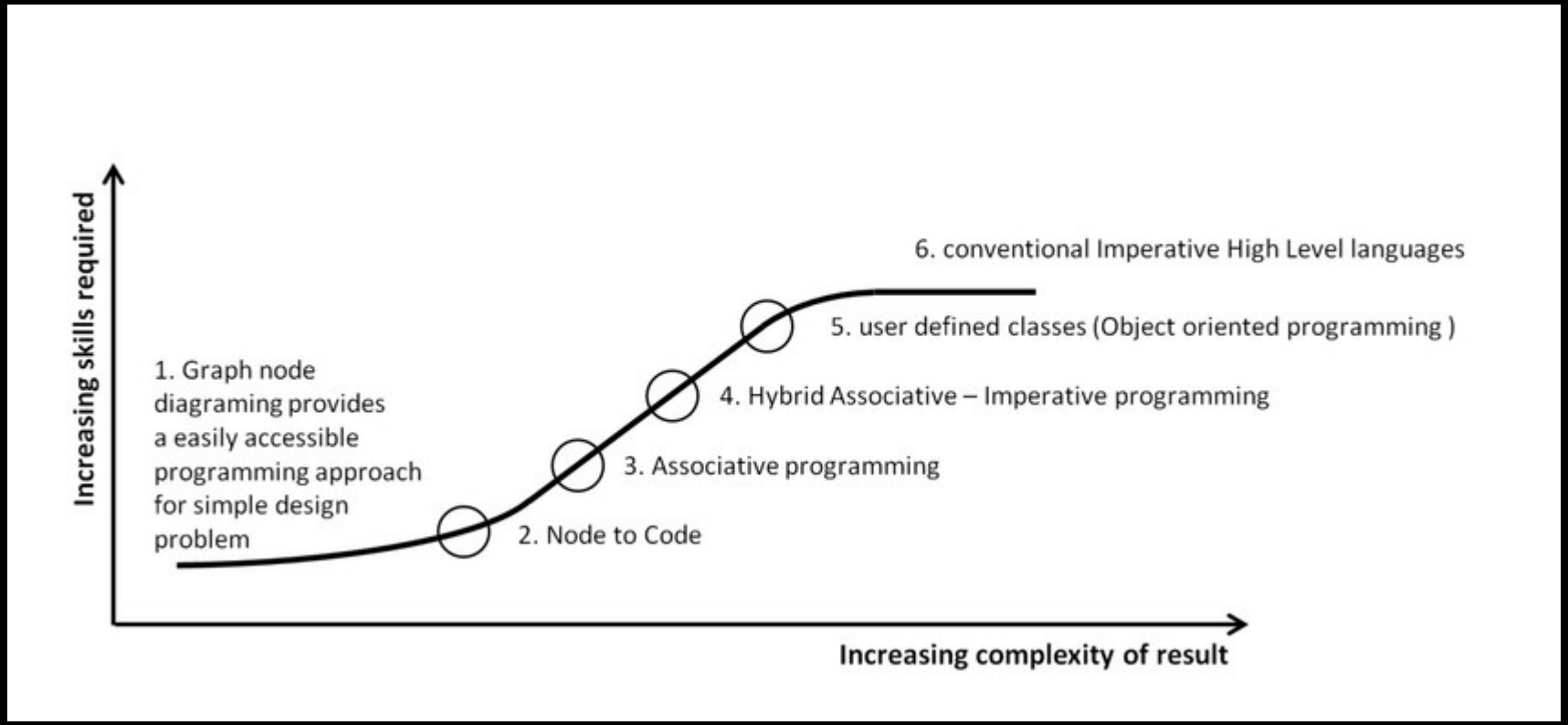


PROFIL D - architecte



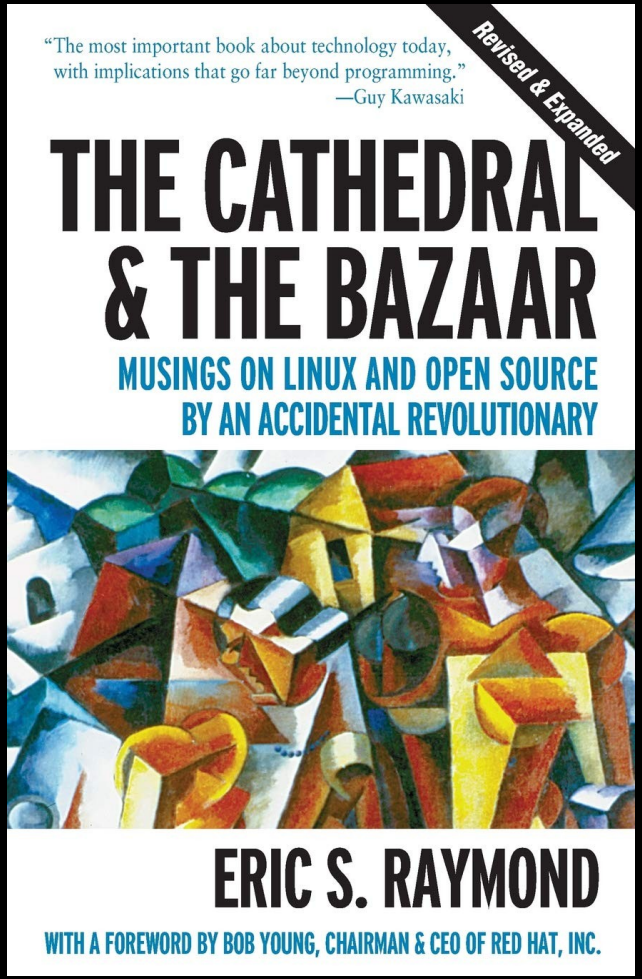

interface en ligne de commande
interface de visualisation
environnement de programmation principal
infrastructure logiciel de visualisation (opt.)
modèles extérieurs (opt.)
compilateur
processeur
programmation visuelle
interface de visualisation
interface de programmation visuelle
infrastructure de programmation visuelle
infrastructure logiciel de visualisation
modèles extérieurs (opt.)
compilateur
processeur
interface utilisateur
interface de visualisation (opt.)
interface utilisateur
interface de programmation visuelle (opt.)
infrastructure de programmation visuelle (opt.)
infrastructure de l'outil
infrastructure logiciel de visualisation
modèles extérieurs (opt.)
compilateur
processeur
interface utilisateur
programmation visuelle
interface en ligne de commande
infrastructure de l'ordinateur

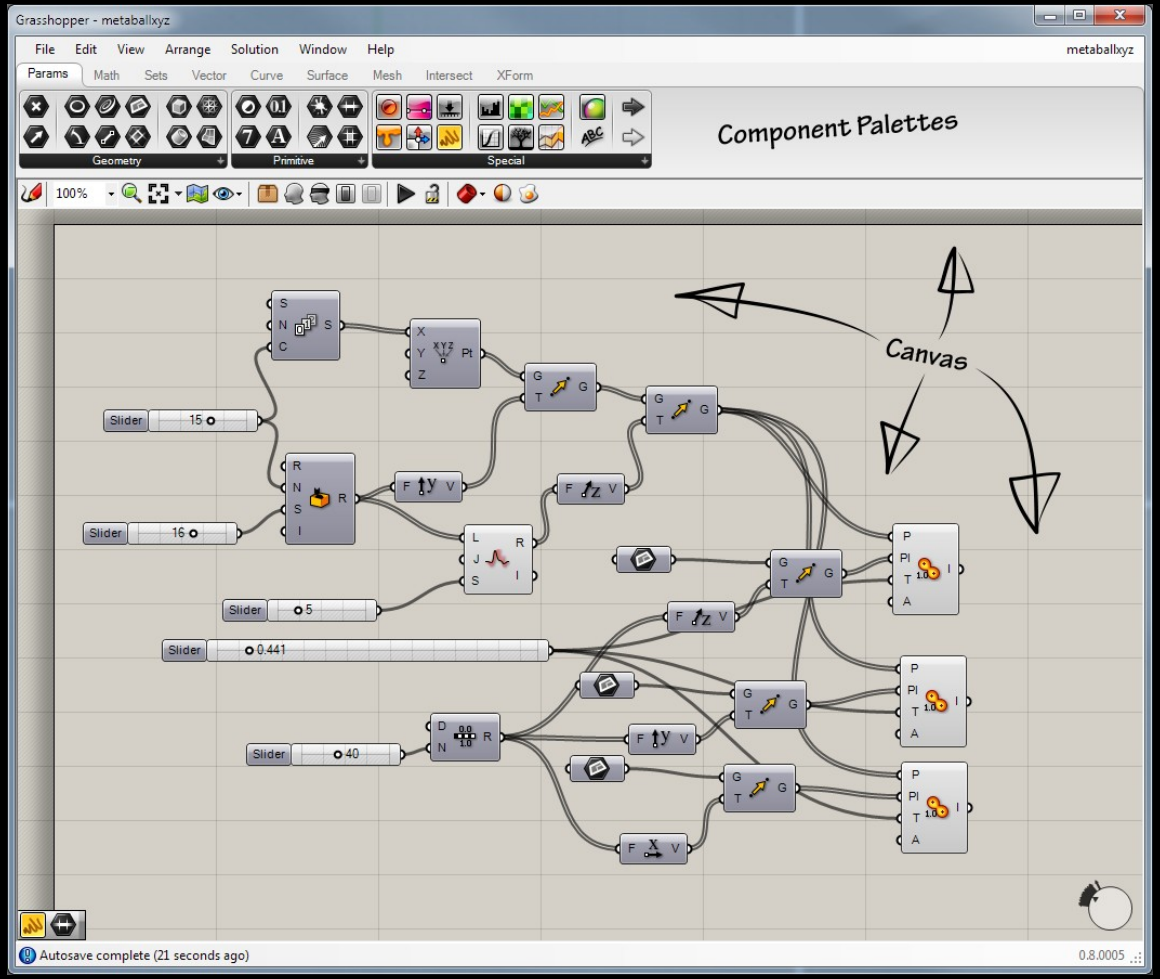
Robert Aish et al.



PARTIE 4

Open-Source et apprentissage, un lien inextricable


"The most important book about technology today, with implications that go far beyond programming."
—Guy Kawasaki
Revised & Expanded
THE CATHEDRAL & THE BAZAAR
MUSINGS ON LINUX AND OPEN SOURCE BY AN ACCIDENTAL REVOLUTIONARY
ERIC S. RAYMOND
WITH A FOREWORD BY BOB YOUNG, CHAIRMAN & CEO OF RED HAT, INC.


Grasshopper - metaballxyz
File Edit View Arrange Solution Window Help
metaballxyz
Params Math Sets Vector Curve Surface Mesh Intersect XForm
Geometry
Primitive
Special
Component Palettes
100%
Canvas
Slider 15
Slider 16
Slider 5
Slider 0.441
Slider 40
Autosave complete (21 seconds ago)
0.8.0005


AUTODESK
BUILD SPACE

facilité d‘appropriation ou contrôle approfondi?
une négociation au coeur du développement
des outils

PARTIE 5

Les limites de l‘open-source

L‘open-source en architecture, à quoi ça sert ?

apprendre la programmation en même temps qu‘apprendre la conception architecturale, un double défi

des praticiens en manque de reconnaissance et
de débouchés professionnels


AUTODESK
BUILD SPACE

des courbes d‘apprentissage qui s‘aplatissent, des boîtes noires qui prolifèrent, des profils amateurs qui demeurent

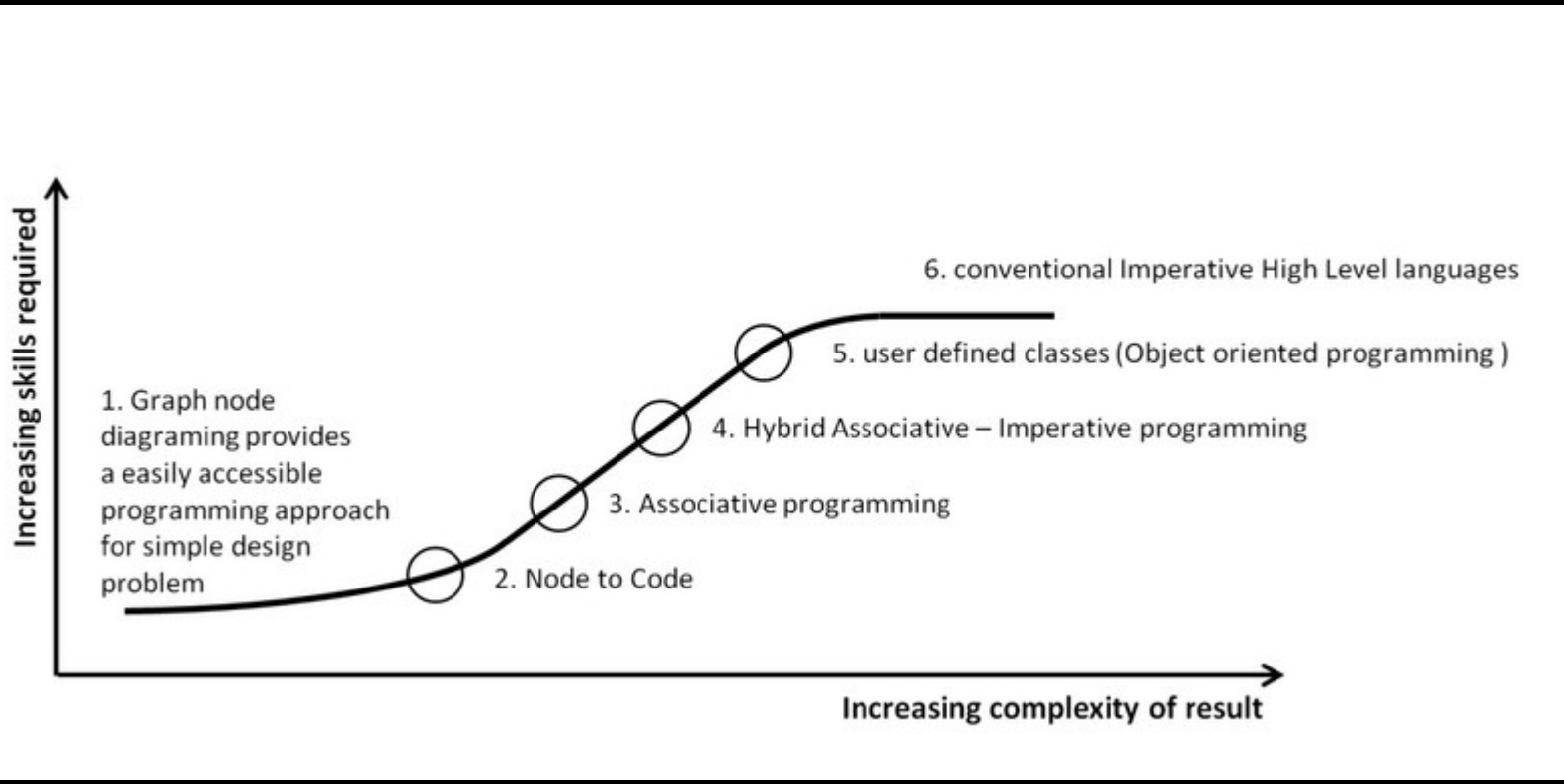
une tendance à l‘exploitation commerciale
de plus en plus prononcée

PARTIE 6

L‘histoire d‘un échec ?

Voir disparaître le bricolage et les pratiques collaboratives qui sont à la base de l'open-source, c'est aussi voir disparaître ce qui fait le sel de la rencontre entre architecture et algorithmes


Polyline input (01)
Panels
Panels


Increasing skills required
1. Graph node diagraming provides a easily accessible programming approach for simple design problem
2. Node to Code
3. Associative programming
4. Hybrid Associative – Imperative programming
5. user defined classes (Object oriented programming)
6. conventional Imperative High Level languages
Increasing complexity of result


WASP
1 2 3
4
Rhinoceros interface
Grasshopper interface
WASP framework (Python)
Grasshopper framework (C++ / VB.net)
Rhinoceros framework (C++ / VB.net / C#)
compiler
PARAMETERS
1 Geometries
2 Rules
3 Constraints
4 Graph
P.STELLAVIATORI
1 2 4
3 5 6
Rhinoceros interface
Grasshopper interface
P. Stellaviatori framework (Python)
Grasshopper framework (C++ / VB.net)
Rhinoceros framework (C++ / VB.net / C#)
compiler
PARAMETERS
1 Container
2 Discretization
3 Maps
4 Probabilities
5 Optimization method
6 Stochastic simulation
COCKATOO
1 2 3
4
3
Rhinoceros interface
Grasshopper interface
Cockatoo framework (Python)
Kangaroo 2 framework (C# / C++)
Grasshopper framework (C++ / VB.net)
Rhinoceros framework (C++ / VB.net / C#)
compiler
PARAMETERS
1 Geometries
2 Forces
3 Relaxation mehtod
4 Knit method
5 Knitting parameters

MERCI POUR VOTRE ATTENTION

Digital Design Unit — Digitales Gestalten