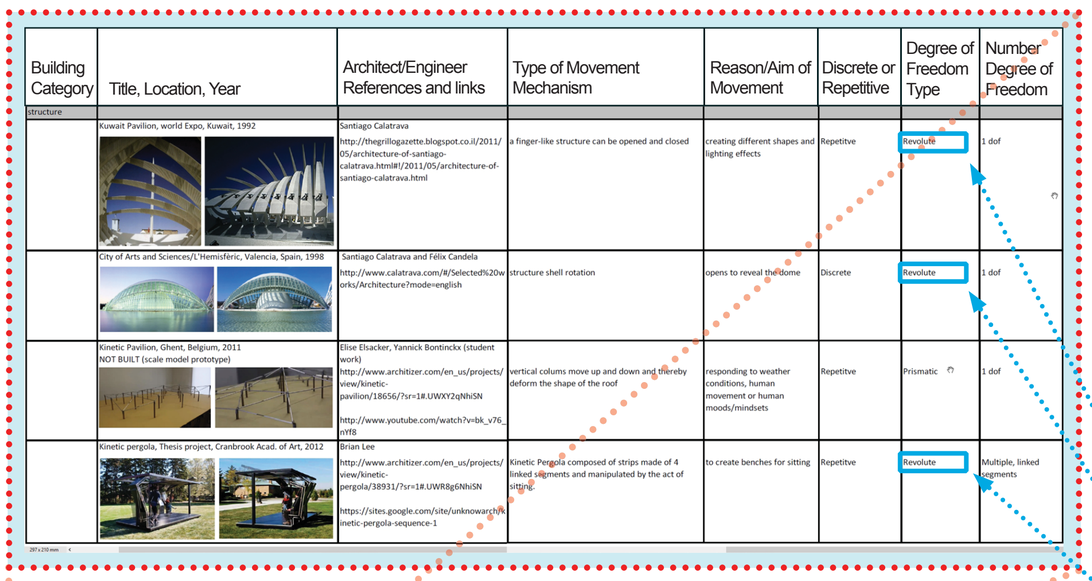
CAADRIA 2014 KYOTO

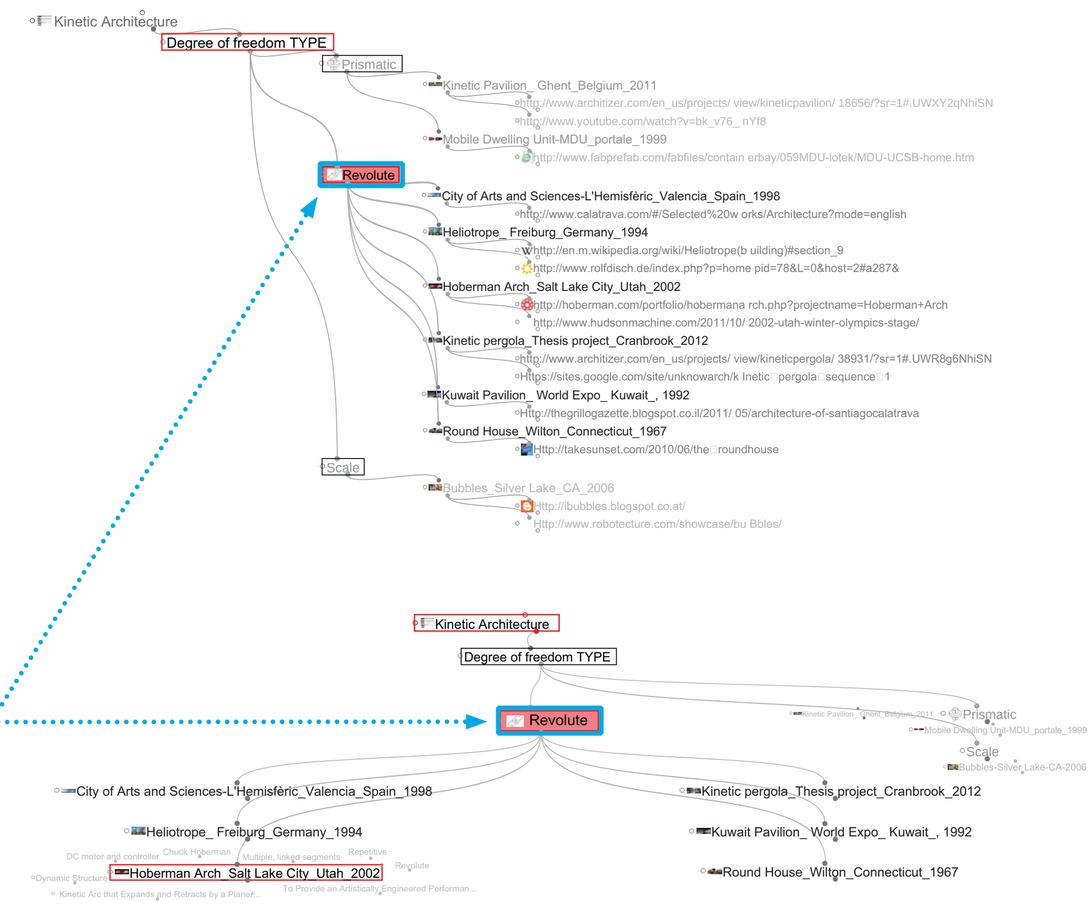
ANALYSING AND VISUALIZING THE MOVING MECHANISMS OF KINETIC ARCHITECTURE

Kinetic architecture matrix: table view - sorted by building category

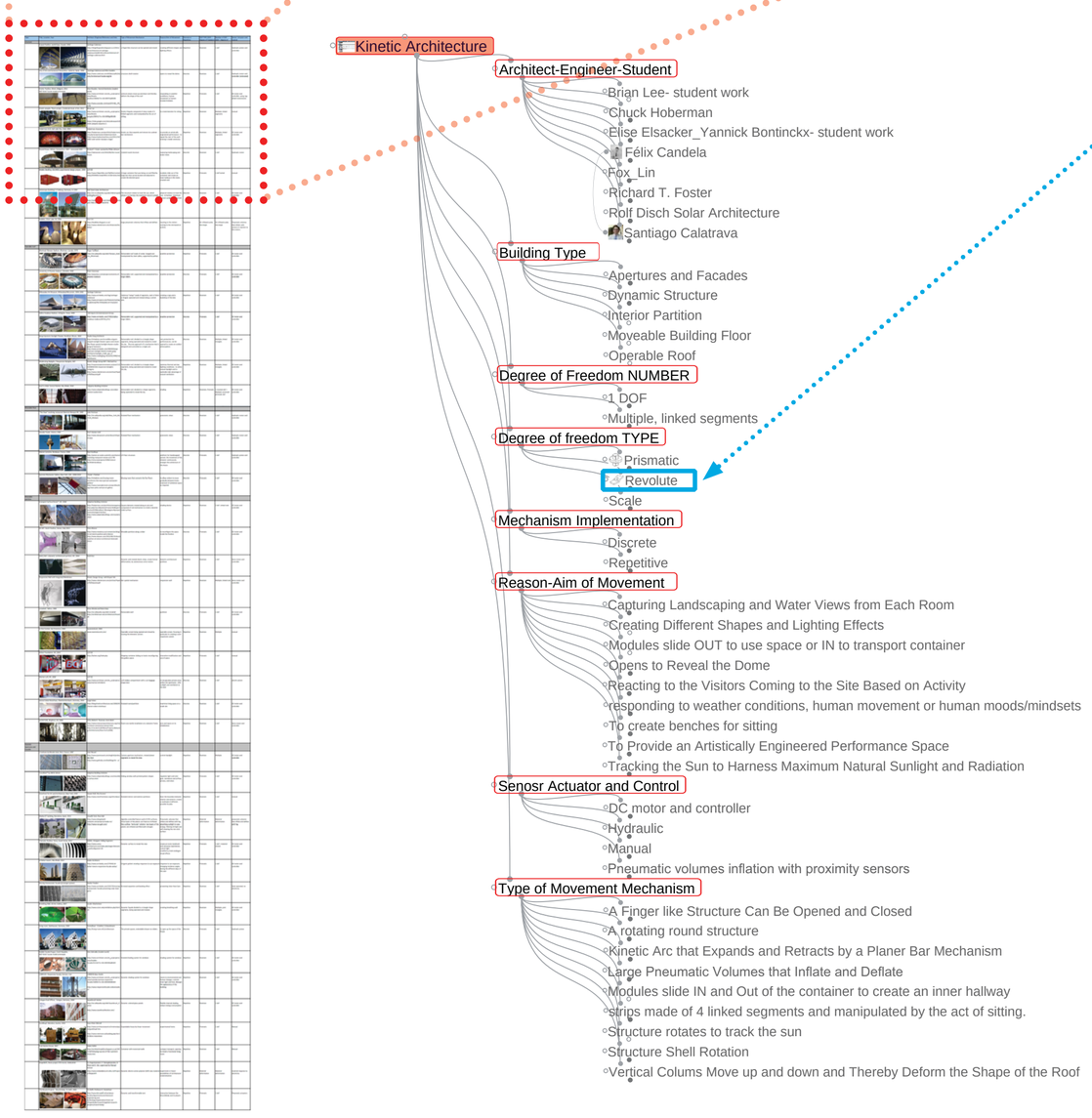


Building Category	Title, Location, Year	Architect/Engineer References and links	Type of Movement Mechanism	Reason/Aim of Movement	Discrete or Repetitive	Degree of Freedom Type	Number Degree of Freedom
structure							
	Kuwait Pavilion, world Expo, Kuwait, 1992	Santiago Calatrava http://thegrillogazette.blogspot.co.il/2011/05/architecture-of-santiago-calatrava.html#!/2011/05/architecture-of-santiago-calatrava.html	a finger-like structure can be opened and closed	creating different shapes and lighting effects	Repetitve	Revolute	1 dof
	City of Arts and Sciences/L'Hemisfèric, Valencia, Spain, 1998	Santiago Calatrava and Félix Candela http://www.calatrava.com/#/Selected%20w orks/Architecture?mode=english	structure shell rotation	opens to reveal the dome	Discrete	Revolute	1 dof
	Kinetic Pavilion, Ghent, Belgium, 2011 NOT BUILT (scale model prototype)	Elise Elsacker, Yannick Bontinckx (student work) http://www.architizer.com/en_us/projects/view/kinetic-pavilion/18656/?sr=1#.UWXY2qNhiSN http://www.youtube.com/watch?v=bk_v76_nYf8	vertical colums move up and down and thereby deform the shape of the roof	responding to weather conditions, human movement or human moods/mindsets	Repetitve	Prismatic	1 dof
	Kinetic pergola, Thesis project, Cranbrook Acad. of Art, 2012	Brian Lee http://www.architizer.com/en_us/projects/view/kinetic-pergola/38931/?sr=1#.UWR8g6NhiSN https://sites.google.com/site/unknowarch/k inetic-pergola-sequence-1	Kinetic Pergola composed of strips made of 4 linked segments and manipulated by the act of sitting.	to create benches for sitting	Repetitve	Revolute	Multiple, linked segments

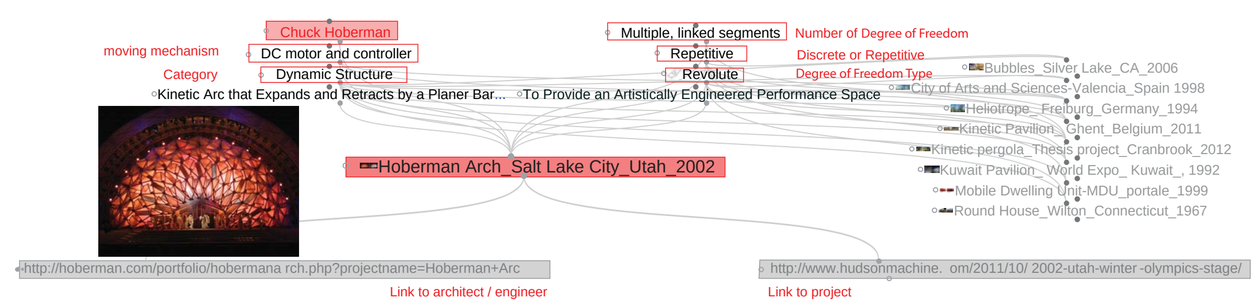
Kinetic architecture "dynamic matrix" - here: sorted by degree of freedom type / revolute



Kinetic architecture - "dynamic matrix" - overview



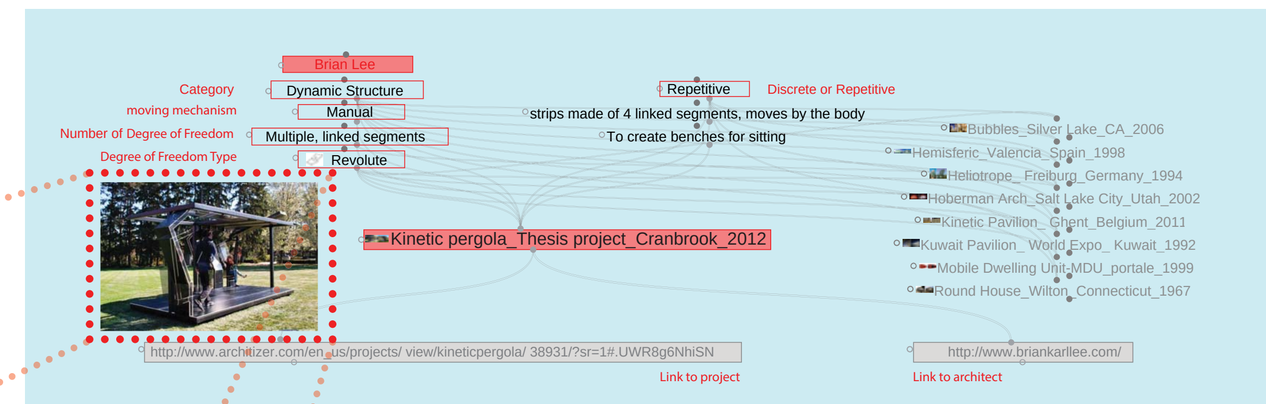
This research investigates kinetic architecture by examining the technologies that enable its actual movement. The study analyses and visualizes different dynamic mechanisms of selected contemporary architectural projects, by looking at parameters and technologies that facilitate the kinetic system. To make the kinetic mechanism visible, we explore mechanical engineering software, such as "AutodeskForceEffect", "Autodesk Inventor" and others, investigating their advantages and limits. The aim of this study is to facilitate the understanding of the inherent technologies of the system's moving mechanisms, and their implementation in individual design projects. Provided with a better understanding of the mechanisms, architects are fitted to approach the design of kinetic projects.



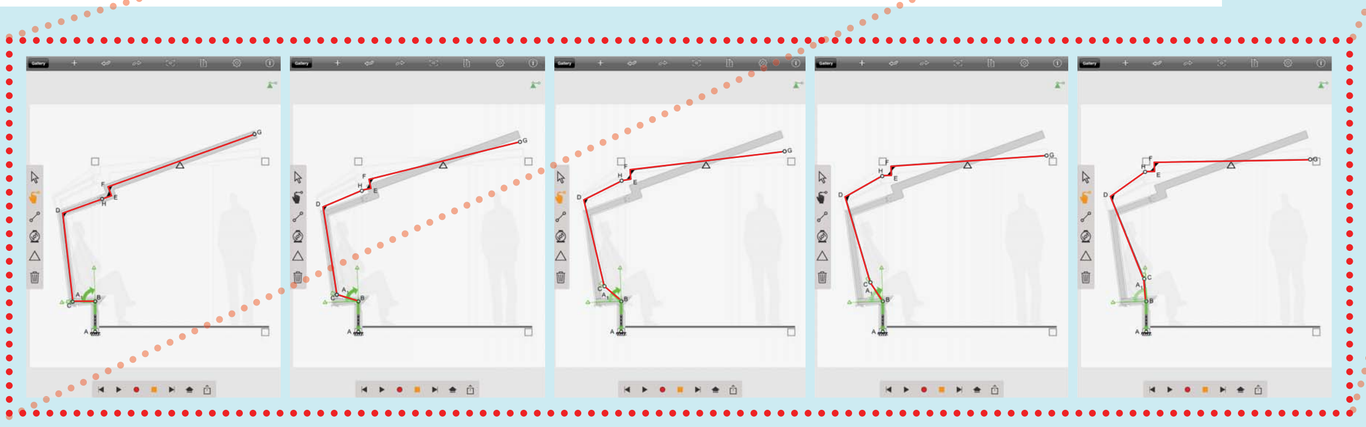
Kinetic architecture "dynamic matrix" - here: focusing on one precedent and its relations: "Hoberman Arch" by Chuck Hoberman

This research extends the author's previous study named "kinetic architecture matrix" - a database that establishes a new classification system of kinetic architecture based on "dynamic analysis" from the field of mechanical engineering. The precedents are categorized by :
Degree of Freedom (DOF) type i.e. prismatic, revolute, and
Degree of Freedom (DOF) number, i.e. one DOF, two DOF or multiple DOF

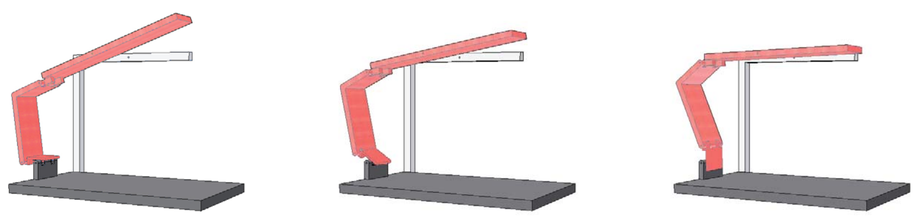
The thereby established "dynamic matrix" implements a unique interface that allows for sorting the precedents according to different categories, interests or viewpoints, as well as visualizing interdependencies that cannot be observed in a traditional database.
In this study, the previous dynamic matrix is extended by illustrating the moving mechanisms of the projects in the database. 2D and 3D diagrams are created by using mechanical engineering software, in order to analyse and visualize the kinetic mechanisms. The system animations are embedded in the "dynamic matrix 2.0", which is intended to facilitate a better understanding of and more founded design approach towards kinetic architecture by visualizing movement mechanisms, projects' similarities, differences and cross-references.



Kinetic architecture "dynamic matrix" - here: focusing on one precedent and its relations: "Kinetic Pergola" by Brian Lee



Kinetic architecture "dynamic matrix 2.0" - here: showing the kinetic mechanism of the project "Kinetic Pergola" by Brian Lee / stills of the animated diagram (Autodesk ForceEffect)



showing the kinetic mechanism of the project "Kinetic Pergola" by Brian Lee / stills of the animated 3D-diagram (Autodesk Inventor)

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