

ARCH 4101 – ADVANCED BUILDING DESIGN

Instructor Chengde Wu

Hours MWF 2:00 – 5:15 pm (5 credit hours)

Project Vibrant Library

Theme Kinetic façade with advanced computational geometry

Premise

Building façade not only expresses the personality of a building, but also affects its physical performance. Curtain walls, shading devices, and double skins are some of the common components of building façades. With the advance of technology in the recent years, kinetic façade emerged as a viable option to satisfy the architects' desire to explore intricate building skin designs. Kinetic façade can create dynamic appearance and generate vibrant cityscape. In addition, kinetic facade can be connected to real time sensors and have its opening ratio and opening direction adjusted based on the sensor data. This also opens the potentials for real time building performance optimization.

The movement of a kinetic façade is usually determined by the structure of the design and the properties of the materials. To realize complex kinetic façade design, understanding advanced computational geometry is essential. It is the key to modeling the digital representation of a complex kinetic façade and simulating its movement. Advanced computational geometry can also be used to analyze the constructability of the façade modules.

Project Overview

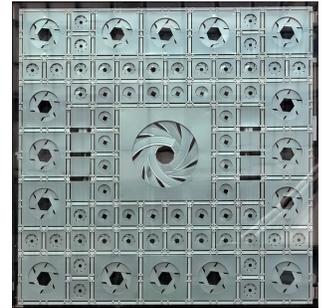
The Vibrant Library (VibLib) project is to design a public library in uptown Charlotte. While the designs should accommodate site context and the space program of a library, the primary focus of the project is to design kinetic façades and investigate the advantages that the kinetic façades bring to building design in terms of performance and appearance.

Goals and Objectives

- Study the general space program and the functional layout of a public library.
- Investigate the typology in the geometric forms of kinetic facades.
- Utilize advanced computational geometry and parametric modeling to design and animate the kinetic façade.
- Simulate and analyze the performance of the kinetic façade.
- Present design process and the product thorough diagrams, drawings, models, and animations.

Content & Structure

The project is composed of two major parts. One is the design of a functional library with kinetic facade. The design should respect the site context and accommodate the space program of a typical library. The other part is the analysis of the kinetic façade. It includes the parametric modeling, the simulation of the movement, and the performance analysis of the kinetic façade.



Arab Institute



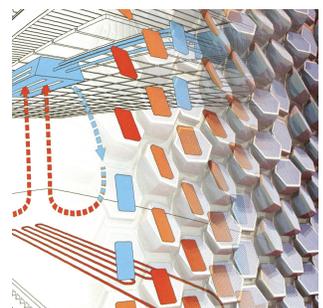
Café-restaurant



Abu Dhabi Investment HQ



Garden by the Bay



CASE Façade Prototype