

APPLYING PARAMETRIC DESIGN IN ORDER TO MEET THE ENVIRONMENTAL GOALS

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Abstract

Environmental problems and reduction of energy resources due to industrialization at the end of the 3rd millennium and excess used of irreproducible energies and lack of information about its consequences and also big changes in different branches of science and technology in new millennium welcomed a new way for understanding the new methods and concepts of designing process. So, it is understood that by using new advancement, we can use pure energy at the best and so limit the usage of the fossil fuels.

One of the most important strategies in design process is using advanced software in order to design and supervise the efficiency of the designed building in the visual space before construction.

The present research studies the importance of using science and new technologies in architecture process including use of different software to get the main principles of designing based on the climate in order to meet the following goals:

Introduction

Using the software and different technologies is an inseparable strategy and approach in architecture design of the third millennium. One of the most important reasons is the ability of the software to meet the environmental goals. An approach and methodology in designing is to insert the parameters effective on the form and inside including the use of electricity and the forces on the building and even aestheticism from the beginning to the end of designing in the visual space without paying too much costs and maximize the efficiency of the building.

Parametric design

Parametric design means that defined factors are introduced in the designing and changes on order to get the desired form. A parametric form can be easily changed and various modes defined by these parameters can be discovered. In addition a parametric design has the capability of being multidimensional. Form can be related to any dimension of the building and the design process can be logical. Defining form and proper parameters or parametric design can be a proper tool for reducing the problems of a building form from the beginning to the end.

So, software is used to model the building in order to increase the response of the building against environmental condition and its more compatibility with the environment.

AutoDesk Ecotect

Date of construction: June 2008

Company: Aouto Desk

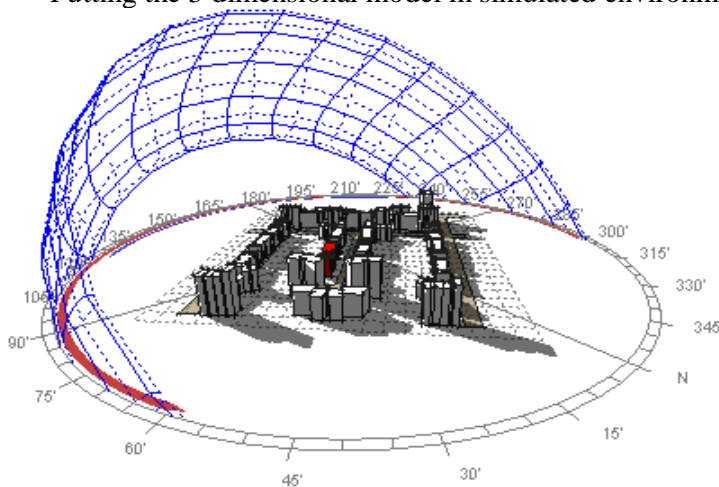
It is a program for analyzing the efficiency and quality of the building before construction. Using this software can result in a stronger, cheaper and more efficient building.

Some capabilities of the software

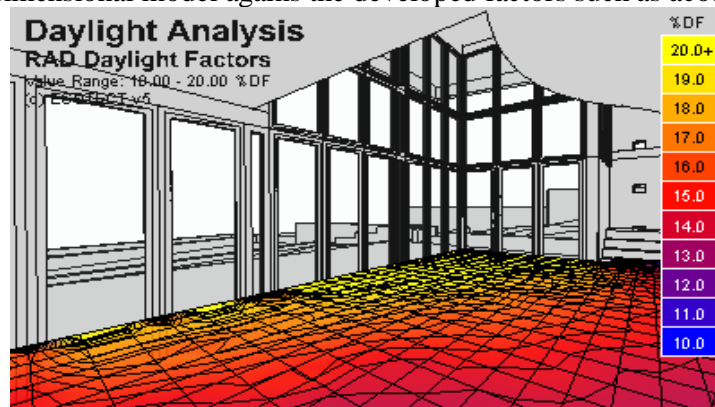
- The possibility of analyzing the energy consumption of the building
- Capability of measuring the thermal efficiency of the building
- The possibility of measuring the amount of electricity consumption inside and outside the building
- Facilities for measuring the sun light
- The possibility of measuring the light of the sun in different times of the day
- Possibility of showing the hits to the buildings
- Possibility of measuring the water needed for the building
- Calculating the carbonic gas exit
- Acoustic analysis of the building
- Calculating wind energy on the building

Methodology

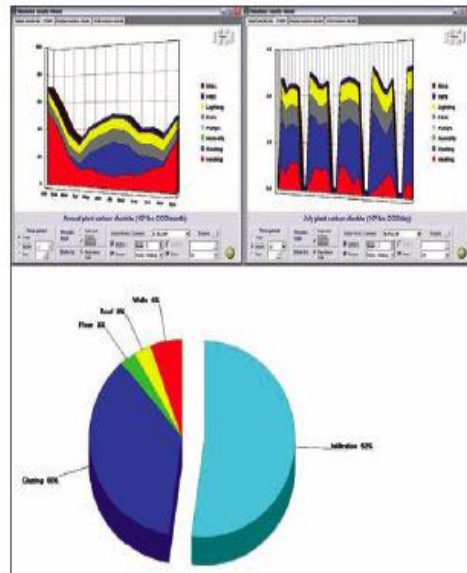
- Simulating the environment in terms of factors such as direction and intensity and light angles in a defined time period
- Putting the 3 dimensional model in simulated environment



Analyzing the 3 dimensional model against the developed factors such as acoustic light and costs



- Introducing a wide range of operational details of the modeled building inside the related field
- Introducing different ideas and a collection of data through completely feeling and effective methods



An annual carbon dioxide graph, monthly carbon dioxide graph, and heat loss pie chart, as displayed in Bentley Hevacomp.

in fact Ecotect passes the route through the concepts of designing the environment. Ecotect is completely different from the analyzed instruments since its aim is designing the primary stages when it needs decision making about energy and other efficiencies to get the final project.

Rhino and Grasshopper

Rhino

Producer Company: McNeil

Strong modeling software

Method:

Producing geometry based on the lines

Advantage: precise performance compared to the basic softwares such as Max due to defining the mathematical lines



Modeling the complicated surfaces with simple instructions in building complicated volumes and curved forms



Grasshopper

One of the plug in of Rhino based on the additional design and creating the curves and free levels and discovering the new forms based on algorithmic and repetitive system which is parametric and has an environment of geometrical function which are predetermined and create the related form through the relationship which is created by drawing the Norbez lines.



Advantage

Possibility of easy and repetitive changes on the form in order to create a form with certain parameters and a defined logic possibility of creating a link among some majors such as architecture, construct, energy, mathematics, project management, electronic, physics and other courses and filling the gap between them. The ability to make and produce the complicated forms out of imagination. The ability to produce various volumes and fast studies.

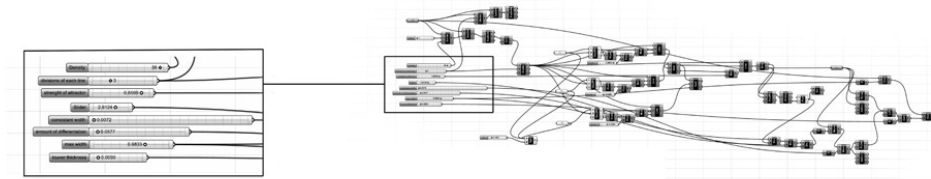
Case study

Parametric designs for frontage

In process of designing the project, it is possible to use parametric design for designing some architectural elements such as frontage.

So, the combined software of Grasshopper and Ecotect was used to modeling the surface of the frontage to improve the proper response for environmental condition and more compatibility with the environment.

Modifiable parameters in Grasshopper

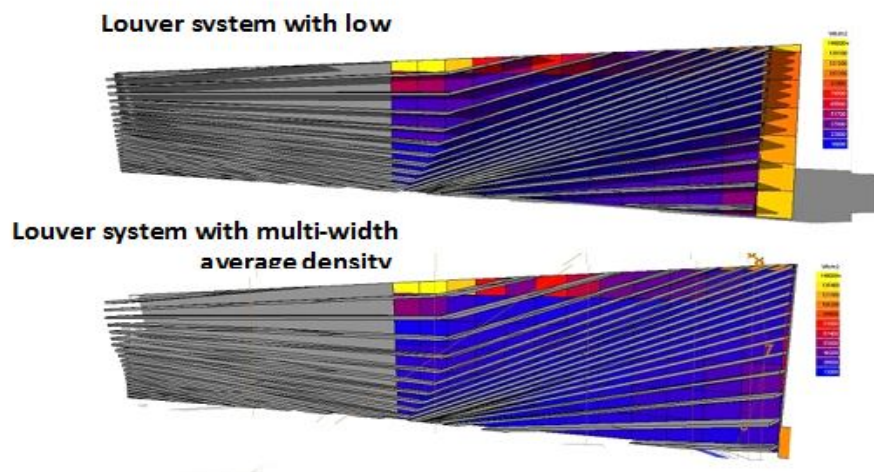
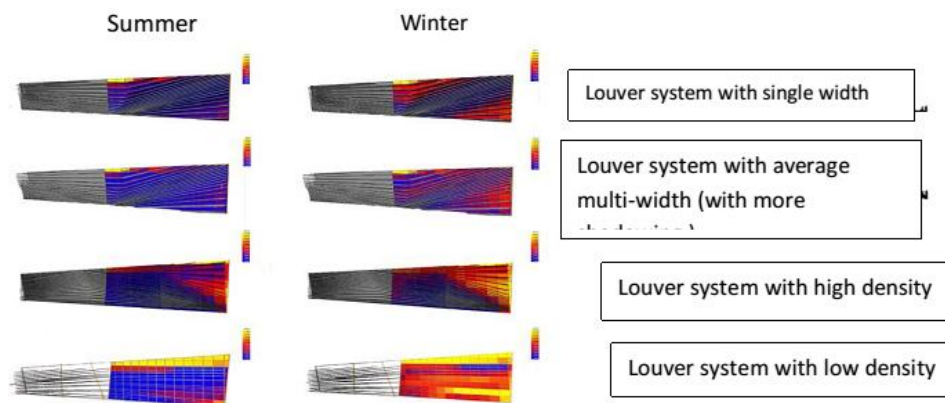


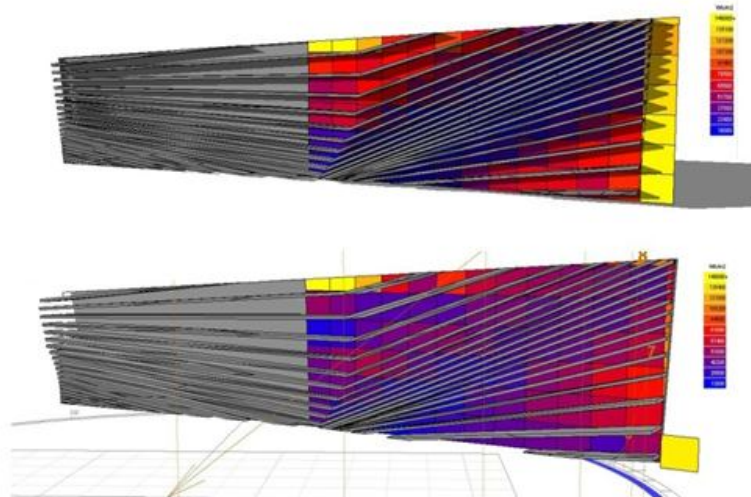
Picture of screen for modifying the system parameters in Grasshopper software

Generative Louver System

Generative system in Grasshopper makes it possible to discover the geometrical shapes. Frontage is closed through the changes in combinations based on attracting points. Then the geometry enters the ecotect so that the efficiency of the environment is measured by it and data is used in the building.

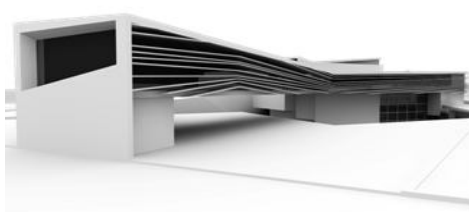
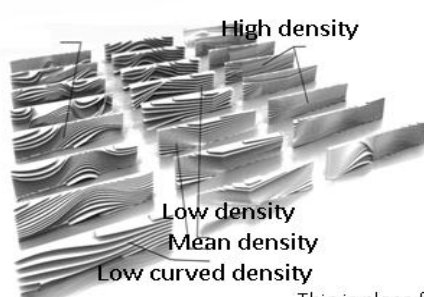
Analysis on the wall of a project in Ecotect





Produced Louver system

Louvers change their density on the specified points based on the planned density. Lesson classes have high density while the relaxing halls are for having view and have less density.

High density
Low density
Mean density
Low curved density

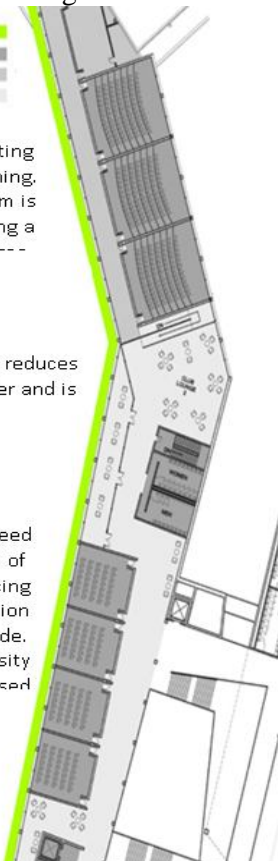
This is place for transportation and resting so

Louver	
High	
Mean	
Low	
density	

The corridor of the resting place with less opening. Here the louver system is divided through creating a lot of openings

Louver system reduces the view barrier and is

Lesson class need more control of light and reducing the attention toward outside. So system density is increased



Conclusion

Since architecture reflects the extract of time-place during the history and since the science and technology is important, so architecture should pass the route of changes based on science.

In the present millennium the global concerns and worries toward the environmental issues and the crisis of energy resources and finally worrying about the low quality of the life in next generation and the third wave of changes in technological improvement and communication, genetics, artificial intelligence, robotic and digital science which are created in the modern world of technology such as IBMS, Parametric Design and IMBP which otherwise welcome a new revolution in architecture design using the last technology for environmental goals to reduce using irreproducible sources and improving the usage of reproducible sources and preventing the environmental pollution and destroying natural and national sources of the country and finally destroying the environmental systems and lowering the quality of life by considering the future generation and this is a must.

Parametric design is an effective method on the form and inside including the use of electricity and the forces on the building and even aestheticism from the beginning to the end of designing in the visual space without paying too much costs and maximize the efficiency of the building.

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