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Study on the Climate Adaptability of Architectural Interface Opening in Suzhou's Regional Residences

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Abstract

Based on the illustration of climate adaptability of interface opening in Suzhou's regional residences, this paper is initiated to make a detailed interpretation of responsive measures and passive design strategies of interface opening, which were developed in the process of long-term adaptation to the regional climate. In the meantime, by the aid of Building Bioclimatic Chart and decomposing analysis of climatic elements, conducts a research on the regional climate responding model of interface opening, as well as the relationship with thermal comfort environment.

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1. Introduction

As is known, the formation of human buildings was derived from "enclosing" and "roofing", which divided the residential space with the clear climate boundary, and people have been changing the environment according to their own purposes from the first shelter. It is commonly considered that there are two levels of treatment in changing external environment: the first one is to create interfaces that can process the exterior climate parameters, and the second is to regulate the interior temperature, increase filtering effect by artificial means. Generally, architects rely more on the latter one nowadays, as a consequence of it resulting in excessive amount of carbon emission and heat island effect.

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In this sense, in order to reduce the dependence on equipment, architects should re-examine the positive role of the exterior-interior climate interface in dealing with the external climate parameters and temperature regulation. For example, decreasing a temperature gradient through the passive adjusting measures of interface strategies as the first step, and then according to the requirement of interior without or reduce the using of active adjusting measures. From this perspective, the interface not only exists as the boundary of the space, but also the medium, which is to transmit, isolate and regulate the exterior-interior temperature, air, humidity, sunshine and wind speed, and adjust the indoor microclimate environment to the greatest extent for the purpose of improving human comfort.

Firstly, the study is initiated to research the climate adaptability of architectural interface openings of regional residences in Suzhou, and then proceed to explore the relationship between interface opening and thermal comfort environment (solar radiation, air temperature, air flow, relative humidity). Architectural interface opening has established the climate gradient between human beings and the nature, regulated and controlled dynamic material and energy between natural and artificial climate in the process of responding to the climate changing. Meanwhile, the regional residence has an excellent reference value, for which is the most original architecture type with the maximum amount, and the most actual reflection of the dialogue between human and climate. Secondly, by the aid of Building Bioclimatic Chart and decomposing analysis of climatic elements, this study is an attempt to make a detailed interpretation of responsive measures and low-tech, zero emission passive design strategies in regulating microclimate of regional residences in Suzhou, which were developed in the process of long-term adaptation to the climate. Moreover, makes a discussion of its thermal responding mode, technique strategies, and practical value of re-application. Finally, through the thought among “Climate-Form-Performance”, and with the assistance of transforming the thinking from space to acclimatization, the purpose of this study is to oriented a new architectural design language and method. As a responding to “Form Follows Function” of the modern architecture, “Form Follows Climate” also should be an indispensable contributor to sustainable, global business.

2. Regional Residences, Interface Opening and Climate

None of the regional buildings in the course of history of human beings is not a truly reflection of the local climate and environment, what is called various climate creating various architectural form, and their physical form is exactly the evolutionary result of adapt to the climate for a long time. The generation and development of which is the most immediate reflection on the external environment, in the meantime, climate factors in building form actually project the dialogical relationship between external conditions and internal responses. [1]

When V. Olgyay put forward the “Climate Balanced Theory” [2] he pointed out that the generative process of buildings should combine with the natural environment, both avoid harmful behavior on the surroundings and make full use of natural resources, then achieve the balance as much as possible. Of course, the perfect climate balance does not exist, but the technologies reflected in regional buildings are simply effective, not only with little negative impact on the environment but utilized the forces of nature efficiently, such as sunlight, wind, temperature and humidity, expressing the unique regional climate responding strategies, which ideas and methods also possess an distinguished value in reviewing the development of today’s architecture, reducing energy consumption and carbon emission. [3]

Based on the interface opening and regional residences in Suzhou, the climate responding strategies of opening elements would be discussed in detail. Moreover, the interface opening does not serve as a single individual, but exists in the regional construction system with multiple internal relationships and dominated by the climatic conditions. In the meantime, the form of interface opening is more restricted by specific regional environment, climate factors and human activities, developed a series of passive strategies of adjusting microclimate environment under particular conditions, and obtained indoor comfortable environment assisted by responding principle.

Through the intensive performance research on interface openings in regional residences, two opening forms were achieved, that is Interfacial Opening such as doors, windows, etc., and Spatial Opening such as courtyard, eaves gallery, etc. In addition, based on Suzhou’s climate characteristics with high temperature, humid, rainy and more calm wind days, and by means of the decomposition of various climate factors, multidimensionally analyzes the heat-responding, light-responding, ventilated-responding performance of interface opening [4], then study in-depth the relationship among building energy consumption, human comfort and the climate adaptability of opening strategies.

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