

自由形體設計與施作流程研究

A Study on the Process of Free Form Design and Construction

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自從 Gehry (1990) 完成巴塞隆納的魚雕塑設計後，建築的形體開始被解放，建築不再是垂直水平的線條，透過電腦及科技新媒材的運用，建築的形式變得毫無限制。這樣的發展在 1997 年後開始大量盛行，隨之而來的是與自由形體建築有關的相關研究，包含探索其他領域的科技、軟硬體、設計製造流程等，而隨這近年來研究的增加，這樣的研究也漸漸成為一專注的領域，探討有關自由形體建築從設計到施工各階段的問題 (Friedman, 1999)。

但台灣由於長期缺乏相關的真實建造案例，雖然在設計上多有著墨，但卻只有極少數可以被建造出來，台灣也因此長期缺乏自由形體在電腦輔助設計/電腦輔助製造 (computer aided design / computer aided manufacturing, CAD/CAM) 組裝方面的各類研究，所以自由形體建築這類設計案通常都只停留在提案階段。

本研究著眼於與自由形體建築設計建造相關的新媒材及流程兩方面上。在自由形體新媒材的發展上，希望可以歸納出自由形體的設計建造流程相關的新媒材發展方向，並發展自由形體建築所需的初步媒材;設計建造流程部分，則希望驗證先前研究提出的初步流程，進而提出叫型自由形體建築的初步設計建造流程。

在研究設計建造流程研究的方法上，首先基於先前研究所提出的小型自由形體設計流程，執行數個與公信設計案某些特定條件相仿的案例，驗證先前研究所提出的設計流程是否完備，以及是否需要修正，進而獲得一個小型自由形體的完整設計流程；接著基於所提出的新流程操作叫型自由形體設計案例，最後希望建構一個叫型自由形體建築設計建造的初步流程。

另外，在界定新媒材的發展方向上，藉由各種不同規模的自由形體案例的執行，探索各種領域相關媒材，運用於自由形體的可能性，並從中釐清目前媒材的不足，歸納出媒材可能的發展方向。最後，發展特定的初步新媒材，以驗證自由形體新媒材發展的重要性。

關鍵字：自由形體、數位媒材、電腦輔助設計、電腦輔助製造、設計過程

Abstract

Since Frank Gehry completed the design of Barcelona Fish in 1990, the form of architecture starts to be liberated. With the help of computer technology and new materials, architecture was no more the geometrical figures. Its form becomes unlimited. This kind of development has been largely adopted since 1997, and then come along with the related researches regarding free-form construction, which include the technology that explores the other fields, the software and the hardware, and the processes of design and manufacture. With increasing numbers of researches, such research has become a specific field that examines all of the questions about free-form architecture from design to construction processes (Friedman, 1999).

Taiwan has gathered sufficient experience with designing free forms; however, only few of the projects came to real constructions. As a result, Taiwan has been lacking in researches about computer aided design/computer aided manufacturing (CAD/CAM) on free forms, which makes those design projects on free-form constructions pause in the proposal stage.

This research is based on two ways concerning free-form design and construction : new materials and manufacturing processes. In the development of new materials of free forms, the goal is to generalize the direction of such development, and then evolve primary materials that free-form constructions need; as for manufacturing processes, the goal is to evaluate those initial processes proposed by the previous researches, and then come up with the initial design and manufacturing processes for the medium free-form constructions.

For the research approach to design and manufacturing processes, some similar projects with certain conditions which are controlled as the same as Bcom project will be executed in order to know if the design processes proposed by previous researches are complete or needed to be modified. Then hopefully a complete set of design processes for a small free-form construction will be established. Afterward, execute the medium free-form design projects with above new processes, and conclude the initial design and manufacturing processed of medium free-form constructions.

Moreover, on the aspect of defining new materials, this research is hereby to find out the possibilities of applying related materials from different fields on free-form constructions by executing different scale free-form projects. Then try to figure out the insufficiency of current materials, and indicate the direction of development of new materials. At last, develop the specific primary new materials, in order to prove the necessary of the development of new materials on free-form constructions.

Keywords : free-form 、 digital media 、 CAD/CAM 、 design processes