A Computer Model for Chinese Traditional Timber Structure: the Foguang Temple

Cao, Dapeng

Submitted in total fulfilment of the requirements of the

degree of Master of Architecture

June 2005

School of Architecture, Landscape Architecture and Urban Design

The University of Adelaide

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to this copy of my thesis, when deposited in the University Library, being available for loan and photocopying.

Signature:

Acknowledgement

This research has been a rare and incredibly fruitful experience. I am appreciative to the School of Architecture, Landscape Architecture and Urban Design, the University of Adelaide for making these investigations possible.

I would like to express my deepest gratitude to professor Antony Radford for the guidance, criticism, support and time.

I am also indebted to Dr. Dean Bruton who has helped to clarify many ideas and technical difficulties, and to Mr. Verdy Kwee (PhD candidate of the University of Adelaide) for editing of my writing.

Gratitude is expressed to Mr. Luke Li (PhD candidate of the TsingHua University) for providing me valuable source of information. Many other colleagues have also provided assistance. These include Dr. Veronica Soebarto and Dr. Peter Scriver, who have been the postgraduate coordinator of my school in the past years..

Finally, I would like to acknowledge the many individuals who have offered their invaluable support throughout my research. I apologise to those whose contributions, inadvertently, have not been acknowledged.

TABLE OF CONTENTS

Table of figures

Abstract

This thesis presents a study of an ancient Chinese timber structure- the main hall of the Foguang temple built in China in the Tang Dynasty (857), which is regarded as one of the most important temples in that period. The research represents a detailed digital model of the structural timber components and their connectivity.

The research questions are:

- Firstly, how to identify and represent the structural components, and the ways they are assembled. This is not covered in the few previous studies of the temple, which just offered brief introductions and general descriptions of the construction of the timber structure.
- Secondly, how to create a digital model for such a structure where there is insufficient or incompatible information. These are common issues that arise in the simulation and representation of historic architecture.

The outcome of the research is the presentation of a digital model that is much more detailed than previously existing representations.

During the process, two concepts were developed and adopted:

- Firstly, the concept of "building an ideal model". Rather than seeking the representation of the timber structure as built, the notion outlined in this thesis is to create an ideal digital model according to the vocabulary of structural components and the predefined spatial relations of their assembly connectivity.
- Secondly, the concept of "simplest adaptation". When choosing from a number of reasonable hypotheses about a component or assembly detail, it is assumed to be the simplest possible adaptation of an already accepted component or assembly detail.

The thesis is organized as followings:

Chapter 1: an introduction to the research on ancient Chinese architecture

Chapter 2: a review of the computer simulation and representation of historic architecture

Chapter 3: a discussion about the methodology on the concept of "building an ideal model", and the methodology for modelling when there is a lack of information

Chapter 4: a record of the digital modelling process

Chapter 5: discussions on and conclusions of the research.

The thesis has an accompanying CD which contains the representation information, including:

- A 2D 'Flash' presentation that shows the brief contents of the research
- 3D animations that represent in detail the timber structure and the assembly process
- A database that represents the structural components and their relations.