

Preface

There were several books with mechanical illustrations that described ingenious inventions and production technologies in ancient China. These books had provided significant research and reference values of the technological standards in the subjects' time periods. However, there is a problem that mechanisms in the literature are unclear due to incomplete interpretation and/or vague drafting. Some ancient mechanisms can only reflect the approximate shapes but the actual motion transmission processes along with mechanism structures are uncertain. This causes a great difficulty for the reader to access and understand the development of technology from the original illustrations.

This work presents a unique approach to study mechanisms and machines with illustrations that were depicted confusedly in major ancient Chinese books. Historical background and structural characteristics of ancient mechanisms are studied. By utilizing the methodology for the conceptual design of modern mechanisms and reconstruction designs of lost ancient machinery, all feasible designs of ancient mechanisms with uncertain members and joints that meet the technical standards of the subjects' time periods are synthesized systematically. Ancient Chinese crossbows (original and repeating crossbows), textile mechanisms (silk-reeling mechanism, spinning mechanisms, and looms), and many other handiwork mechanisms are used as illustrated examples. Such an approach provides a logical tool for the reconstruction designs of ancient mechanisms with uncertain structures. It also provides an innovative direction for researchers to further identify the original structures of mechanisms and machines with illustrations in the ancient literature.

The book is organized in such a way that it can be used for teaching, research, and self-study. [Chapter 1](#) is an introduction to the book. [Chapter 2](#) introduces the contents and background of five typical books with mechanical illustrations in ancient China. [Chapter 3](#) explains the definitions of mechanical members, joints, mechanisms, machines, representation of joints, generalized kinematic chains, mechanism structures, and constrained motion. [Chapter 4](#) outlines the historical development of ancient Chinese machinery and the common types of mechanisms. [Chapter 5](#) introduces a method of classifying mechanical illustrations and generating all feasible designs of ancient mechanisms in the historical literature. Three different types of illustrations are presented as examples to demonstrate the proposed method in detail. [Chapters 6–11](#) explain the mechanism structure of each

device and the results of the reconstruction designs, according to the classification of mechanical members.

The book can be used as a textbook and/or a supplemental reading material for courses related to history of ancient (Chinese) machinery and creative mechanism design for senior and graduate students.

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The authors believe that this book will meet the needs of academic research and teaching in the reconstruction design of ancient machinery and creative design of modern mechanisms. Comments and suggestions to the improvement and revision of the book will be highly appreciated.



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