

Chapter 4. Precision Machine System Design

Lecture 5. Servo Mechanical System Design

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Outline

- ❑ Goals of Servo Mechanical Systems
- ❑ Types of Servo Mechanical Systems
 - ✍ Open loop servo mechanical system
 - ✍ Closed loop servo mechanical system
- ❑ Actuators
- ❑ Mechanical Transmission Devices
- ❑ Accuracy
- ❑ Error Correction



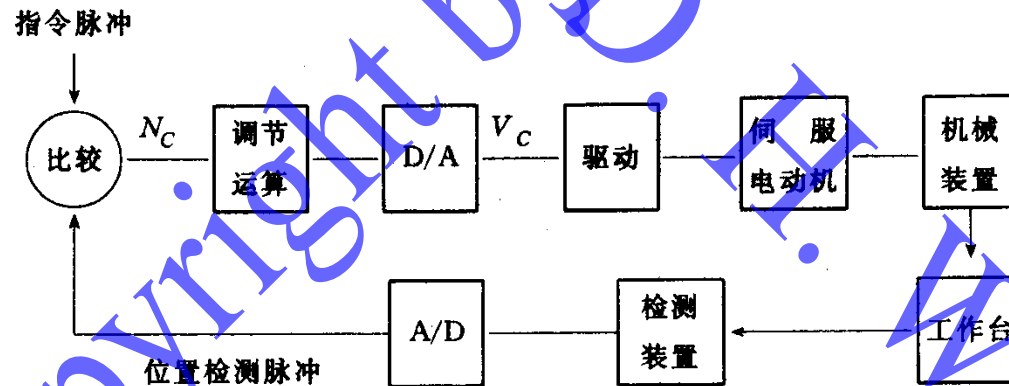
Actuators

- ❑ Reluctance motors (stepper motors)
- ❑ Brushless DC-motors
- ❑ Asynchronous motors
- ❑ Synchronous motors
- ❑ Hydraulic actuators
- ❑ Pneumatic actuators
- ❑ Piezo Actuators



Types of Servo Mechanical Systems

- ❑ Open loop servo mechanical system
- ❑ Closed loop servo mechanical system



Mechanical Transmission Elements

- ❑ Overall design approach
- ❑ Minimum required stiffness and servoloop time
- ❑ Optimal transmission ratio selection
- ❑ Checking system servo bandwidth



Mechanical Transmission Elements

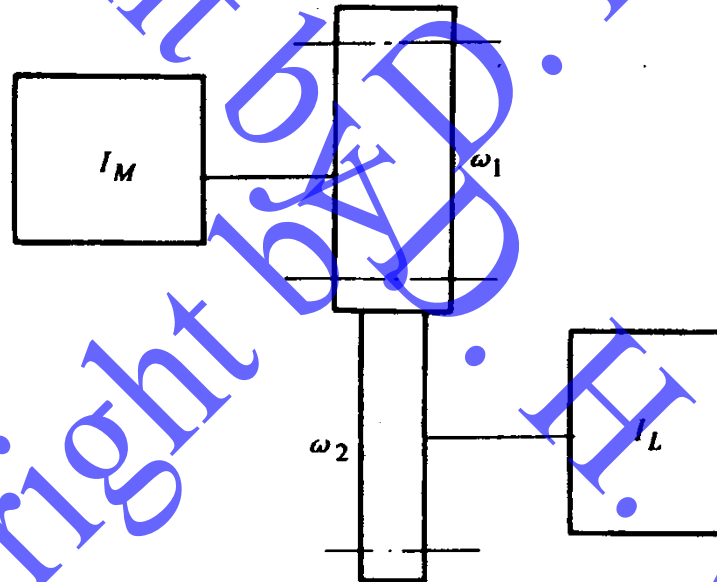
- Selection of the mechanical transmission elements



Mechanical Transmission Elements

□ Optimal transmission ratio selection

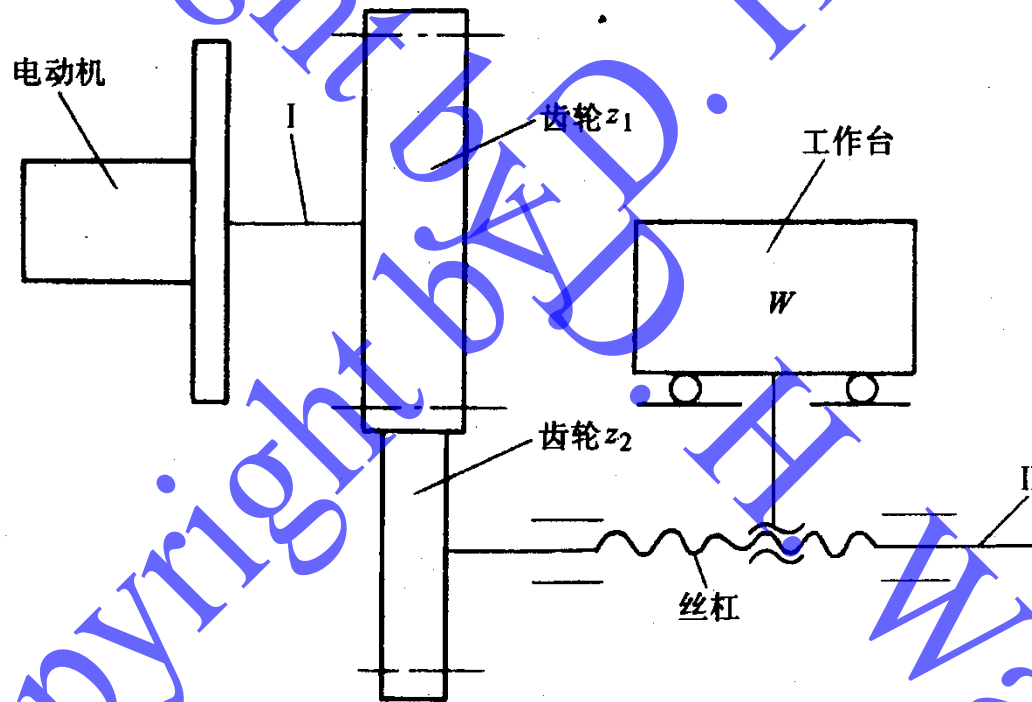
 **Maximize the accelerations**



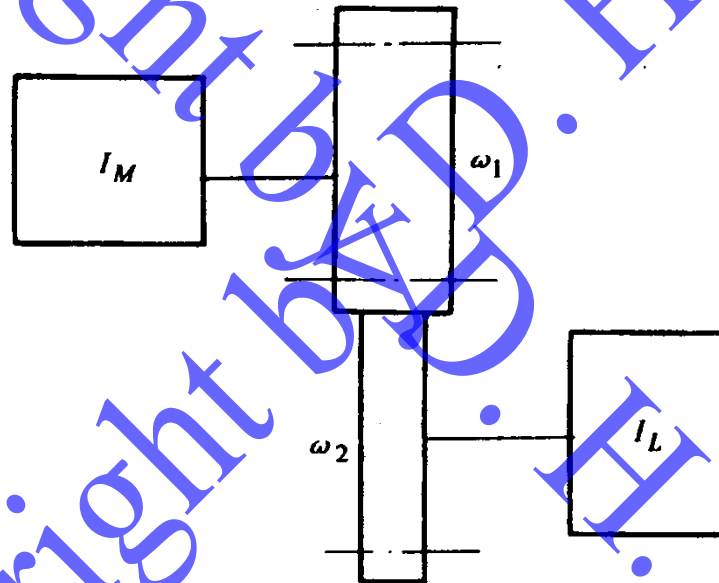
Mechanical Transmission Elements

□ Power design for mechanical transmission elements

足够的力矩和功率

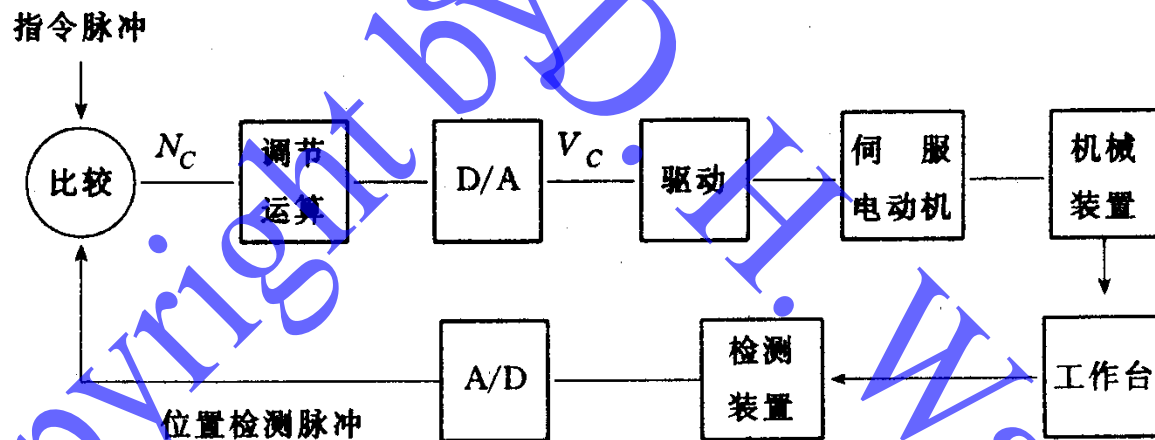


□ Stiffness of mechanical transmission elements



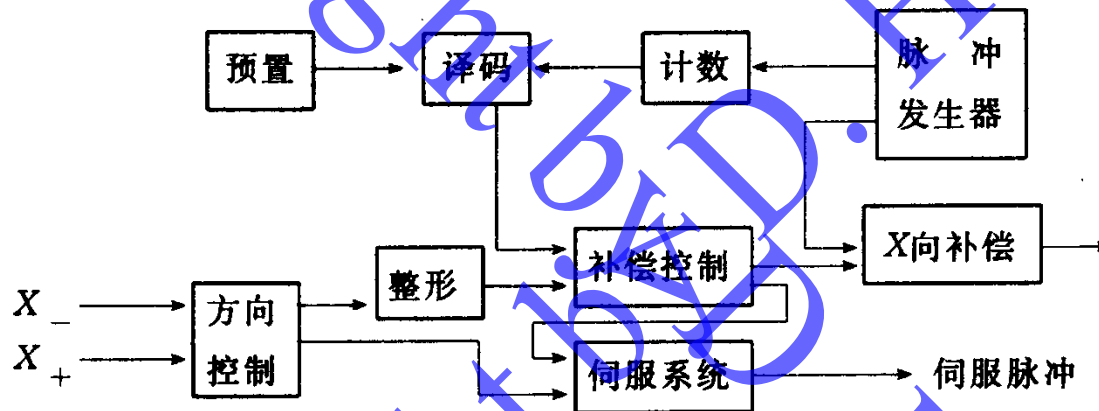
Accuracy

- ❑ Accuracy of Open loop servo system
- ❑ Accuracy of Closed loop servo system



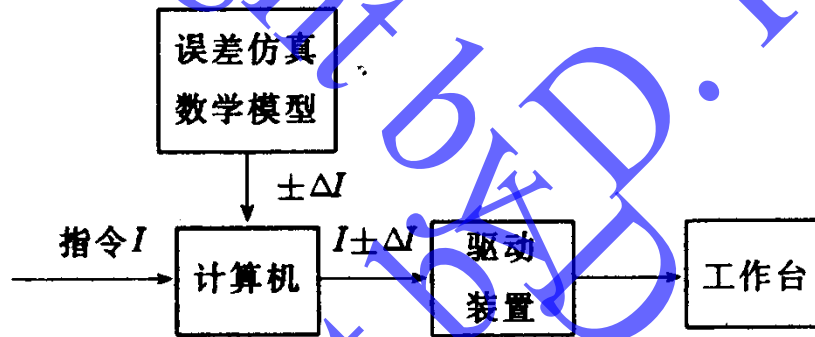
Error Correction

□ 反向死区补偿电路



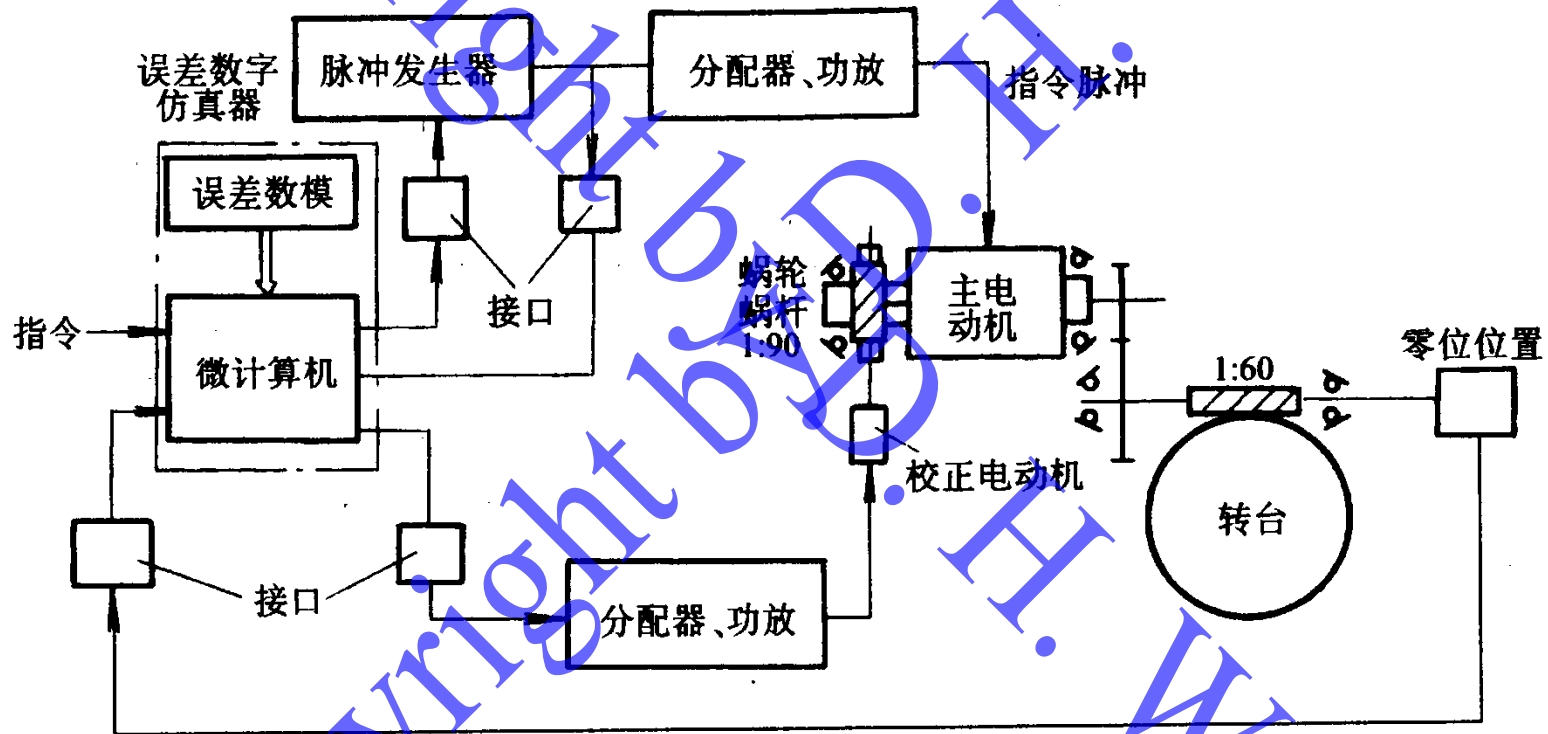
Error Correction

□ 单一通道计算机误差校正框图



Error Correction

□ 双通道计算机误差校正框图



Error Correction

□ 计算机误差校正的关键问题

✍ 获得误差补偿的数学模型



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Acknowledgement

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