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The title of the thesis is 「Control design of the pneumatic servo system considering the effect of connected pipelines」 and organized as the following five chapters.

Chapter 1 (Introduction) introduces the background and purpose of the research. The purpose of this research is as follows: 1. Improve the position controllability of the pneumatic servo system considering the dynamics of the system elements such as pipelines and servo valves. 2. Reduce the total magnetic leak around the pneumatic actuator by releasing pressure sensors from the cylinder chamber.

Chapter 2 (Precise position control of the pneumatic servo table considering the dynamics of pipelines) proposes the integrated control method of the pneumatic servo table system with air bearing, considering the dynamics of pipelines and servo valves. With a 5^{th} order feed forward show that the maximum trajectory error is decrease to 0.3μm.

Chapter 3 (Distributed model of connected pipelines) discusses the control design of a pneumatic system using long connected pipelines to release pressure sensors from cylinder chambers. The pipeline is designed as a one dimensional distributed model. Based on the estimated and measured pressure values in cylinder chambers, it is found that with this distributed model, the pressure in the cylinder chambers is estimated precisely by the measured values at the control ports of the servo valve in the real time. The experimental results demonstrate that the position accuracy is almost the same as that of using the measured pressure signals in the cylinder chambers.

Chapter 4 (Index to judge the necessity of the distributed pipeline model) proposes an index to use the distributed model of pipelines has been introduced. The index is designed from the maximum pressure loss along pipelines divided by the resolution of the pressure sensors (±10kPa). Based on experimental results, the index is smaller than 1.0, the influence of connected pipelines can be ignored. When this index is equal to or large than 1.0, the position results will be influenced by the connected pipelines and the distributed model of pipelines is needed.

Chapter 5 (Conclusions) summarizes the results of this study and proposes the future works of this research.