

题 目： 神经网络 PID 控制方法研究与实现

---

---

## 摘 要

在工业的发展中，常规 PID 控制器起到了很大的作用，因为结构简单控制效果较好，被广泛的应用于现代工业的控制技术上。随着被控对象的要求变得越来越高，常规 PID 控制常常会出现难以解决的问题。后来，人们研究在常规 PID 控制器的基础上使用神经网络技术，发现这样的使用可以解决很多常规 PID 控制器在控制上的不足。神经网络 PID 控制器也就由此诞生了。

本文将要在增量式 PID 控制器的基础上，结合使用神经网络，构成神经网络 PID 控制器进行研究。本文介绍了神经网络用于 PID 控制器方面的相关知识，体现其在控制上独具的特点。在神经网络的庞大种类中，选择单神经元和 BP 神经网络两种网络类型用于与增量式 PID 控制算法结合，形成新的控制算法。并且对这两种神经网络 PID 控制器进行设计与仿真。最后，在锅炉液位控制的背景下，给出控制对象的传递函数，根据三种不同 PID 控制器的控制方法与核心算法的思想，写出仿真步骤与程序，经过不断的修改与调试，得到所研究的三种 PID 控制仿真图，通过自身在不同参数和相互之间的对比，分析并得出实验结论。

在 PID 控制算法中加入神经网络，不仅使系统拥有学习能力，更加全面准确的进行调节，而且能够很好的用于非线性系统和不确定性系统系统的动态性能，可以较好的完成比较复杂的控制任务，达到预期的控制效果。

**关键词：**神经网络；PID 控制器；BP 神经网络；神经网络 PID 控制

---

---

## ABSTRACT

In the development of industry, the conventional PID controller plays a very important role. Because of its simple structure, it is widely used in the control technology of modern industry. With the requirements of the controlled object becoming higher and higher, the conventional PID control often has problems that are difficult to solve. Later, people study the use of neural network technology on the basis of conventional PID controller, and find that such use can solve the control deficiencies of many conventional PID controllers. So the neural network PID controller is born.

This article will be based on the incremental PID controller, combined with the use of neural networks to form a neural network PID controller for research. This article introduces the relevant knowledge of the neural network used in PID controller, reflecting its unique characteristics in control. Among the huge types of neural networks, two types of networks, single neuron and BP neural network, are used to combine with the incremental PID control algorithm to form a new control algorithm. And design and simulate these two kinds of neural network PID controllers. Finally, under the background of boiler liquid level control, the transfer function of the control object is given. According to the control methods of three different PID controllers and the idea of core algorithm, the simulation steps and procedures are written. The three kinds of PID control simulation diagrams studied, through their own comparison of different parameters and each other, analyze and draw experimental conclusions.

Adding a neural network to the PID control algorithm not only makes the system have the learning ability, more comprehensive and accurate adjustment, but also can be well used for the dynamic performance of nonlinear systems and uncertain systems, and can be completed more complex Control tasks to achieve the desired control effect.

**Key words: neural network; PID controller;BP neural network; neural network PID control**

---

以上内容仅为本文档的试下载部分，为可阅读页数的一半内容。

如要下载或阅读全文，请访问：

<https://d.book118.com/538031060117006076>