

# 中文摘要

以可程式控制器（Programmable Logic Controller, PLC）為基礎之馬達控制技術具有良好的運轉品質及提供較佳控制性能的優點，因此，若屬於一般用途之馬達驅動控制，產業界均習慣採用以 PLC 為基礎之 PID 控制方法取代傳統的驅動方式，以精簡控制電路元件，滿足控制上的需求。

為進一步提升 PLC 在馬達控制上的性能，本論文結合模糊理論與類神經網路於感應馬達之閉迴路速度控制。模糊理論採用人類語言取代繁雜的數學模式，對於一種高度非線性系統或微分方程不易獲得場合，模糊理論能提供一種較簡化的控制方式。另外，為了使模糊控制策略易於 PLC 階梯程式中實現，本論文再利用類神經網路(Artificial Neural Network, ANN)針對模糊推論進行學習訓練，以更進一步簡化控制模式。

本論文利用一部三相感應馬達進行實驗，以驗證所提出方法的可行性。此外，為了提供擬人化的人機介面，本論文再結合 Microsoft Visual Basic(VB)軟體及 RS485 通訊模組完成三相感應馬達之分散式監控，達到一台 PC 監控多台馬達的監控需求。

## 英文摘要

The motor control technique based on programmable logic controller (PLC) has the advantages of good operation quality and superior control performance during on-off instant. Hence, provided that it belongs to the general purpose of motor drive and control, the industrial circles are used to utilize the PLC based PID control method to substitute for the traditional driving technique in order to simplify the control circuit components and satisfy the control requirements.

To further promote the performance of motor control for PLC, this thesis combines fuzzy theory and artificial neural network to the close-loop speed control of induction motor. The fuzzy theory adopts the human language to replace the complicated mathematics model. For one highly non-linear system or in which the differential equation is not easy to be obtained, the fuzzy theory can offer a simpler control method. In addition, in order to have the fuzzy control strategy to be implemented easily in the PLC ladder program, this thesis utilizes ANN to learn the fuzzy inference rules in order to further simplify the control model.

To verify the feasibility of the proposed method, this thesis employs one three-phase induction motor to fulfill the experiment. Furthermore, to provide the personification man-machine interface, this thesis also combines the VB software and RS485 module to carry out the distributed monitor of three-phase induction motor that it can reaches the monitor requirement of one PC monitors several motors.