



作品名稱 **神經網路鏡頭變形校正晶片**
Neural Lens Corrector

隊伍名稱 **r328**

隊長 **姚敦凱** 中央大學資訊工程研究所

指導老師 **陳慶瀚** 中央大學資訊工程研究所

作品摘要

本作品脫離放射狀變形模型思維，提出一個適用於廣角鏡頭影像校正的高性能演算法，採用類神經網路建模進行曲面擬合，不需以變形中心作為多項式中心，同時改善曲線擬合需要重複使用電路轉換座標系統的轉換運算，減少因為電路位元寬度不足造成的精度損失，所有校正運算在都在卡式座標系統內完成。而由數個平行的神經元組成的類神經網路核心，取代最少6次方的多項式運算，避免實作大資料寬度乘法器電路與連續高次方的多項式運算，減低因為乘法器寬度不足，而造成的運算精度消耗。

系統晶片中，類神經廣角鏡頭變形校正子系統使用的倒傳遞類神經網路電路與微處理器子系統協同完成在線訓練與修正類神經網路；在訓練過程中，正向傳遞使用倒傳遞類神經網路電路運算輸出結果，倒傳遞則使用處理器運算均方誤差並修正神經元鍵值，當完成訓練，類神經廣角鏡頭變形校正晶片即可獨立運作，並整合驗證所需的其他電路子系統，最後實現一個基於神經網路的智慧型鏡頭校正系統晶片。

ABSTRACT

This project breaks away from the radial distortion model and proposes a high-performance wide-angle lens image correction algorithm that uses neural network to fit distortion surface. This approach doesn't use the distortion center to fit polynomial and change the coordinate system between the Cartesian coordinate system and polar coordinate system that can reduce the loss of the calculation. The neuron array uses to replace the polynomial hardware that is more than six orders. The parallel neurons can replace the polynomial hardware, and the neuron was implemented by less width multiplier.

The neural wide-angle lens distortion correction subsystem immediately uses the back-propagation neural network accelerator and microprocessor subsystem to train and modify the parameter of the neural network in the SoC. In the training, the forward operation of the back-propagation neural network generates the association result of the distortion, and the back operation uses the mean square error to modify the weights of the neurons. The neural wide-angle lens distortion correction subsystem can independently correct the distortion after the training. To integrate the other subsystems use to verify this SoC, this project finally implements a neural wide-angle lens distortion correction SoC that bases on neural network.