

數位相機之自動曝光演算法

碩士研究生：林哲弘

指導教授：謝漢萍 博士

國立交通大學 光電工程研究所

中文摘要

消費型數位相機的出現是爲了使得拍照簡單化，其中，自動曝光在決定拍照時的適當曝光參數扮演了重要的角色。自動曝光系統決定曝光參數主要根據測光值，因此，準確的測光系統是不可或缺的。爲了強化數位相機的自動曝光系統，我們提出兩種改善數位相機測光系統的方法。

爲了提升測光系統在不同亮暗拍照場景的穩定度，我們根據傳統測光方法提出修正的測光模型，並且，經由實驗結果證實了修正模型的穩定性，在不同亮暗場景的測試下發現與理想測光表之平均誤差小於 6%。藉由此修正測光模型可以大大提升測光系統的穩定性與精確度。

爲了提升測光系統在特殊拍照場景的成功率，我們提出了一種二維場景分析法來分別正常與特殊場景。藉由影像之灰階圖分佈，擷取出不同拍照場景的特徵，並利用此特徵分類我們所蒐集的不同拍照場景影像。透過對此特徵分類法進行最佳化模擬並建立影像資料庫。我們進行此場景分類法與其他測光方法在不同拍照場景下的性能測試實驗。我們發現此方法可以經由簡單的計算與模糊推論偵測不同拍照場景，並對於特殊場景給予適當之曝光補償值。有效的改善了數位相機的曝光準確度。

Automatic Exposure Algorithms of Digital Still Cameras

Student : Zhe-Hong Lin Advisor : Dr. Han-Ping D. Shieh

Institute of Electro-Optical Engineering
National Chiao Tung University

Abstract

As the rapid development of Digital Still Cameras (DSCs), taking picture is no more a tough job for the users. When a digital image is recorded, DSCs need to perform a lot of controls to provide the user a viewable image. These controls include exposure adjustment, white balance adjustment, focus adjustment and other procedures. The most fundamental one is the automatic exposure (AE) which plays an important role on determining the proper exposure of a picture with a good image quality. In the AE system, the exposure parameters are obtained according to the detected scene luminance. To enhance the AE system of DSCs, we proposed two novel light metering methods.

A modified luminance detection model was proposed to improve the light metering accuracy under different luminance of photographic scene. The stability of the modified model is confirmed through experiments. In the simulation of light metering, the mean metering deviation is of less than 6% compared with an ideal light meter. According to the proposed model, the stability and accuracy of light metering system can be much improved.

A 2-D scene analysis method was proposed to improve the light metering accuracy in special lighting conditions. With the histogram, we analyze a lot of images under different lighting conditions and the features of special lighting images are derived. We collect a lot of images to build the database by the features. To smoothly compensate the exposure in the transition region, “fuzzy membership functions” are applied to alleviate this issue. In the performance test, the proposed method can analyze the images under backlighting, strong frontlighting and dark environment situations to further define proper exposure compensation amounts, and the images in normal and highlight situations can be retained with appropriate brightness. Through the 2-D scene analysis method, the accuracy of AE system can be effectively enhanced.

