

## 基于 FPGA 的色空间 HSI 到 RGB 转换算法设计与实现

## 摘 要

相比于计算机等过时的图像处理方法, 硬件处理图像数据更加的高效且节省资源, 因此国内外近些年广泛地选择 FPGA (可编程逻辑门阵列) 作为数字图像处理系统的芯片。

色空间转换指的是把一个色彩空间中的颜色数据点转换成另一个色彩空间中的对应数据点, 旨在对图像中的亮度、色调、色饱和度等色彩分量分开处理。论文首先介绍了 HIS 转换为 RGB 的算法研究的国内外研究现状, 并详细分析了 HIS 到 RGB 色空间转换的基本原理。然后, 对 HIS 到 RGB 色空间的转换算法进行了研究。论文通过对 H 参数进行处理改进常规的色空间 HIS 到 RGB 转换公式, 很好的提高了色空间转换速率。论文使用 VHDL 硬件语言完成了 HIS 至 RGB 色彩空间转换算法设计。在 ISE 14.7 平台上完成了算法及其功能的仿真, 并给出了仿真结果。结果表明, 改进的 HSI 至 RGB 转换算法在保证实现色空间变换性能的基础上, 节约了硬件资源, 提高了运算速度。

**关键词:** FPGA; HSI; RGB; 色空间转换

## Abstract

Compared with the outdated image processing methods such as computer, hardware processing image data is more efficient and save resources, so in recent years, FPGA (programmable logic gate array) is widely selected as the chip of digital image processing system at home and abroad.

Color space conversion refers to the conversion of color data points in one color space into corresponding data points in another color space, aiming to separate the brightness, hue, color saturation and other color components in the image. Firstly, this paper introduces the research status of his to RGB algorithm at home and abroad, and analyzes the basic principle of his to RGB color space conversion in detail. Then, the conversion algorithm from his to RGB color space is studied. In this paper, the h parameter is processed to improve the conventional color space his to RGB conversion formula, which greatly improves the color space conversion rate. In this paper, VHDL is used to complete the algorithm design of his to RGB color space conversion. The algorithm and its function are simulated on ISE 14.7 platform, and the simulation results are given. The results show that the improved HSI to RGB conversion algorithm can save hardware resources and improve the operation speed on the basis of ensuring the performance of color space conversion.

**Keywords:** FPGA; HSI; RGB; Color space conversion

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