INTRODUCTION AND OVERVIEW

IMAGE PROCESSING MODEL

For simplicity, we often assume discrete-space, continuous-amplitude, continuous-discrete-continuous.

3 stages: continuous-continuous-discrete-continuous.

Physical world of image acquisition or display is continuous.

Digital image is a discrete-space (sampled) and discrete-amplitude (quantized) approximation to physical world image.

Optical (or other) image (acquisition) -> digital image -> optical image (display)

3 stages: continuous-discrete-continuous.
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Information Flow in an Imaging System

Information Flow in an Imaging System

- Light source
- Scene
- Image acquisition subsystem
- Image processing subsystem
- Display subsystem
- Human vision subsystem
- Neuronal network
- Retina
- Brain

* Points of signal transduction, optical -> electronic

* indicates points where optical <-> electronic modeling is appropriate.

Appropriate continuous mathematical modeling is indicated by blue indicators.
The goal of image processing is mainly to improve the quality of the information that reaches the visual system, but...
Introduction and Overview

What you see is not always what you get!

Does each gray step have uniform brightness?

Are there two triangles, one over the other?
INTRODUCTION

Amplitude Quantization

Visual appearance continuous-tone required for 32 to 64 levels.

16 levels
8 levels
4 levels
2 levels
256 levels
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Dithered
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Surface Views

Contour Plot

With \( z = f(x, y) \)

Perspective Plot
Spatial Quantization (Sampling)

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