Introduction to Data Exploration

Color Schemes and Design

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Objectives

Objective

Identify appropriate color schemes for different data types

Design Principles

Given a univariate data type,

Order

- the color scale that is chosen to map the data must represent a perceived ordering

Separation

- the color scale that is chosen to map the data must represent a perceived ordering

Aesthetics

- color map should be aesthetically pleasing, contain a maximum perceptual resolution, and ordering should be intuitive

Univariate Color Schemes

Rainbow Color Scheme

- Rainbow color scale is one of the most commonly used
- It is a poor color map in a large variety of domain problems
- Ordering of the hues is unintuitive
- Nominal data types can use this scale as no ordering is implied

Qualitative Color Scheme

Univariate Color Schemes

Sequential Color Scheme

- Sequential maps represent ordered data
- Dark colors typically represent high ranges, bright, low
- Benefits are that the scale is intuitive
- Weakness is that limited number of distinguishable colors can be represented

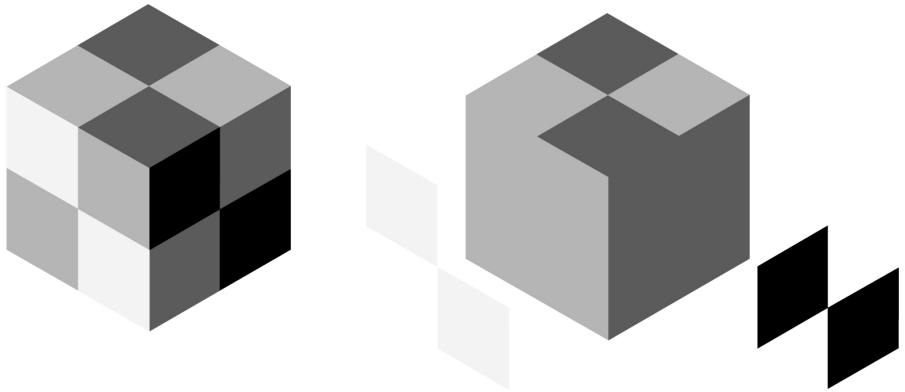
Sequential

Grayscale Color Scheme

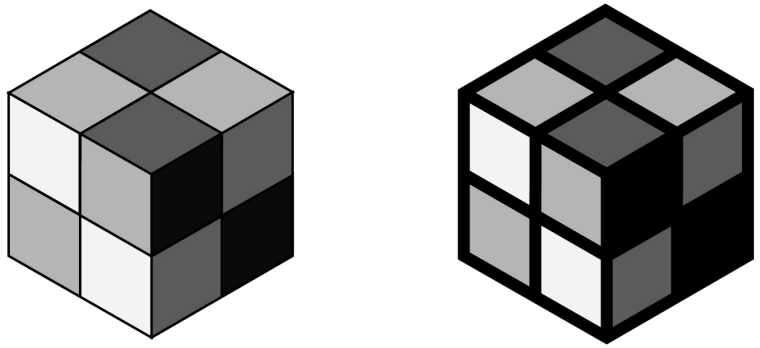
Simplest is the gray scale map where variable is mapped to brightness

Grayscale

Illusions in Grayscale



The eye sees six different shades of gray, but actually there are only four



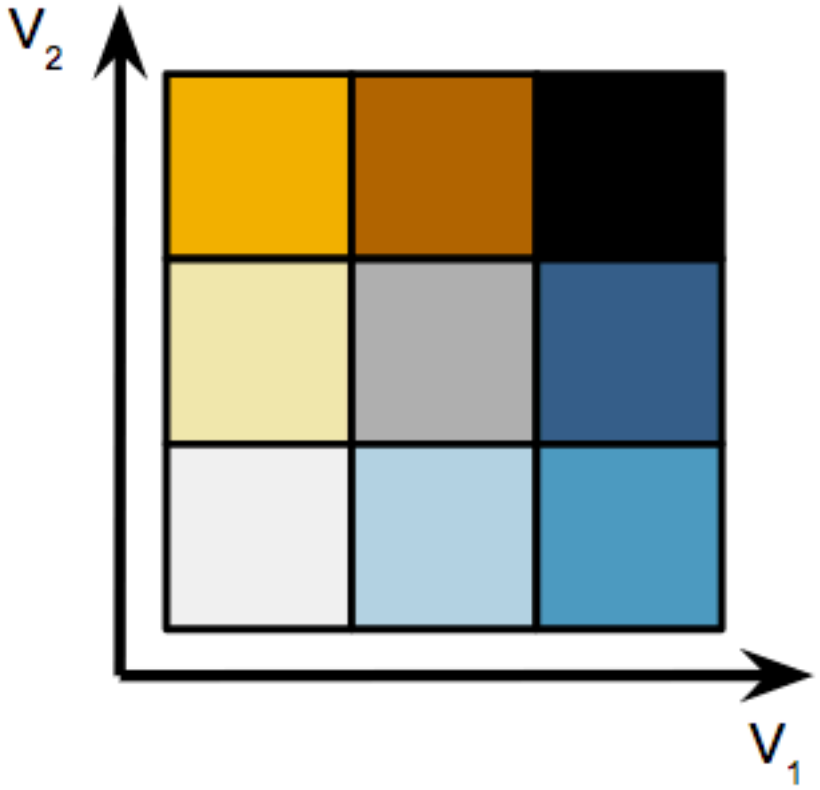
Adding a thin border has minimal effect on the illusion, but having a thick border is able to neutralize the effect

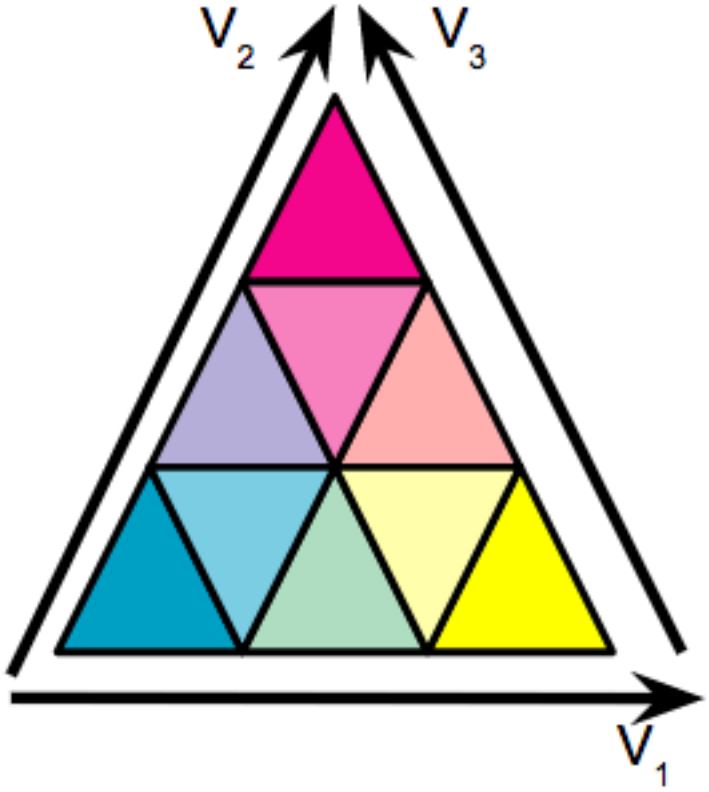
Divergent Color Scheme

- Provides means for variable comparisons
- Best suited for ratio data where there is some meaningful zero point
- Scale lacks a natural ordering of colors
- Careful choices must be made in choosing high and low ends
- Can use concept of cool (blues) and warm (reds and yellow) colors

Divergent

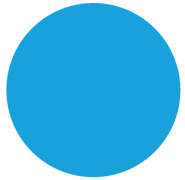
Multivariate Color Schemes



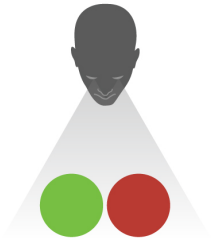


M. A. Harrower and C. A. Brewer, “ColorBrewer.org: An online tool for selecting color schemes for maps," *The Catrtographic Journal*, vol. 40, no. 1, pp. 27-37, 2003.

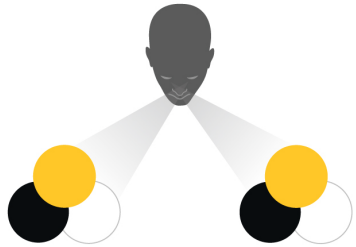
Mapping Color



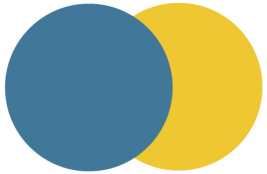
Use blue in large regions, not thin lines



Use red and green in the center of the field of view

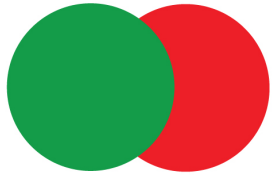


Use black, white and yellow in the periphery



Use adjacent colors that vary in hue and value

Use color for grouping and search



Beware effects from adjacent color regions

Do not use highly saturated colors for large regions

Do not use spectrally exteme colors together

Do not use adjacent colors that vary in amount of blue

Mapping Color

Hello, here is some text. Can you read what it says?
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