

Tree Colors

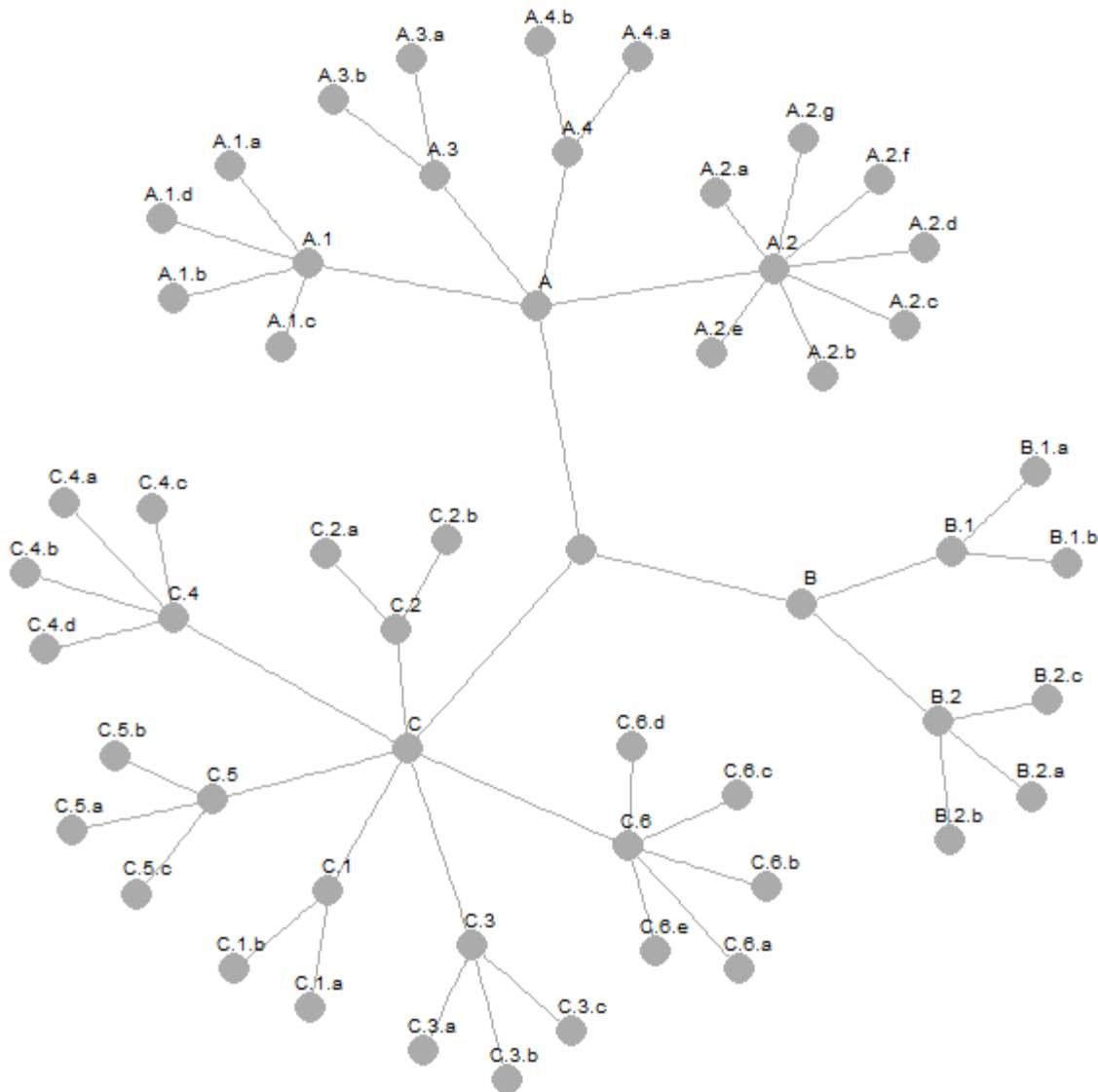
Color Schemes for Tree-Structured Data

Martijn Tennekes m.tennekes@cbs.nl

Edwin de Jonge: e.dejonge@cbs.nl

Statistics Netherlands

Tree-structured data



Applications within Official Statistics:

- Economic activity
- Goods
- Jobs
- Regions




Need for color schemes that reflect tree structures




Why?




- To support visual analysis
- To relax the tree layout for node-link diagrams
- To improve visual appeal of tree visualizations

Related work

treevis.net - A Visual Bibliography of Tree Visualization 2.0 by Hans-Jörg Schulz


Dimensionality: All   

Representation: All   

Alignment: All   

Fulltext Search: x

Techniques Shown: 276



Related work

The image shows a screenshot of the Newsmap website interface. At the top, there is a navigation bar with options like REGISTER, LOGIN, CUSTOMIZE, and a search bar. Below the navigation bar, the main content area is a grid of news articles. The articles are arranged in a grid that is roughly 6 columns wide and 8 rows high. The articles are color-coded by category: red for international news, blue for sports, green for business, yellow for technology, purple for entertainment, and pink for health. The largest article in the grid is 'PM's US Visit: Narendra Modi unlikely to be accompanied by business ...' in green. Other prominent articles include 'Britain and Iran hold talks for first time since Islamic revolution' in red, 'Obama asks world's help to fight Islamic State's 'network of death'' in red, and 'Grand jury opts not to indict NASCAR's Tony Stewart in fatal incident' in blue. The bottom of the page features a footer with the Newsmap logo, the date 'Thu September 25, 2014 11:31:12', and a navigation bar with categories like WORLD, NATIONAL, BUSINESS, TECHNOLOGY, SPORTS, ENTERTAINMENT, and HEALTH.

REGISTER LOGIN CUSTOMIZE SELECT ALL

NEWSMAP AUSTRALIAN RUSSIAN BRAZIL CHINA FINANCE HISTORY INDIA ITALY JAPAN MEXICO NETHERLANDS NEW ZEALAND SPAIN U.K. U.S. search all...

Britain and Iran hold talks for first time since Islamic revolution

Obama asks world's help to fight Islamic State's 'network of death'

Floods Have Killed 73 in India's Northeast

Grand jury opts not to indict NASCAR's Tony Stewart in fatal incident

Twins Pitcher Hughes Misses \$500000 Bonus By 1 Out Due to Rain

NFL notes: ESPN suspends Simmons after Goodell tirade

Cameron Will Hold Parliamentary Debate on UK Joining Airstrikes In Iraq

Turkish writer convicted for 'insulting' Erdogan

UN General Assembly: Barack Obama's big day

Previewing Thursday's college football TV games

Sorenson: Ravens' Steve Smith out to prove something every week

Recalibrated Rangers primed for another Cup run

Ukraine to UN: 'We know what terrorism means;' wants sanctions vs. Russia to ...

Boko Haram chief Abubakar Shekau dead, Nigerian military claims

UN aims to block jihadist recruits

Yemen pres. appoints Houthis, Al-Hirak presidential advisers

Turkish leader says world not doing enough

Buffalo Bills struggle with overcoming leads

Brennan: US Ryder Cup team may win again with no Wicks

History against Bridgewater, Bales as midseason OS changes

Phil Mickelton's barb directed at Rory McIlroy ahead of the Ryder Cup at ...

Allow links to finish off Adair's first batting title

Recess: Bales put center in it

Islamic State crisis: UN backs ban on joining militants

Denzel Washington brings OCD element to The Equalizer

Jeremy Renner confirms marriage

'Jersey Shore's' Mike 'The Situation' Sorrentino pleads not guilty to federal ta

FBI Study Confirms Rise in Active Shootings Over the Past Decade

Barbra Streisand makes US chart history

Andre 3000 Has Some Interesting Casting Ideas For An Outkast Movie

Workers, labor group try to force Wisconsin to raise minimum wage

Judge Delays Marathon Bombing Trial, Won't Move It

Price tag for northern California wildfires tops \$53 million

Big Brother 16 Winner Revealed! Find Out Who Won and Who Was America's ...

TV review: 'How to Get Away With Murder' reveals in hysteria from the get-go

'Survivor: San Juan del Sur' premiere: And the first eliminated contestant is...

18 Mich. Jimmy John's in national data security breach

Stevens Signals FBA Considering Ways to Curb Investor Home Loans

Virgin's Richard Branson offers staff unlimited holiday

With China Set to Open Stock Trading, Investors Lay Groundwork

Woman punished by California officer settles for \$1.5M, officer to resign

Illinois Gov. Bruce Rauner signs bill to ...

Illinois Gov. Bruce Rauner signs bill to ...

Rod Stewart sued over injuries caused by soccer ball at Las Vegas concert

Vin Diesel hopes Walker would be proud of FF7

'Nashville' season premiere recap: Who's pregnant?

Backstage Look At Lady Gaga & Tony Bennett's CHEEK TO CHEEK Promotional.

No 6 Peak Stage: The Cheek to the Cheek and the White House ...

OS: Screen It: Star Trek Through the Wormhole ...

Skirt size increase linked to breast cancer risk, says study

Tuberculosis exposure: Babies exposed after birthdate excluded from list; side ...

Memory loss support offered in educational series

'Bigger than Heist': Bash bug could leave IT systems in shellshock

Over 100,000 in Cleveland stadium for ...

FDA approves Ozempic for plaque prioritization

Many people have trouble ...

Search tips: ...

U.S. Dollar Gauge Climbs to Four-Year High as Kiwi Slumps

Asian shares, dollar rally after Wall St surge

FAA said to be planning to let filmmakers operate drones

U.S. Dollar Gauge Climbs to Four-Year High as Kiwi Slumps

Asian shares, dollar rally after Wall St surge

FAA said to be planning to let filmmakers operate drones

newsmap

Thu September 25, 2014 11:31:12

SELECT ALL WORLD NATIONAL BUSINESS TECHNOLOGY SPORTS ENTERTAINMENT HEALTH LESS THAN 10 MIN. AGO MORE THAN 10 MIN. AGO MORE THAN 1 HOUR AGO

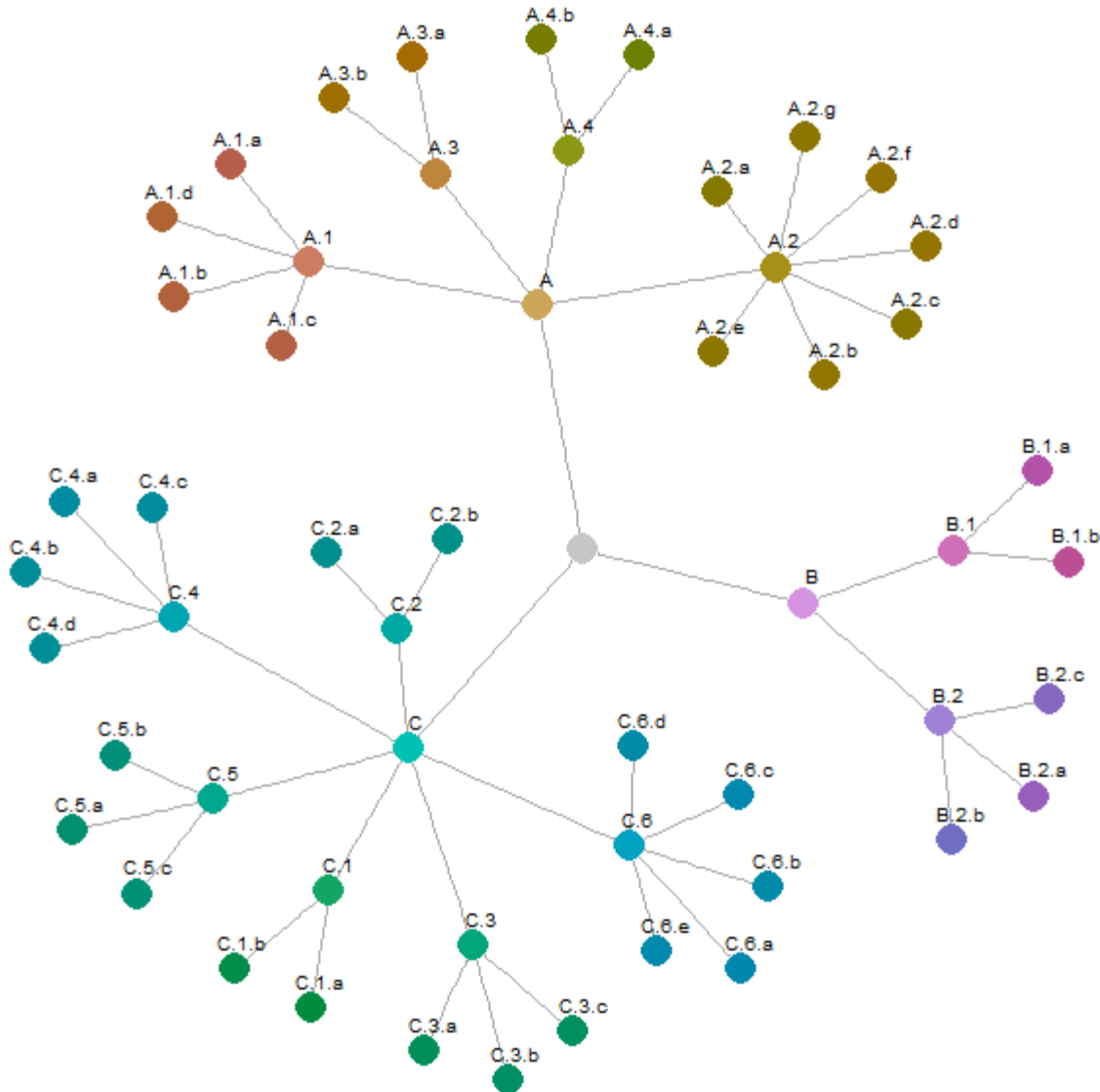
Tree Colors



Desired properties:

- Unique colors
- No perceived order of siblings
- Parent-child relations encoded
- Node depths encoded

Tree Colors



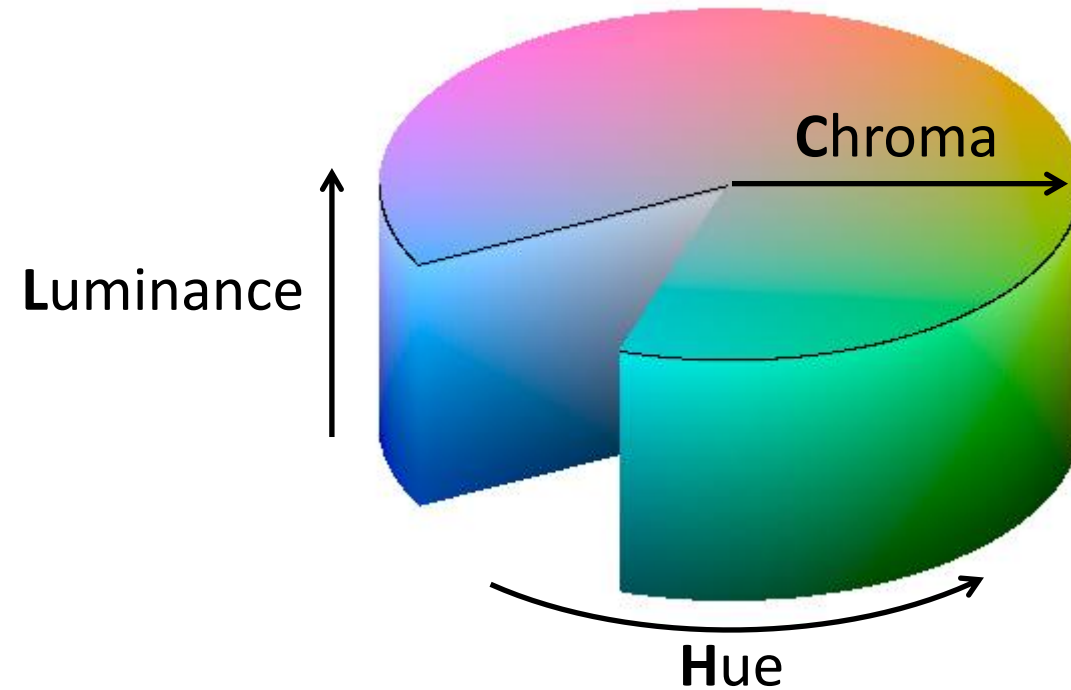
Desired properties:

- Unique colors
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- Node depths encoded

Approach

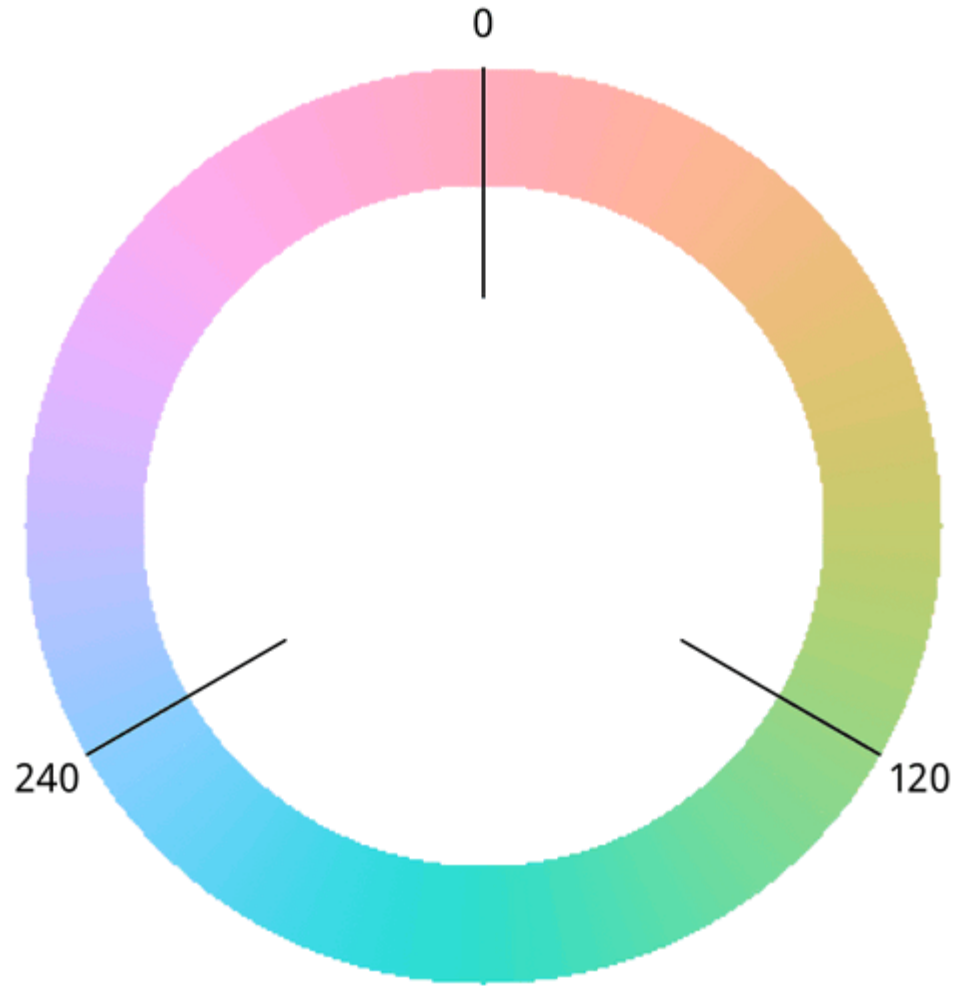
- Hue resembles branches
- Chroma and luminance discriminate hierarchical levels

HCL color space

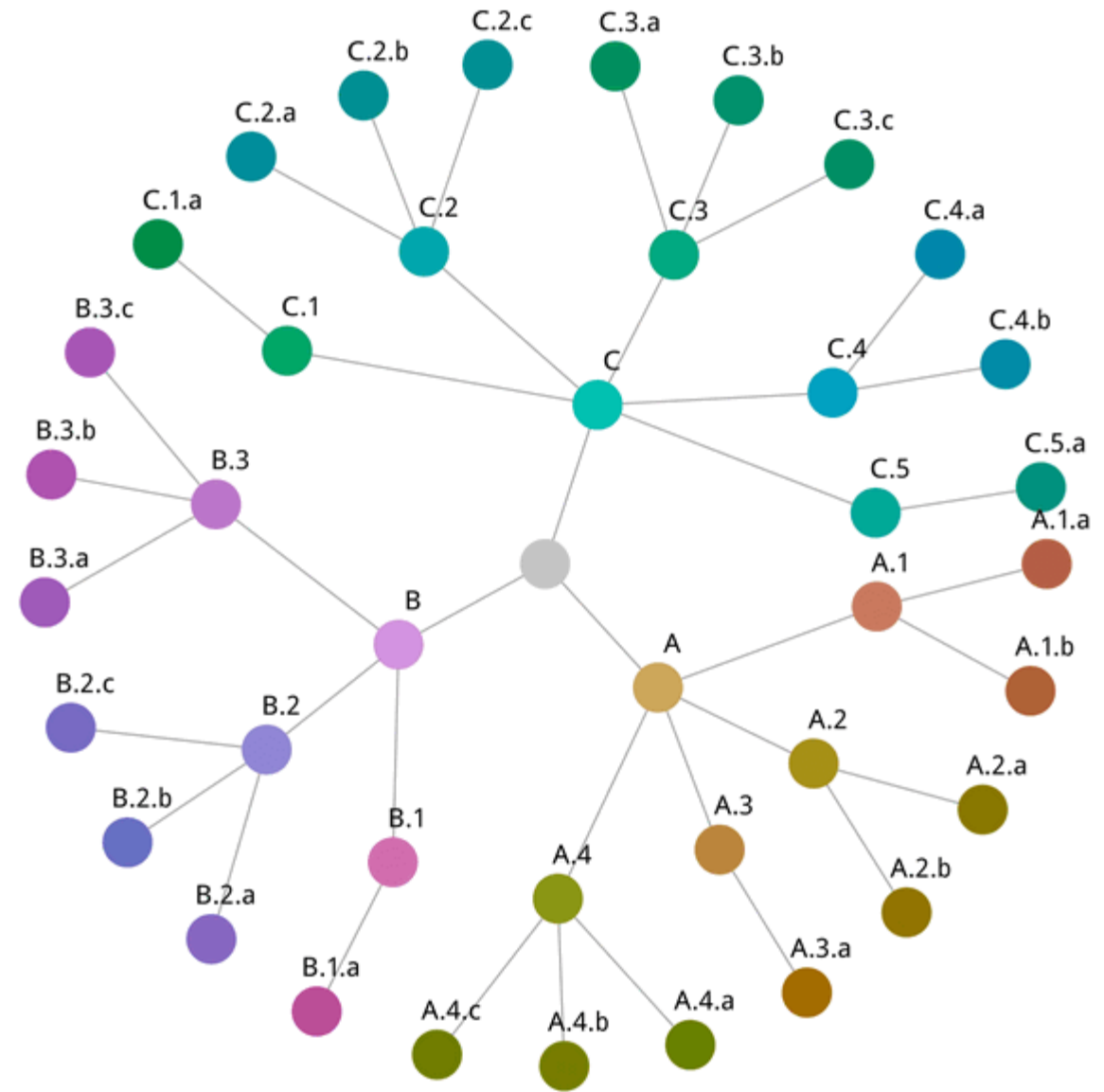


- ✓ Well-balanced perceptual properties

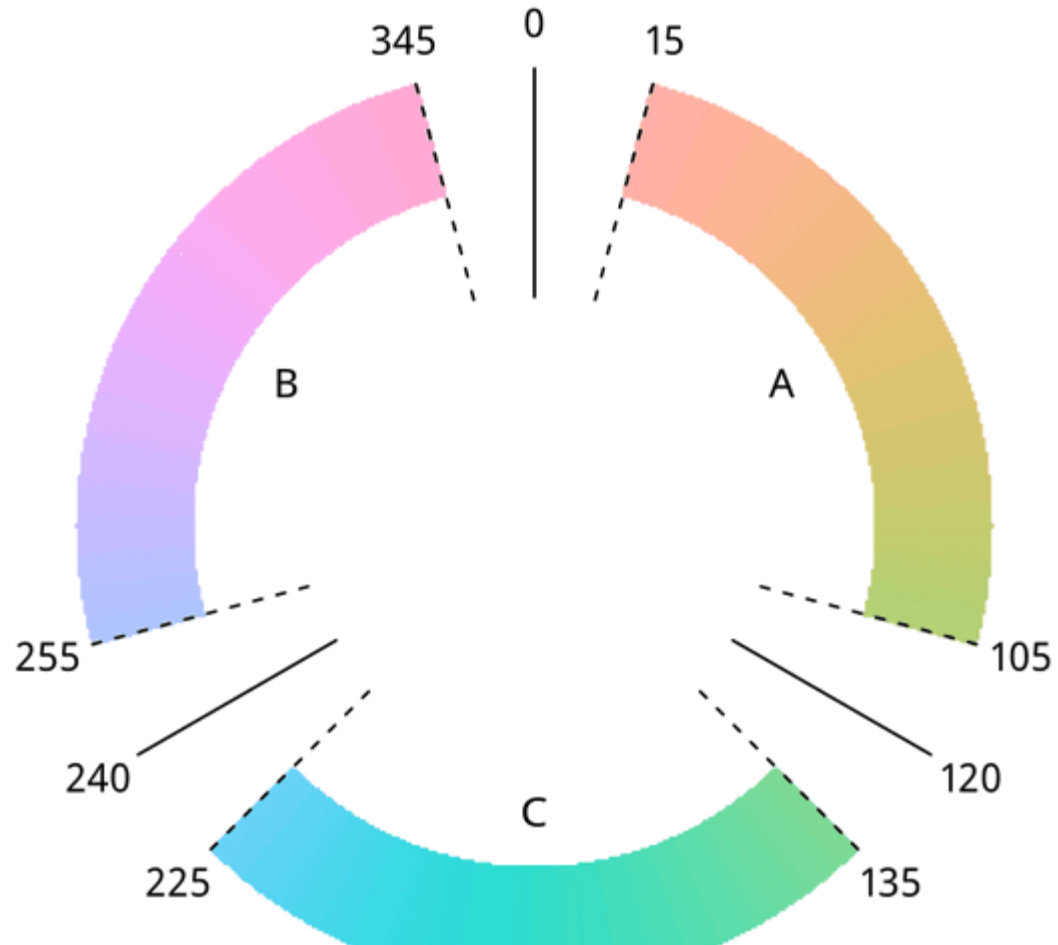
Hue allocation



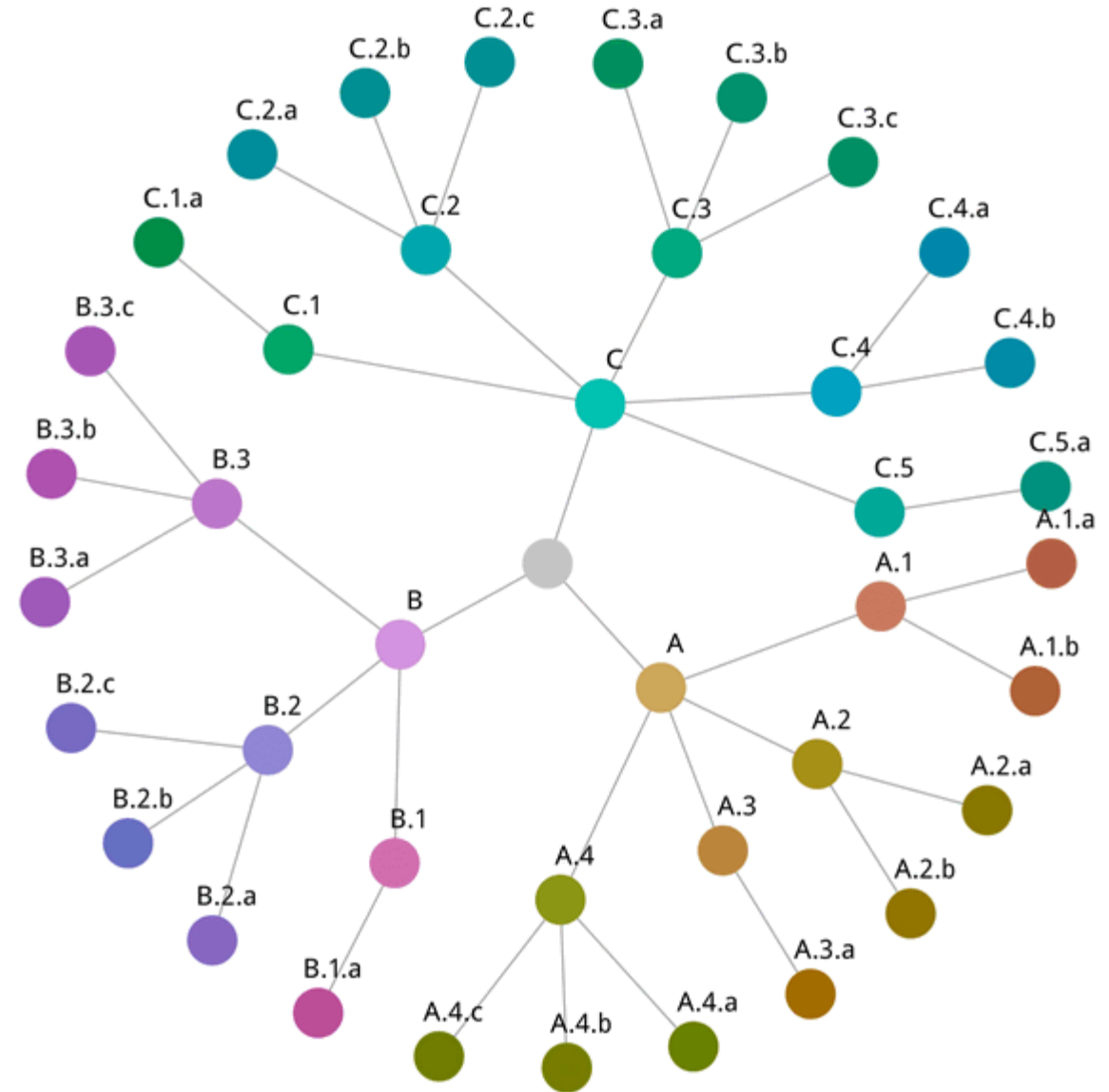
(a) Hue range equally split in three



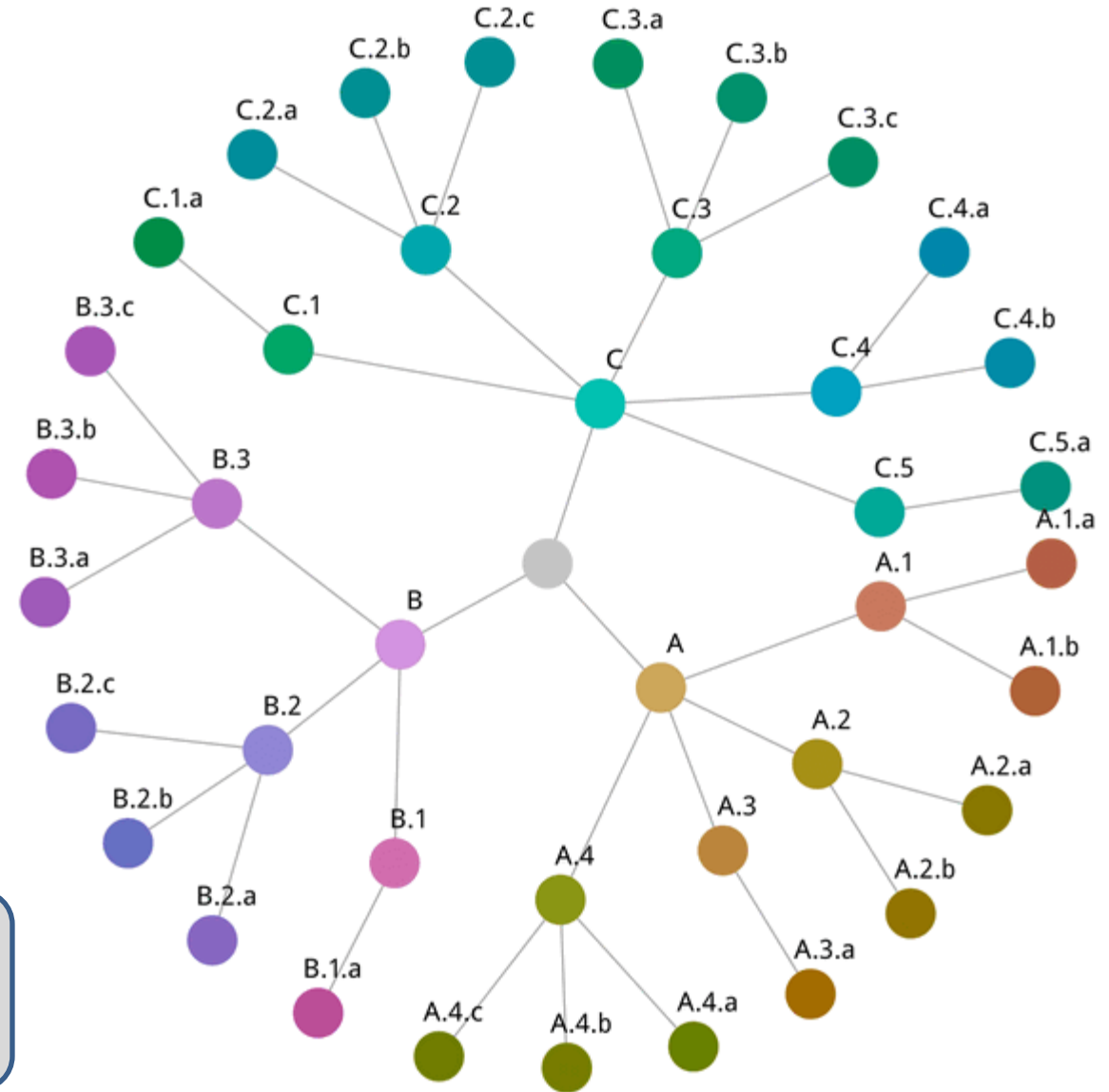
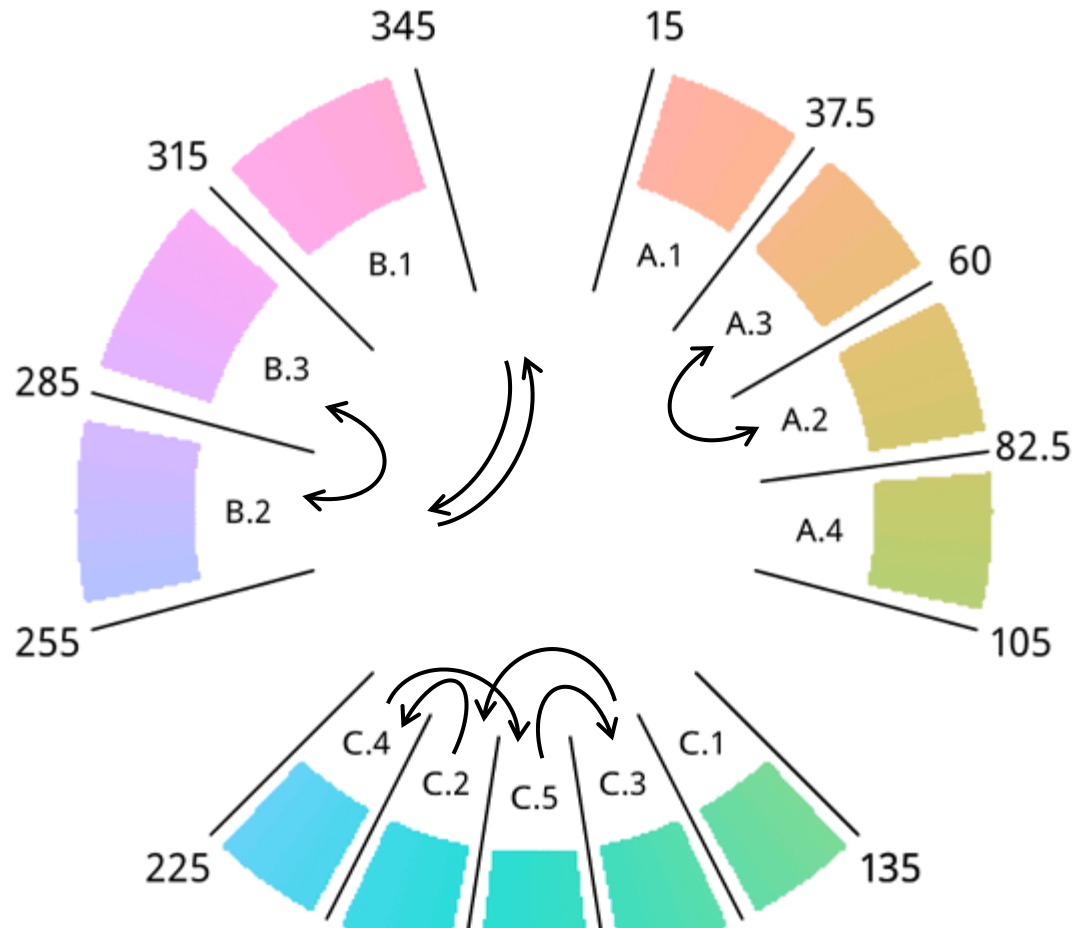
Hue allocation



Hue ranges reduced by fraction $f=0.75$



Hue allocation

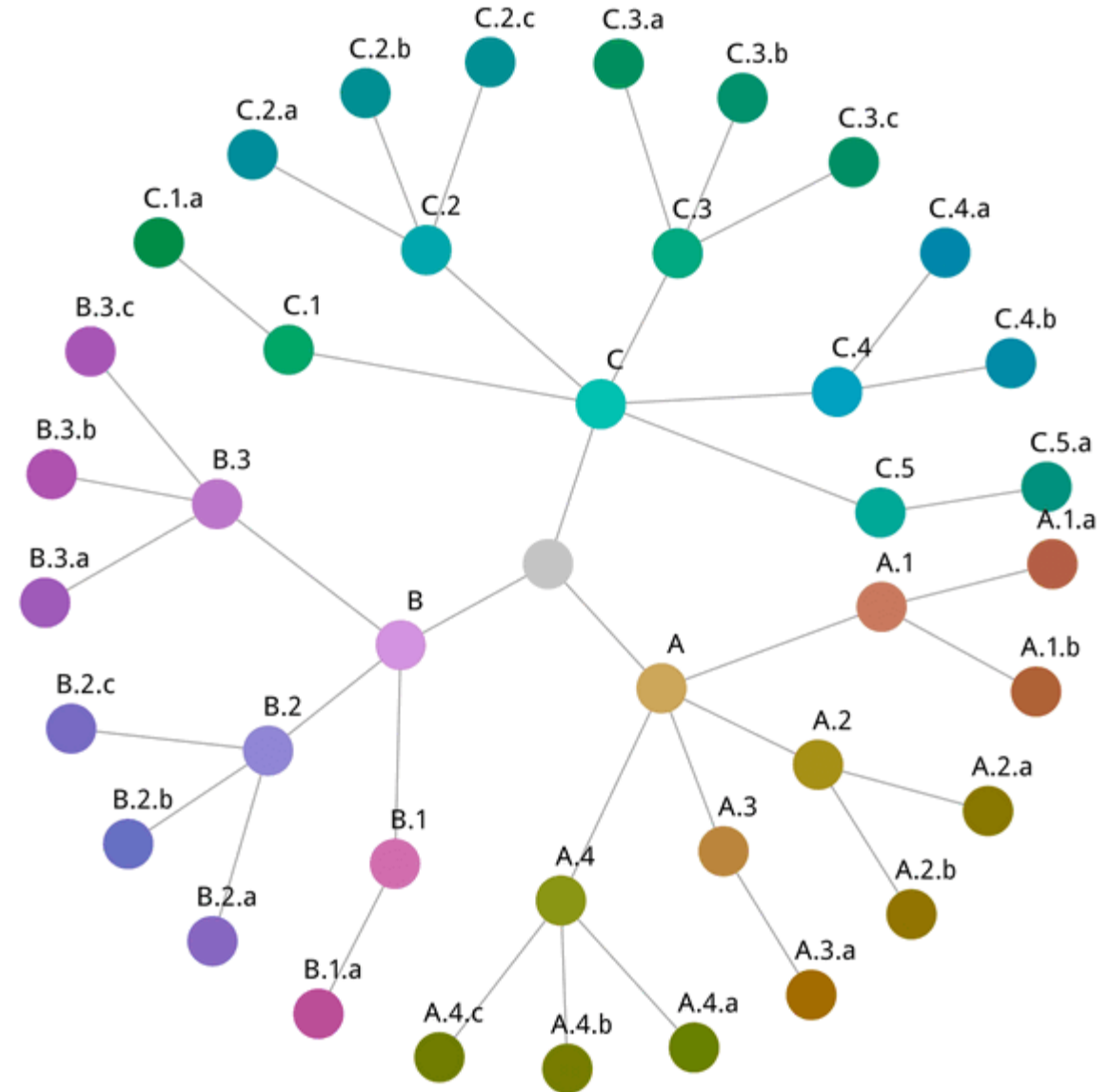


Hue ranges of siblings **permuted**
and for even-numbered branches **reversed**

Depth

Default method

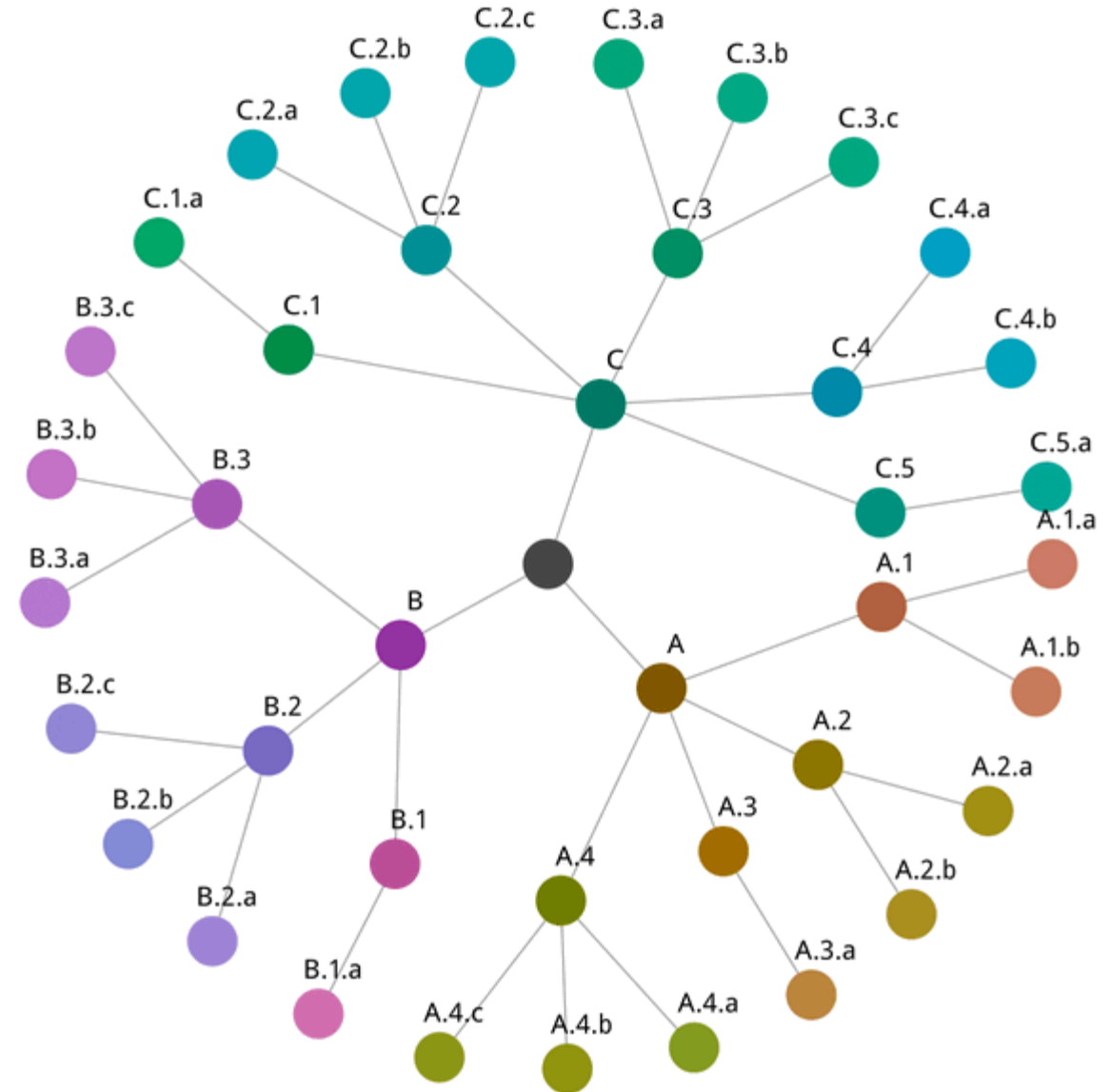
Luminance **decreases** with depth
Chroma **increases** with depth



Depth

Alternative method

Luminance **increases** with depth
Chroma **decreases** with depth



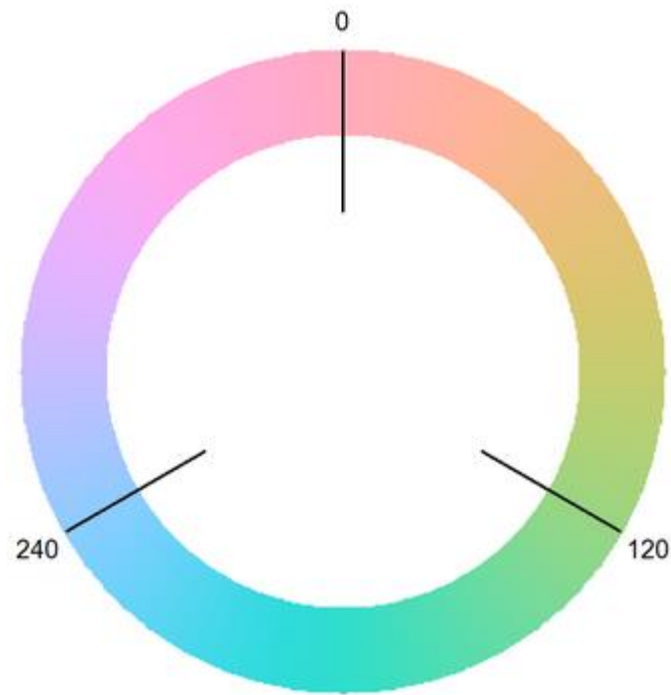
Software

- Near future: implementation as Javascript library
- Tree Colors implemented in R-package [treemap](#)

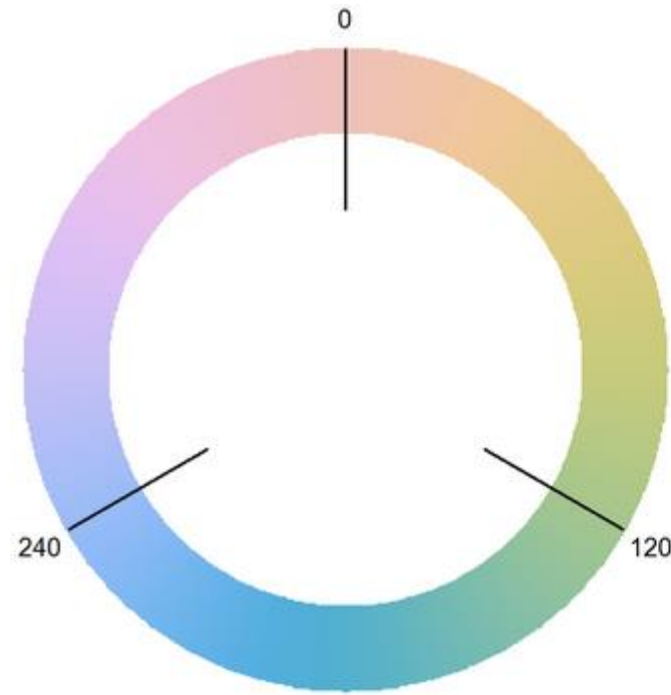
`library(treemap)`

`treecolors()`

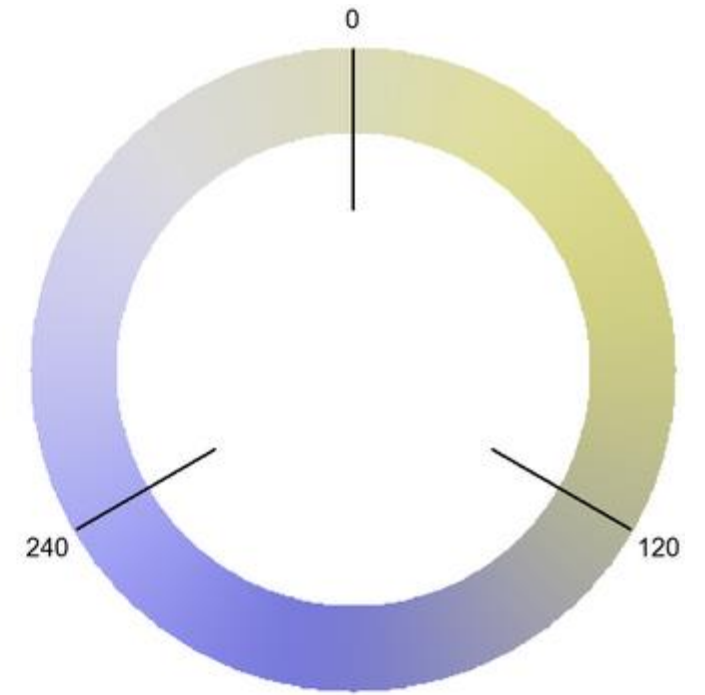
Color vision deficiency



Normal color vision
(trichromats)

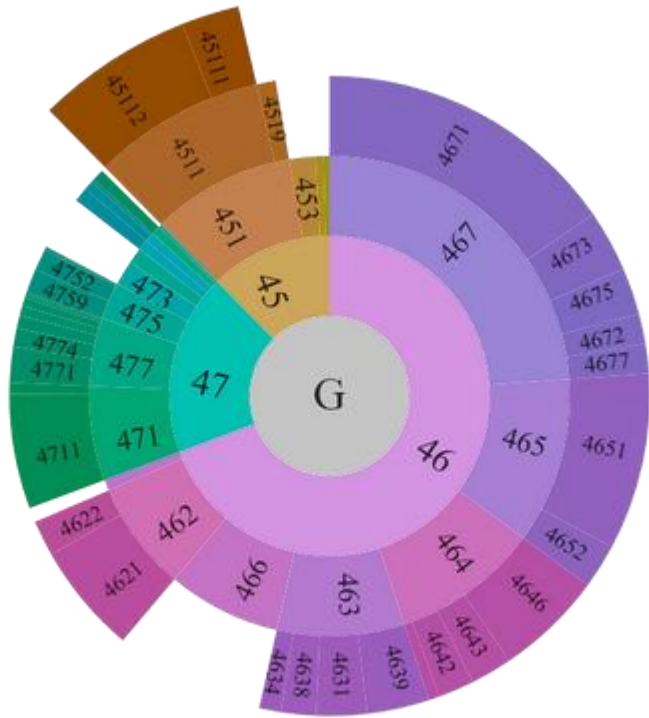


Deuteranomaly
(anomalous trichromats)



Protanopia
(dichromats)

Applications (1)



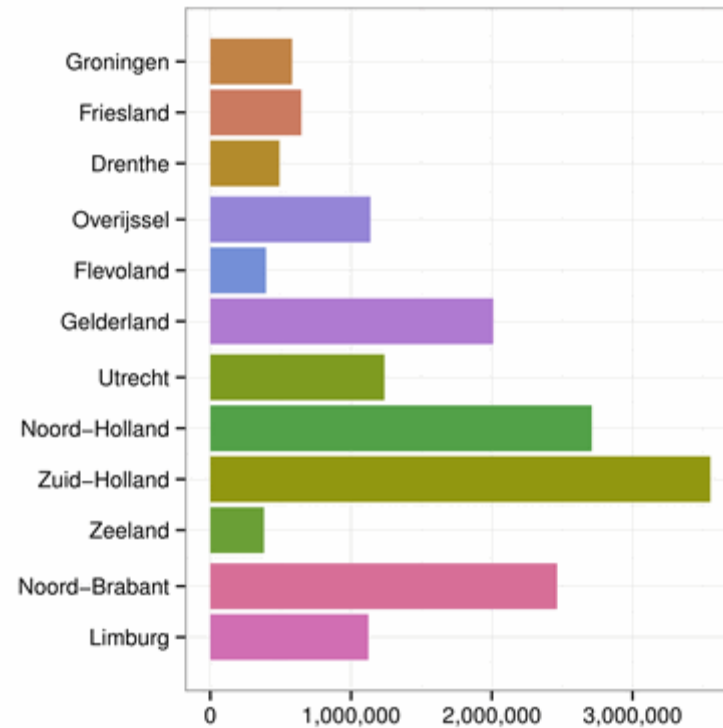
(a) Sunburst diagram



(b) Treemap

Net turnover for economic activity sector G, *Wholesale and retail trade*

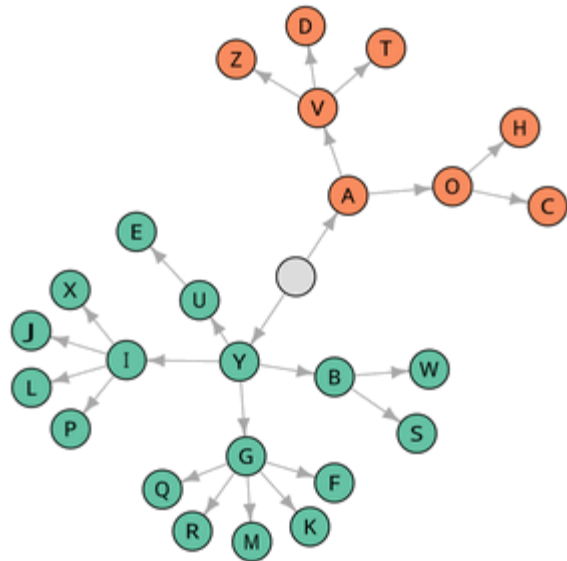
Applications (2)



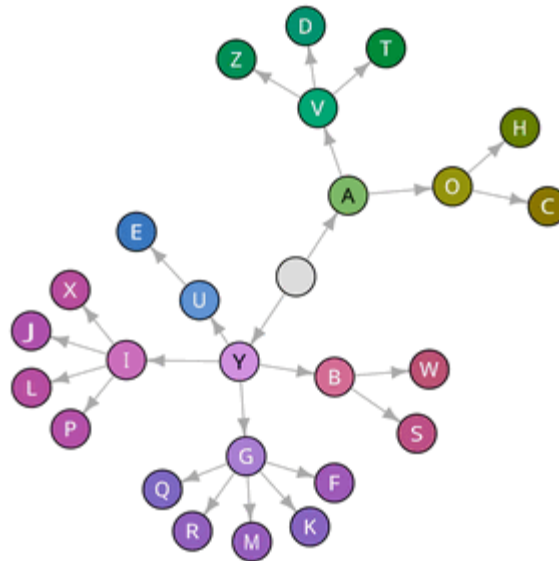
Dutch population per province

User study: setup

- 98 participants with normal color vision
- 10 participants with color vision deficiency



Main Branch Colors



Tree Colors

Reading questions:

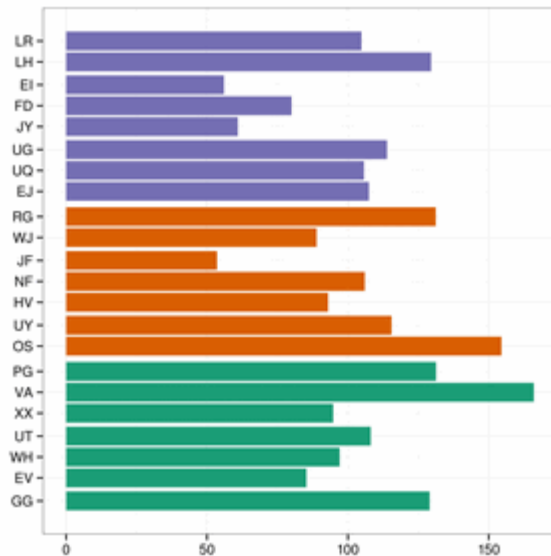
- Relations
- Offspring

Evaluation questions:

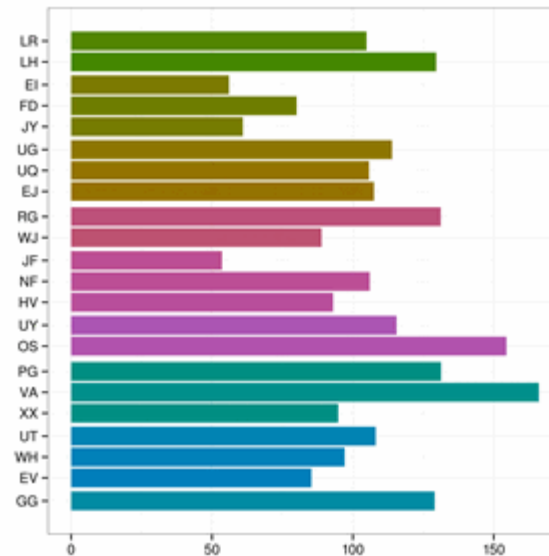
- Prettiness
- Interpretation
- Overview

User study: setup

- 98 participants with normal color vision
- 10 participants with color vision deficiency



Main Branch Colors



Tree Colors

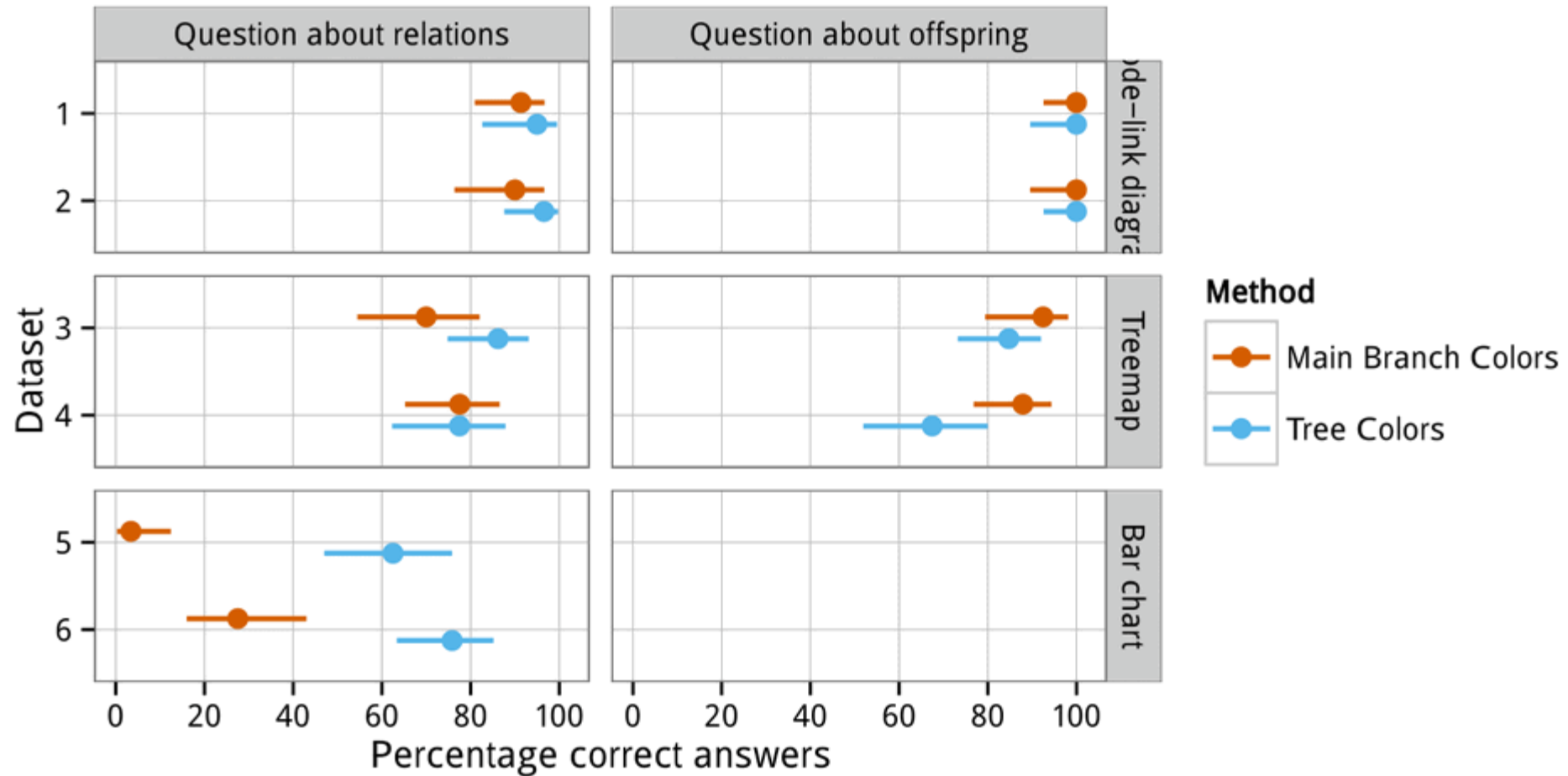
Reading questions:

- Relations
- Offspring

Evaluation questions:

- Prettiness
- Interpretation
- Overview

User study: results



Final remarks

- Tree Colors **can improve** visualizations of tree-structured data.
- Designed for **linearly** or **radially** ordered siblings.
 - More research needed on **2d visualizations** (e.g. treemap).
- Not suited for people with **color vision deficiency**.
- Tree Colors can be applied to **large** hierarchical datasets.
 - However, the effectiveness is unknown.