Modul:Color

This module is used primarily by Vorlage:Tl, eliminating the need for external color converters and preventing mismatch between color coordinates.

Usage

To use this module, you may use one of the above listed templates or invoke the module directly. All functions that accept hexadecimal triplets also handle the shorthand three-digit format.

To convert a hexadecimal triplet to an RGB triplet as comma-separated values:

```
{{#invoke:Color|hexToRgbTriplet|color}}
```

To convert a hexadecimal triplet to the CMYK color model without a color profile:

```
{{#invoke:Color|hexToCmyk|color|precision=?|pctsign=?}}
```

To convert a hexadecimal triplet to HSL or HSV:

```
{{#invoke:Color|hexToHsl|color|precision=?}}
{{#invoke:Color|hexToHsv|color|precision=?}}
```

To convert a hexadecimal triplet to the perceptual $CIELCh_{uv}$ color space:

```
{{#invoke:Color|hexToCielch|color|precision=?}}
```

To mix two colors in the more physically correct linear RGB space:

```
{{#invoke:Color|hexMix|color1|color2|proportion|min=?|max=?}}
```

The following parameters are optional:

- `precision`: defaults to `0` (zero)
- `pctsign`: set to `0` (zero) to suppress percent signs in the generated output
- `proportion`: proportion of `color2`, defaults to 50
- `min`: minimum value of proportion range, defaults to 0
- `max`: maximum value of proportion range, defaults to 100

```
-- Introduction: https://colorspace.r-forge.r-project.org/articles/color_spaces.h

local p = {}

local function isempty(v)
        return v == nil or v == ''
end

local function hexToRgb(color)
        local cleanColor = color:gsub("&#35;", "#"):match('^[%s#]*(.-)[%s;]*$')
        if (#cleanColor == 6) then
                return {
                        r = tonumber(string.sub(cleanColor, 1, 2), 16),
                        g = tonumber(string.sub(cleanColor, 3, 4), 16),
```

```
                        b = tonumber(string.sub(cleanColor, 5, 6), 16)
                }
        elseif (#cleanColor == 3) then
                return {
                        r = 17 * tonumber(string.sub(cleanColor, 1, 1), 16),
                        g = 17 * tonumber(string.sub(cleanColor, 2, 2), 16),
                        b = 17 * tonumber(string.sub(cleanColor, 3, 3), 16)
                }
        end
        error("Invalid hexadecimal color " .. cleanColor, 1)
end

local function round(v)
        if (v < 0) then
                return math.ceil(v - 0.5)
        else
                return math.floor(v + 0.5)
        end
end

local function rgbToHex(r, g, b)
        return string.format("%02X%02X%02X", round(r), round(g), round(b))
end

local function rgbToCmyk(r, g, b)
        if (r > 255 or g > 255 or b > 255 or r < 0 or g < 0 or b < 0) then
                error("Color level out of bounds")
        end
        local c = 1 - r / 255
        local m = 1 - g / 255
        local y = 1 - b / 255
        local k = math.min(c, m, y)
        if (k == 1) then
                c = 0
                m = 0
                y = 0
        else
                local d = 1 - k
                c = (c - k) / d
                m = (m - k) / d
                y = (y - k) / d
        end
        return { c = c * 100, m = m * 100, y = y * 100, k = k * 100 }
end

local function rgbToHsl(r, g, b)
        if (r > 255 or g > 255 or b > 255 or r < 0 or g < 0 or b < 0) then
                error("Color level out of bounds")
        end
        local channelMax = math.max(r, g, b)
        local channelMin = math.min(r, g, b)
        local range = channelMax - channelMin
        local h, s
        if (range == 0) then
                h = 0
        elseif (channelMax == r) then
                h = 60 * ((g - b) / range)
                if (h < 0) then
                        h = 360 + h
                end
        elseif (channelMax == g) then
                h = 60 * (2 + (b - r) / range)
        else
                h = 60 * (4 + (r - g) / range)
```

```
        end
        local L = channelMax + channelMin
        if (L == 0 or L == 510) then
                s = 0
        else
                s = 100 * range / math.min(L, 510 - L)
        end
        return { h = h, s = s, l = L * 50 / 255 }
end

local function rgbToHsv(r, g, b)
        if (r > 255 or g > 255 or b > 255 or r < 0 or g < 0 or b < 0) then
                error("Color level out of bounds")
        end
        local channelMax = math.max(r, g, b)
        local channelMin = math.min(r, g, b)
        local range = channelMax - channelMin
        local h, s
        if (range == 0) then
                h = 0
        elseif (channelMax == r) then
                h = 60 * ((g - b) / range)
                if (h < 0) then
                        h = 360 + h
                end
        elseif (channelMax == g) then
                h = 60 * (2 + (b - r) / range)
        else
                h = 60 * (4 + (r - g) / range)
        end
        if (channelMax == 0) then
                s = 0
        else
                s = 100 * range / channelMax
        end
        return { h = h, s = s, v = channelMax * 100 / 255 }
end

-- c in [0, 255], condition tweaked for no discontinuity
-- http://entropymine.com/imageworsener/srgbformula/
local function toLinear(c)
        if (c > 10.314300250662591) then
                return math.pow((c + 14.025) / 269.025, 2.4)
        else
                return c / 3294.6
        end
end

local function toNonLinear(c)
        if (c > 0.00313066844250063) then
                return 269.025 * math.pow(c, 1.0/2.4) - 14.025
        else
                return 3294.6 * c
        end
end

local function srgbToCielchuvD65o2deg(r, g, b)
        if (r > 255 or g > 255 or b > 255 or r < 0 or g < 0 or b < 0) then
                error("Color level out of bounds")
        end
        local R = toLinear(r)
        local G = toLinear(g)
        local B = toLinear(b)
        -- https://github.com/w3c/csswg-drafts/issues/5922
```

```
	local X = 0.1804807884018343 * B + 0.357584339383878 * G + 0.412390799265
	local Y = 0.07219231536073371 * B + 0.21263900587151027 * R + 0.715168678
	local Z = 0.01933081871559182 * R + 0.11919477979462598 * G + 0.950532152
	local L, C, h
	if (Y > 0.008856451679035631) then
		L = 116 * math.pow(Y, 1/3) - 16
	else
		L = Y * 903.2962962962962963
	end
	if ((r == g and g == b) or L == 0) then
		C = 0
		h = 0
	else
		d = X + 3 * Z + 15 * Y
		if (d == 0) then
			C = 0
			h = 0
		else
			-- 0.19783... and 0.4631... computed with extra precisior
			-- in which case (u,v) ≈ (0,0)
			local us = 4 * X / d - 0.19783000664283678994
			local vs = 9 * Y / d - 0.46831999493879099801
			h = math.atan2(vs, us) * 57.2957795130823208768
			if (h < 0) then
				h = h + 360
			elseif (h == 0) then
				h = 0 -- ensure zero is positive
			end
			C = math.sqrt(us * us + vs * vs) * 13 * L
			if (C == 0) then
				C = 0
				h = 0
			end
		end
	end
	return { L = L, C = C, h = h }
end

local function srgbMix(t, r0, g0, b0, r1, g1, b1)
	if (t > 1 or t < 0) then
		error("Interpolation parameter out of bounds")
	end
	if (r0 > 255 or g0 > 255 or b0 > 255 or r1 > 255 or g1 > 255 or b1 > 255
		error("Color level out of bounds")
	end
	local tc = 1 - t
	return {
		r = toNonLinear(tc * toLinear(r0) + t * toLinear(r1)),
		g = toNonLinear(tc * toLinear(g0) + t * toLinear(g1)),
		b = toNonLinear(tc * toLinear(b0) + t * toLinear(b1))
	}
end

local function formatToPrecision(value, p)
	return string.format("%." .. p .. "f", value)
end

local function getFractionalZeros(p)
	if (p > 0) then
		return "." .. string.rep("0", p)
	else
		return ""
	end
end
```

```
function p.hexToRgbTriplet(frame)
	local args = frame.args or frame:getParent().args
	local hex = args[1]
	if (hex) then
		local rgb = hexToRgb(hex)
		return rgb.r .. ', ' .. rgb.g .. ', ' .. rgb.b
	else
		return ""
	end
end

function p.hexToCmyk(frame)
	local args = frame.args or frame:getParent().args
	local hex = args[1]
	if (hex) then
		local p = tonumber(args.precision) or 0
		local s = args.pctsign or "1"
		local rgb = hexToRgb(hex)
		local cmyk = rgbToCmyk(rgb.r, rgb.g, rgb.b)
		local fk = formatToPrecision(cmyk.k, p)
		local fc, fm, fy
		local fracZeros = getFractionalZeros(p)
		if (fk == 100  .. fracZeros) then
			local fZero = 0 .. fracZeros
			fc = fZero
			fm = fZero
			fy = fZero
		else
			fc = formatToPrecision(cmyk.c, p)
			fm = formatToPrecision(cmyk.m, p)
			fy = formatToPrecision(cmyk.y, p)
		end
		if (s ~= "0") then
			return fc .. "%, " .. fm .. "%, " .. fy .. "%, " .. fk .
		else
			return fc .. ", " .. fm .. ", " .. fy .. ", " .. fk
		end
	else
		return ""
	end
end

function p.hexToHsl(frame)
	local args = frame.args or frame:getParent().args
	local hex = args[1]
	if (hex) then
		local p = tonumber(args.precision) or 0
		local rgb = hexToRgb(hex)
		local hsl = rgbToHsl(rgb.r, rgb.g, rgb.b)
		local fl = formatToPrecision(hsl.l, p)
		local fs, fh
		local fracZeros = getFractionalZeros(p)
		local fZero = 0 .. fracZeros
		if (fl == fZero or fl == 100 .. fracZeros) then
			fs = fZero
			fh = fZero
		else
			fs = formatToPrecision(hsl.s, p)
			if (fs == fZero) then
				fh = fZero
			else
				fh = formatToPrecision(hsl.h, p)
				if (fh == 360 .. fracZeros) then
```

```
                                        fh = fZero -- handle rounding to 360
                                end
                        end
                end
                return fh .. "°, " .. fs .. "%, " .. fl .. "%"
        else
                return ""
        end
end

function p.hexToHsv(frame)
        local args = frame.args or frame:getParent().args
        local hex = args[1]
        if (hex) then
                local p = tonumber(args.precision) or 0
                local rgb = hexToRgb(hex)
                local hsv = rgbToHsv(rgb.r, rgb.g, rgb.b)
                local fv = formatToPrecision(hsv.v, p)
                local fs, fh
                local fracZeros = getFractionalZeros(p)
                local fZero = 0 .. fracZeros
                if (fv == fZero) then
                        fh = fZero
                        fs = fZero
                else
                        fs = formatToPrecision(hsv.s, p)
                        if (fs == fZero) then
                                fh = fZero
                        else
                                fh = formatToPrecision(hsv.h, p)
                                if (fh == 360 .. fracZeros) then
                                        fh = fZero -- handle rounding to 360
                                end
                        end
                end
                return fh .. "°, " .. fs .. "%, " .. fv .. "%"
        else
                return ""
        end
end

function p.hexToCielch(frame)
        local args = frame.args or frame:getParent().args
        local hex = args[1]
        if (hex) then
                local p = tonumber(args.precision) or 0
                local rgb = hexToRgb(hex)
                local LCh = srgbToCielchuvD65o2deg(rgb.r, rgb.g, rgb.b)
                local fL = formatToPrecision(LCh.L, p)
                local fC, fh
                local fracZeros = getFractionalZeros(p)
                local fZero = 0 .. fracZeros
                if (fL == fZero or fL == 100 .. fracZeros) then
                        fC = fZero
                        fh = fZero
                else
                        fC = formatToPrecision(LCh.C, p)
                        if (fC == fZero) then
                                fh = fZero
                        else
                                fh = formatToPrecision(LCh.h, p)
                                if (fh == 360 .. fracZeros) then
                                        fh = fZero -- handle rounding to 360
                                end
```

```
                        end
                end
                return fL .. ", " .. fC .. ", " .. fh .. "°"
        else
                return ""
        end
end

function p.hexMix(frame)
        local args = frame.args or frame:getParent().args
        local hex0 = args[1]
        local hex1 = args[2]
        if (isempty(hex0) or isempty(hex1)) then
                return ""
        end
        local t = args[3]
        if (isempty(t)) then
                t = 0.5
        else
                t = tonumber(t)
                local min = tonumber(args.min) or 0
                local max = tonumber(args.max) or 100
                if (min >= max) then
                        error("Minimum proportion greater than or equal to maximu
                elseif (t < min) then
                        t = 0
                elseif (t > max) then
                        t = 1
                else
                        t = (t - min) / (max - min)
                end
        end
        local rgb0 = hexToRgb(hex0)
        local rgb1 = hexToRgb(hex1)
        local rgb = srgbMix(t, rgb0.r, rgb0.g, rgb0.b, rgb1.r, rgb1.g, rgb1.b)
        return rgbToHex(rgb.r, rgb.g, rgb.b)
end

return p
```