

Modul:Color

This module is used primarily by **Vorlage:TI**, 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 **CIE LCh_{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.f
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),

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        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
end
```

```
        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 > 0.00885645167903563082) then
    L = 116 * math.pow(Y, 1/3) - 16
else
    L = Y * 903.2962962962962962963
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 precision
        -- 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

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                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
    end
end
```



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