RGB to HSI

First, we convert RGB color space image to HSI space beginning with normalizing RGB values:

$r = \frac{R}{R+G+B}$, $g = \frac{G}{R+G+B}$, $b = \frac{B}{R+G+B}$.

Each normalized H, S and I components are then obtained by,

$$h = \cos^{-1}\left\{\frac{0.5\cdot\left[(r-g)+(r-b)\right]}{\left[(r-g)^2+(r-b)(g-b)\right]^{1/2}}\right\} \qquad h\in[0,\pi] \text{ for } b\le g$$

$$h = 2\pi-\cos^{-1}\left\{\frac{0.5\cdot\left[(r-g)+(r-b)\right]}{\left[(r-g)^2+(r-b)(g-b)\right]^{1/2}}\right\} \qquad h\in[\pi,2\pi] \text{ for } b> g$$

$$s = 1-3\cdot\min(r,g,b) \qquad s\in[0,1]$$

$$i = (R+G+B)/(3\cdot 255) \qquad i\in[0,1].$$

For convenience, h, s and i values are converted in the ranges of [0,360], [0,100], [0, 255], respectively by: $H = h\times 180/\pi$; $S = s\times 100$ and $I = i\times 255$.

HSI to RGB

$h = H\cdot\pi/180$; $s = S/100$; $i = I/255$

$x = i\cdot(1-s)$

$y = i\cdot\left[1+\frac{s\cdot\cos(h)}{\cos(\pi/3-h)}\right]$

$z = 3i-(x+y)$;

when $h<2\pi/3$, $b=x$; $r=y$ and $g=z$.

when $2\pi/3\le h<4\pi/3$, $h=h-2\pi/3$, and $r=x$; $g=y$ and $b=z$.

when $4\pi/3\le h<2\pi$, $h=h-4\pi/3$, and $g=x$; $b=y$ and $r=z$.

The result r, g and b are normalized values which are in the ranges of [0,1], therefore, they should be multiplied by 255 for displaying.