RGB Color Space

RGB Cube:

Grays are on dotted main diagonal.
CIE Chromaticity Diagram

The corners of this triangle is approximately where the phosphors of a typical color monitor plot.

Unique green about here

Unique yellow about here

Unique blue about here

Unique red plots about here
YIQ – TV broadcasting

Recording of RGB for
- transmission efficiency and
- downward compatibility with B&W TV.

Recoded signal is transmitted using NTSC standard

\[
\begin{bmatrix}
Y \\
I \\
Q
\end{bmatrix} = \begin{bmatrix}
0.299 & 0.587 & 0.114 \\
0.596 & -0.275 & -0.321 \\
0.212 & -0.528 & 0.311
\end{bmatrix} \begin{bmatrix}
R \\
G \\
B
\end{bmatrix}
\]

- Y = Luminance
  - (only one shown in B&W TV)
- I = Chromaticity
HSV Color Space

*User Oriented*

**H = hue**
- measured by angle around verticle axis with red at $8^\circ$, green at $120^\circ$, etc.

**S = saturation**
- ranging from 0 to 1

**V = Value**
Other color models and their relationships

CMY: Cyan, Magenta and Yellow

\[
\begin{bmatrix}
C \\
M \\
Y
\end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} - \begin{bmatrix} R \\ G \\ B \end{bmatrix}
\]

and

\[
\begin{bmatrix}
R \\
G \\
B
\end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} - \begin{bmatrix} C \\ M \\ Y \end{bmatrix}
\]

Cyan = White - Red
= Blue + Green;

Magenta = White - Green
= Red + Blue;

Yellow = White - Blue
= Red + Green
YIQ:
\[
\begin{bmatrix}
Y \\
I \\
Q
\end{bmatrix}
= \begin{bmatrix}
0.299 & 0.587 & 0.114 \\
0.596 & -0.275 & -0.321 \\
0.212 & -0.523 & 0.311
\end{bmatrix}
\begin{bmatrix}
R \\
G \\
B
\end{bmatrix}
\]

Y component of YIQ is luminance, same as CIE Y primary. Only the Y component of a color TV signal is shown on B/W TVs. The chromaticity is encoded in I and Q.

Other models: HLS (Hue, Lightness, Saturation); LAB and LUV (Munsell Color Space)