

# Data Representation

# Images

CS 101 - Spring 2018

Department of Computer Science

Middlebury College

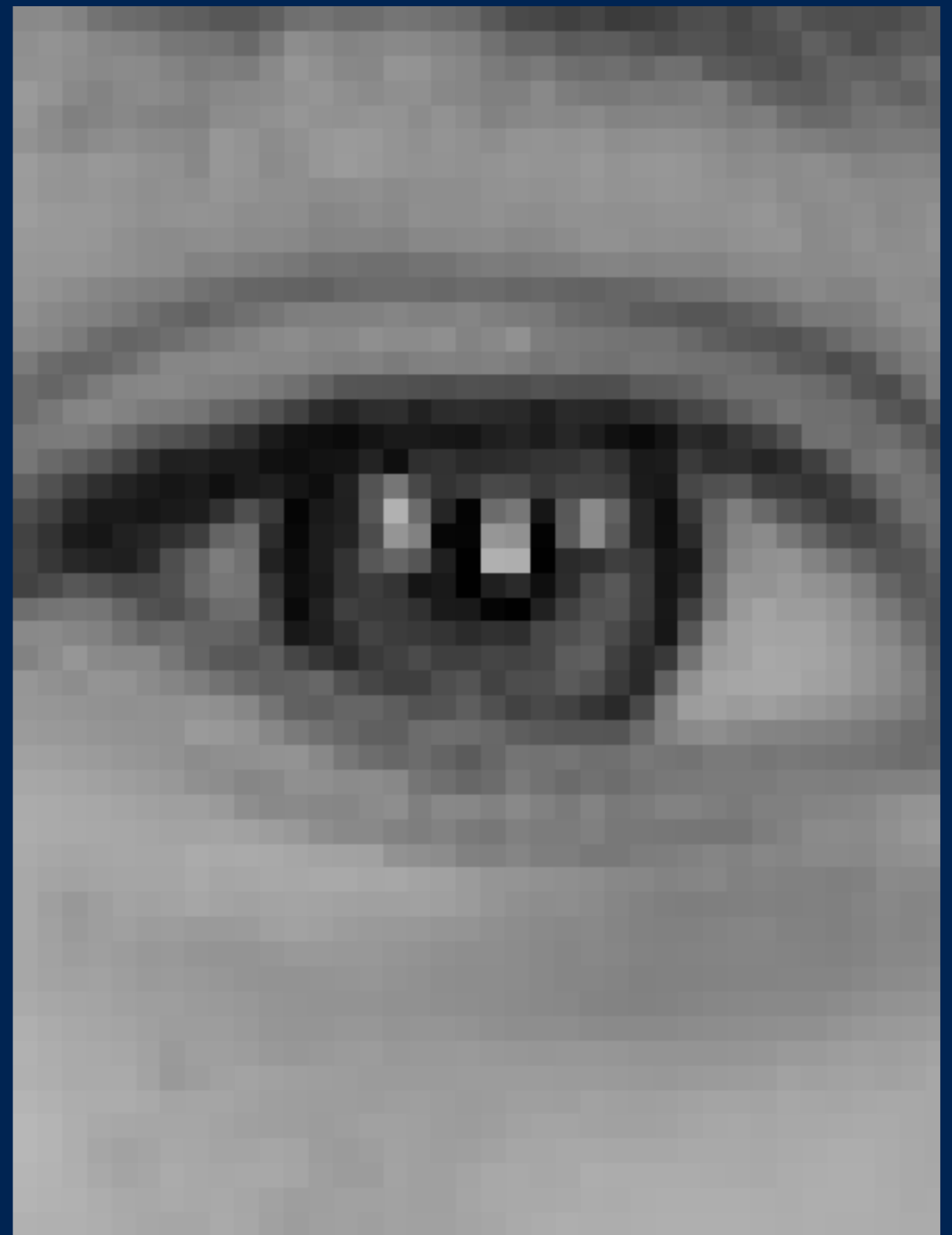
# ASCII Table

Dec	Hx	Oct	Char	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr
0	0	000	<b>NUL</b> (null)	32	20	040	&#32;	Space	64	40	100	&#64;	@	96	60	140	&#96;	`
1	1	001	<b>SOH</b> (start of heading)	33	21	041	&#33;	!	65	41	101	&#65;	A	97	61	141	&#97;	a
2	2	002	<b>STX</b> (start of text)	34	22	042	&#34;	"	66	42	102	&#66;	B	98	62	142	&#98;	b
3	3	003	<b>ETX</b> (end of text)	35	23	043	&#35;	#	67	43	103	&#67;	C	99	63	143	&#99;	c
4	4	004	<b>EOT</b> (end of transmission)	36	24	044	&#36;	\$	68	44	104	&#68;	D	100	64	144	&#100;	d
5	5	005	<b>ENQ</b> (enquiry)	37	25	045	&#37;	%	69	45	105	&#69;	E	101	65	145	&#101;	e
6	6	006	<b>ACK</b> (acknowledge)	38	26	046	&#38;	&	70	46	106	&#70;	F	102	66	146	&#102;	f
7	7	007	<b>BEL</b> (bell)	39	27	047	&#39;	'	71	47	107	&#71;	G	103	67	147	&#103;	g
8	8	010	<b>BS</b> (backspace)	40	28	050	&#40;	(	72	48	110	&#72;	H	104	68	150	&#104;	h
9	9	011	<b>TAB</b> (horizontal tab)	41	29	051	&#41;	)	73	49	111	&#73;	I	105	69	151	&#105;	i
10	A	012	<b>LF</b> (NL line feed, new line)	42	2A	052	&#42;	*	74	4A	112	&#74;	J	106	70	152	&#106;	j
11	B	013	<b>VT</b> (vertical tab)	43	2B	053	&#43;	+	75	4B	113	&#75;	K	107	71	153	&#107;	k
12	C	014	<b>FF</b> (NP form feed, new page)	44	2C	054	&#44;	,	76	4C	114	&#76;	L	108	72	154	&#108;	l
13	D	015	<b>CR</b> (carriage return)	45	2D	055	&#45;	-	77	4D	115	&#77;	M	109	73	155	&#109;	m
14	E	016	<b>SO</b> (shift out)	46	2E	056	&#46;	.	78	4E	116	&#78;	N	110	74	156	&#110;	n
15	F	017	<b>SI</b> (shift in)	47	2F	057	&#47;	/	79	4F	117	&#79;	O	111	75	157	&#111;	o
16	10	020	<b>DLE</b> (data link escape)	48	30	060	&#48;	0	80	50	120	&#80;	P	112	76	160	&#112;	p
17	11	021	<b>DC1</b> (device control 1)	49	31	061	&#49;	1	81	51	121	&#81;	Q	113	77	161	&#113;	q
18	12	022	<b>DC2</b> (device control 2)	50	32	062	&#50;	2	82	52	122	&#82;	R	114	78	162	&#114;	r
19	13	023	<b>DC3</b> (device control 3)	51	33	063	&#51;	3	83	53	123	&#83;	S	115	79	163	&#115;	s
20	14	024	<b>DC4</b> (device control 4)	52	34	064	&#52;	4	84	54	124	&#84;	T	116	80	164	&#116;	t
21	15	025	<b>NAK</b> (negative acknowledge)	53	35	065	&#53;	5	85	55	125	&#85;	U	117	81	165	&#117;	u
22	16	026	<b>SYN</b>											118	82	166	&#118;	v
23	17	027	<b>ETB</b>											119	83	167	&#119;	w
24	18	030	<b>CAN</b>											120	84	168	&#120;	x
25	19	031	<b>EM</b>											121	85	169	&#121;	y
26	1A	032	<b>SUB</b>											122	86	170	&#122;	z
27	1B	033	<b>ESC</b> (escape)	59	3B	073	&#59;	;	91	5B	133	&#91;	[	123	7B	173	&#123;	{
28	1C	034	<b>FS</b> (file separator)	60	3C	074	&#60;	<	92	5C	134	&#92;	\	124	7C	174	&#124;	
29	1D	035	<b>GS</b> (group separator)	61	3D	075	&#61;	=	93	5D	135	&#93;	]	125	7D	175	&#125;	}
30	1E	036	<b>RS</b> (record separator)	62	3E	076	&#62;	>	94	5E	136	&#94;	^	126	7E	176	&#126;	~
31	1F	037	<b>US</b> (unit separator)	63	3F	077	&#63;	?	95	5F	137	&#95;	_	127	7F	177	&#127;	DEL

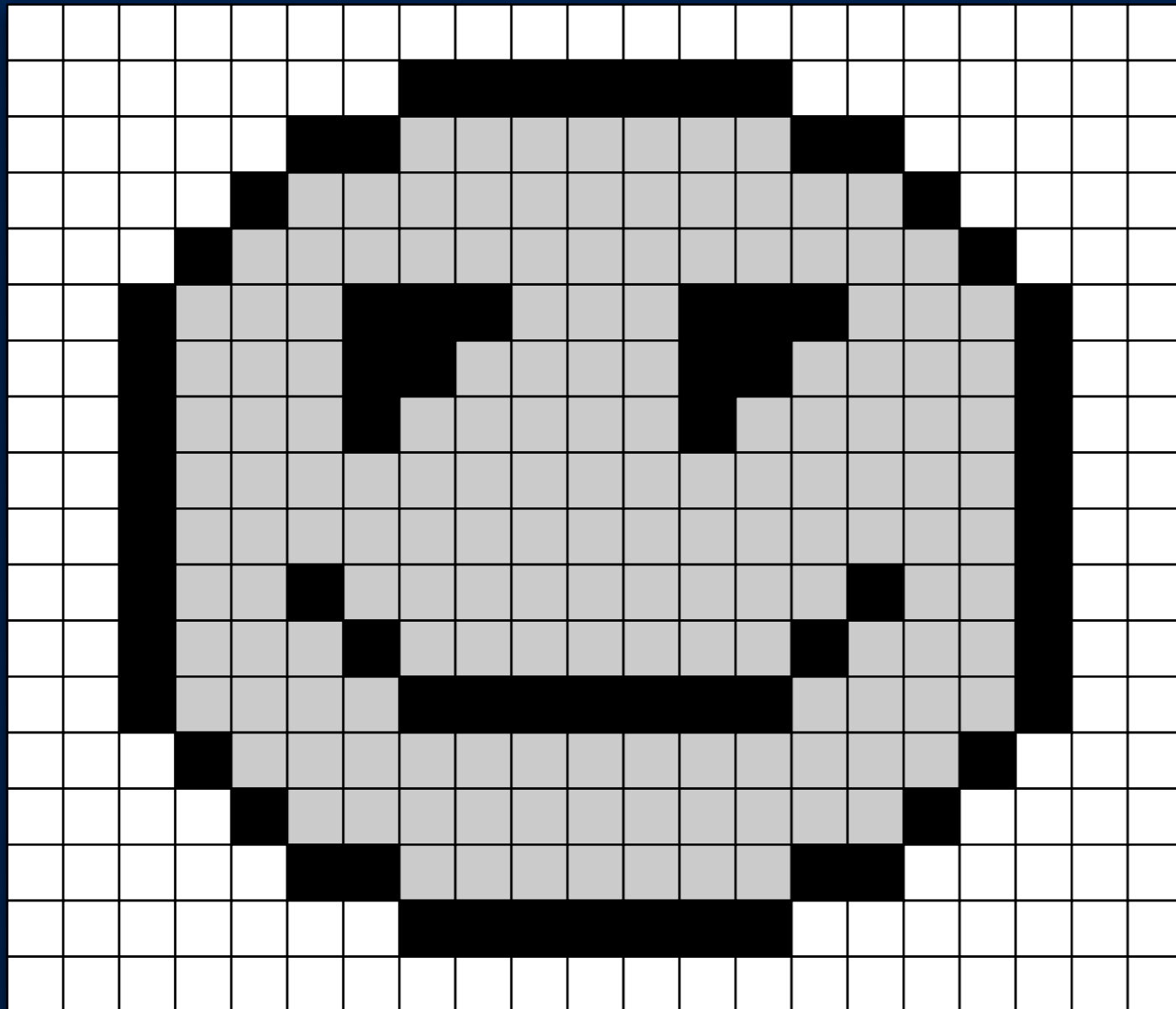
0100 0001 -> 65 -> 'A'



# Pictures



# Pictures



255	255	255	255	255	255	0
255	255	255	255	0	0	190
255	255	255	0	190	190	190
255	255	0	190	190	190	190
255	0	190	190	190	0	0
255	0	190	190	190	0	0
255	0	190	190	190	0	190



# Pictures



8 bit



4 bit

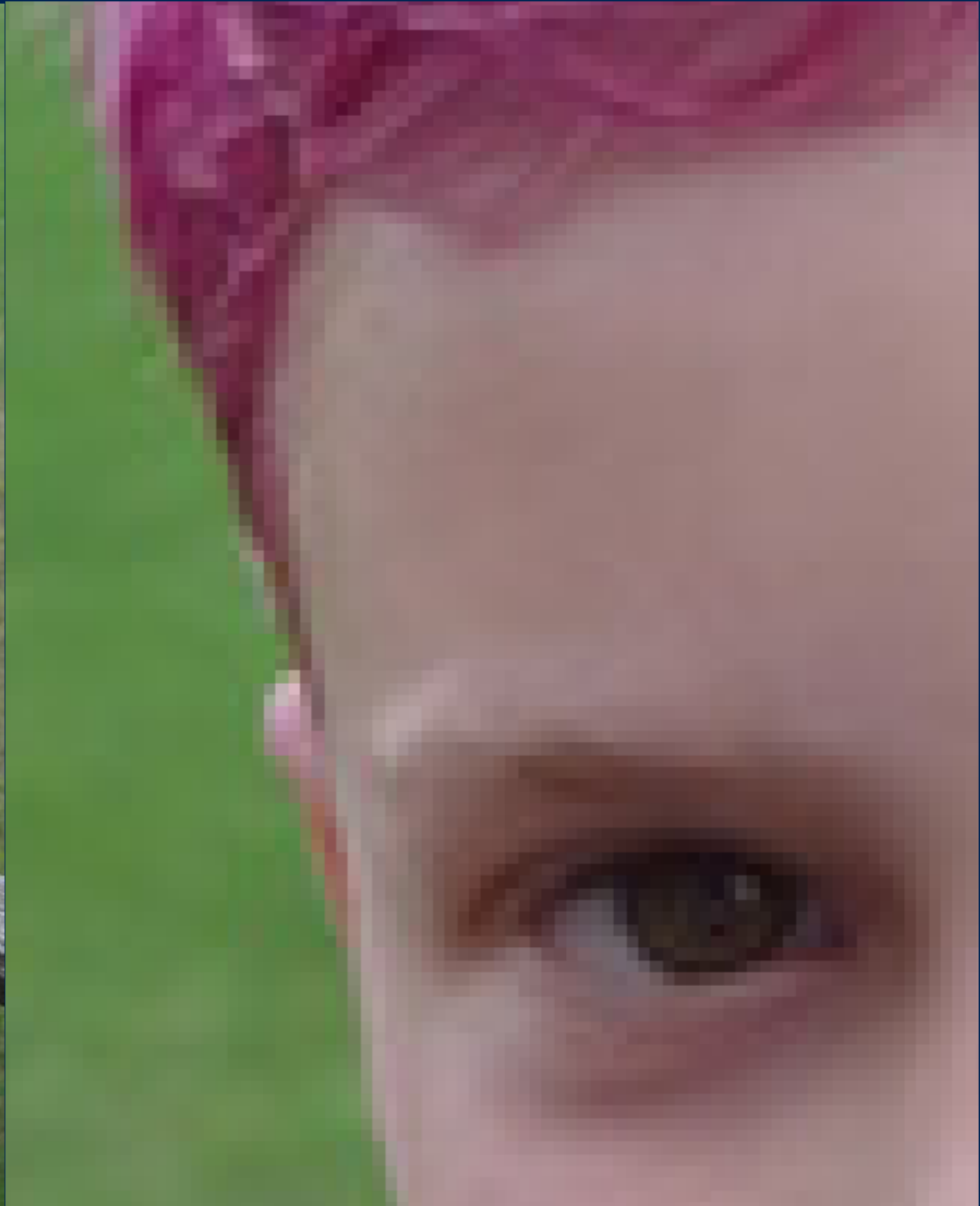


2 bit



1 bit

# Color

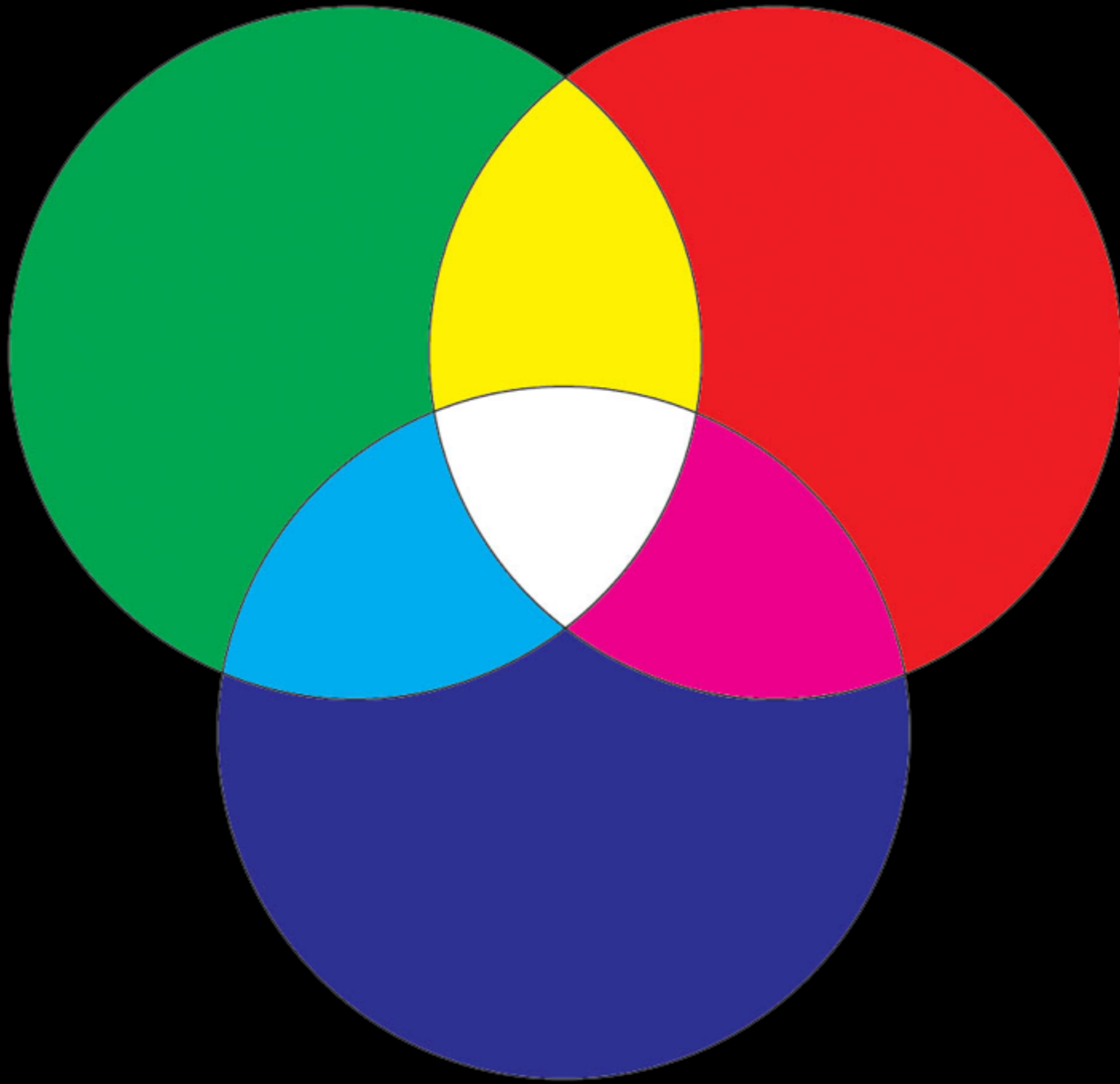


# Representing Images

- Break image into  $m \times n$  grid of pixels (picture elements)
  - E.g.,  $400 \times 400 = 160,000$  pixels
  - E.g.,  $1024 \times 768 = 786,432$  pixels
- Represent each pixel with a color value
- Each color value made up of **red**, **green**, **blue** components
- each component represented by certain number of bits
  - E.g., 8 bits  $\rightarrow$  256 values
  - 24-bit color ("Truecolor")  $\rightarrow$  16,777,216 colors



Color



# Color

RGB Color Wheel

