CS372 (Graphics)

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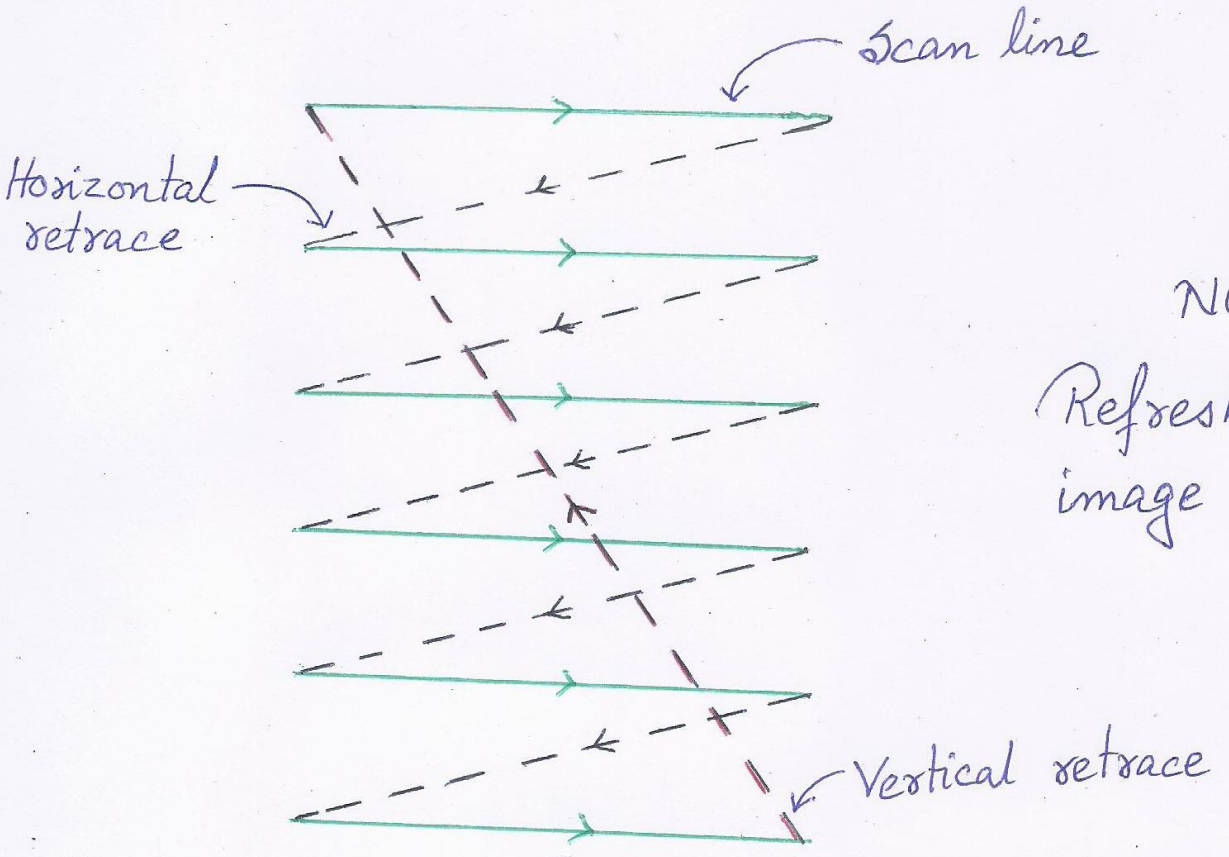
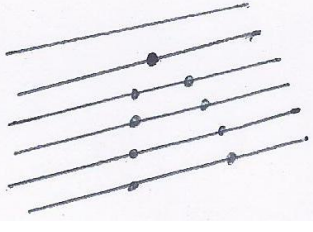


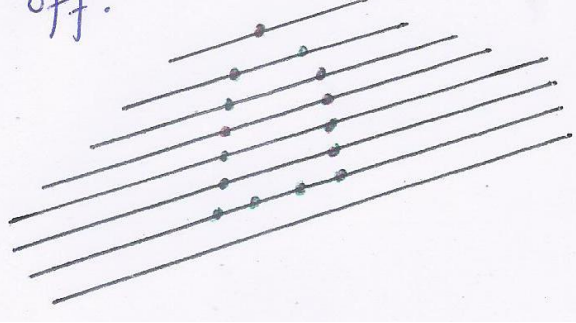
RASTER SCAN

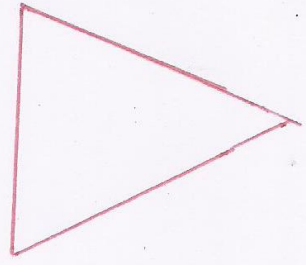
NON-INTERLACING

Refresh rate = no. of times the image is drawn/second on the screen.

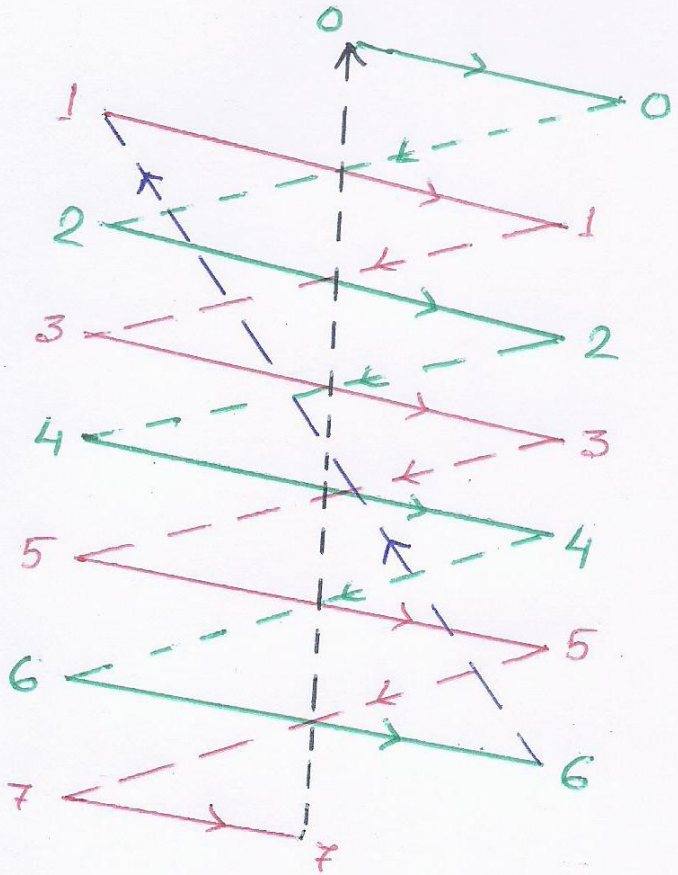
So, the lines essentially shows the beam traversing path. To give the display of the object, the beam switches on at only those points and then switches off.







INTERLACING

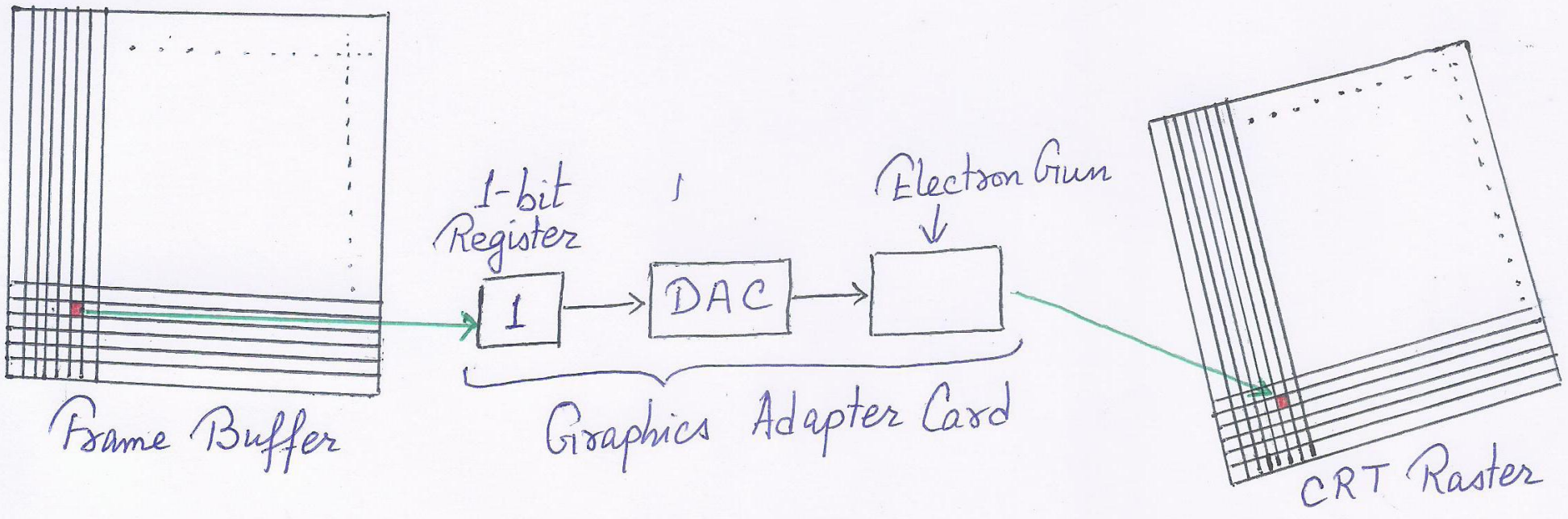


Each frame has 2 fields

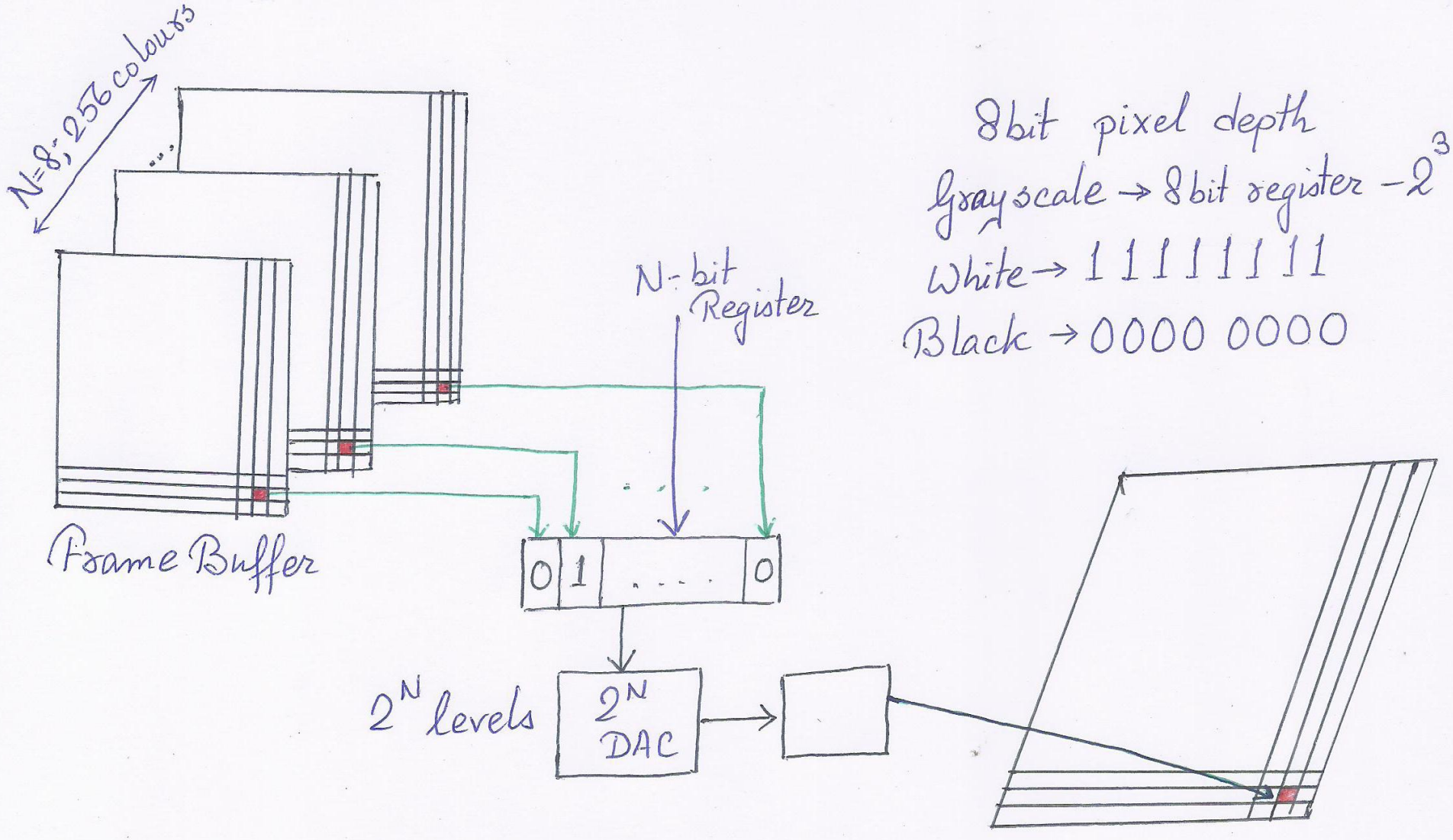
One field contains the odd scan lines (1, 3, 5, ...)

The other field contains the even scan lines (2, 4, 6, ...)

A SINGLE BIT-PLANE B&W Frame Buffer Raster CRT Graphics Device



N-Bit plane Gray level



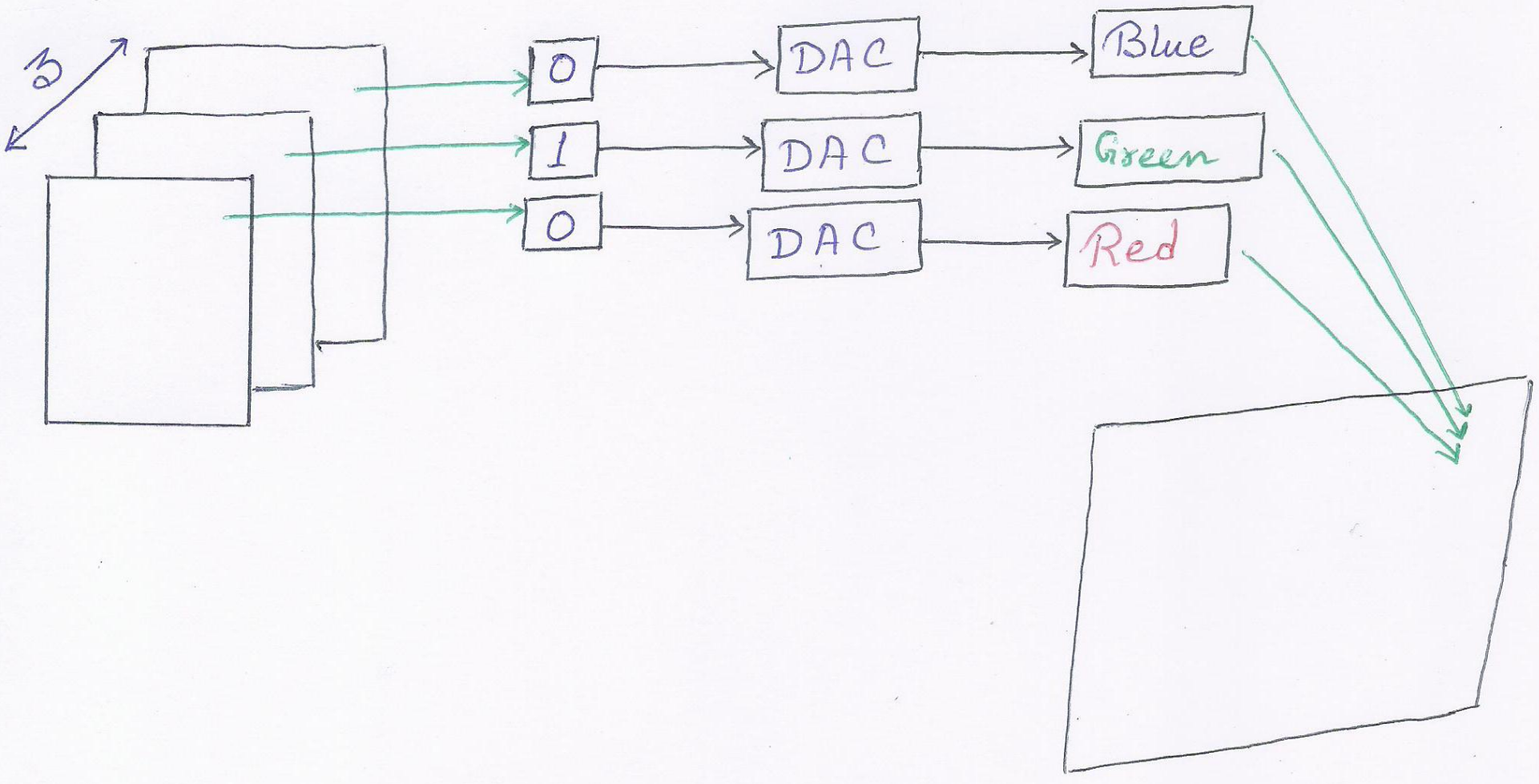
8bit pixel depth

Grayscale → 8bit register – 2^3

White → 11111111

Black → 0000 0000

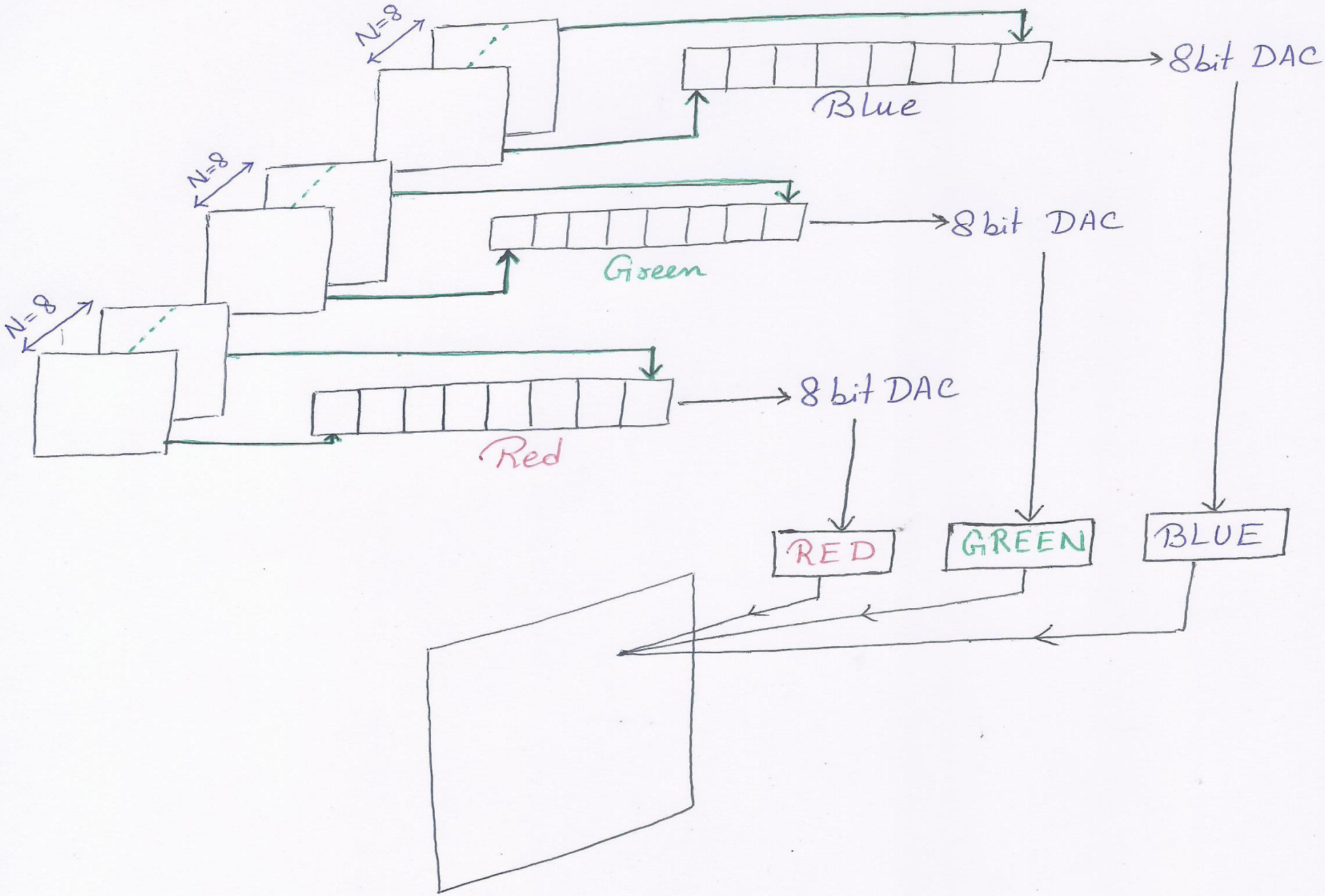
Simple Color FRAME BUFFER



Now, for $N=3$, we will have $2^3 = 8$ colours:

	R	G	B
Black	0	0	0
Blue	0	0	1
Green	0	1	0
Cyan	0	1	1
Red	1	0	0
Magenta	1	0	1
Yellow	1	1	0
White	1	1	1

Full Colour Frame Buffer



FULL COLOR FRAME BUFFER / 24 BIT PLANE F.B.

1. Typically 8-bit planes per color is used, which gives a 24-bit plane F.B.
2. Each group of bit plane drives an 8-bit DAC.
3. Each group generates 256 shades of intensities of ~~seq~~ red, green or blue.
4. Hence, we obtain $2^{24} = 16,777,216$ possible colors.

So, there is a huge requirement of memory & B.W. But in practice, we do not need this huge no. of colors. So, for efficient management, a new device is introduced, which is known as the Lookup Table or LUT.

ASSIGNMENT: Explain the operation of an N ($=8$)-bit plane gray level FB with a W ($=10$)-bit wide lookup table.

3. Let the average time to execute an instruction in the display list be 33.33 μsec. If the frame rate is 30 fps, obtain the max. no. of instructions that may be present in the display list (random scan displays).

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→ Frame rate = 30 Hz. Time to scan one frame = $\frac{1}{30}$ sec. = 33.33 ms.

$$\text{Maximum no. of instructions} = \frac{33.33 \times 10^{-3}}{33.33 \times 10^{-6}} = 1000$$

4. Consider the display area of a video monitor to be 12" x 9.6". If the resolution of the monitor is 1280 x 1024, what is the diameter of each pixel (assume aspect ratio = 1)?

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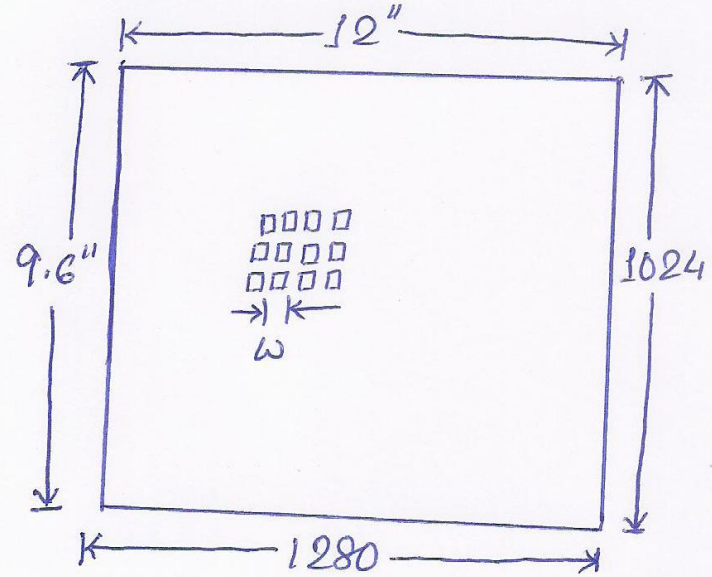

$$\omega \times 1280 = 12''$$

$$\Rightarrow \omega = \frac{12''}{1280} \simeq 9.4 \times 10^{-3}''$$

5. Compute the access time per pixel, for systems with resolutions (a) 640×480 and (b) 1280×1024. Assume a refresh rate of 60fps.

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→ Screen resolution = 640×480, Refresh rate = 60fps or 60 Hz

Time required to scan 1 frame = $1/60$ sec $\simeq 16.7$ ms

So, in 16.7 ms, 640×480 pixels will be accessed. So, time required to access 1 pixel = $\frac{16.7}{640 \times 480}$ ms $\simeq 54\,\mu s$.

6. Assuming a transfer rate of 0.1 MB/sec, how much time would be necessary to load pix maps with resolutions:

(a) $512 \times 512 \times 1$ (b) $1024 \times 1280 \times 1$.

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→ Transfer rate = 0.1 MB/s ≃ 102 KB/sec.

Pix map resolution = $\frac{512 \times 512}{8}$ Bytes = $\frac{2^9 \times 2^9}{2^3} = 2^5 \times 2^{10} = 32$ KB

Time required = $\frac{32}{102} \simeq 0.31$ sec.