SUCCESSIVE APPROXIMATION. TECHNIQUE

Assume step size = 10 mV. , 8 - bit successive Approx. ADC. V_{in} = 1 Volt.

Since n = 8 , 256 (decimal), $\frac{V_{ref}}{2} = \frac{256}{2} = 128$

1) Start with binary | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - 128.

D_7 D_6 D_5 D_4 D_3 D_2 D_1 D_0

128 x 10 mV = 1.28 V > 1 V (V_{in})

D_7 is cleared

2) | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | = 64 x 10 mV = 0.64 V

0.64 < 1 V (V_{in}).

D_6 is kept.

3) | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |

D_5

96 x 10 mV = 0.96 V

0.96 < 1 V.

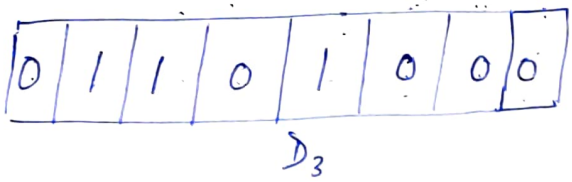
D_5 is kept.

4) | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | = 112 x 10 mV = 1.12 V

D_4

1.12 V > 1 V

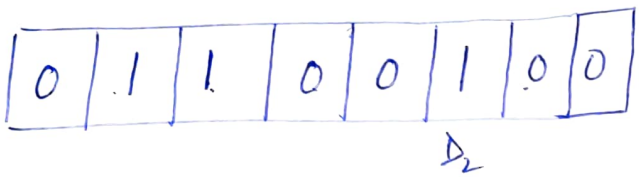
D_4 is discarded/clear.

5) 

$104 \times 10\ mV = 1.04\ V$

$1.04\ V > 1\ V$.

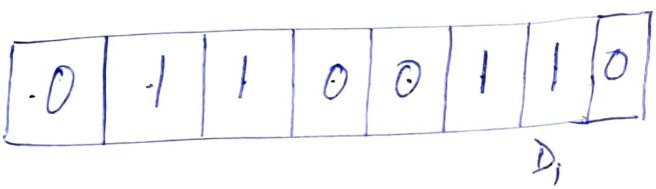
D_3 is Discarded.

6) 

$100 \times 10\ mV = 1\ V$

$1\ V = 1\ V$

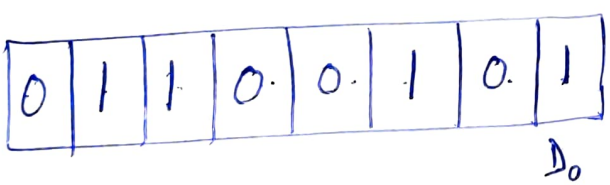
D_2 is kept.

7) 

$102 \times 10\ mV = 1.02\ V$

$1.02\ V > 1\ V$

D_1 is discarded.

8) 

$101 \times 10\ mV = 1.01\ V$

$1.01\ V > 1\ V$

D_0 is Discarded.

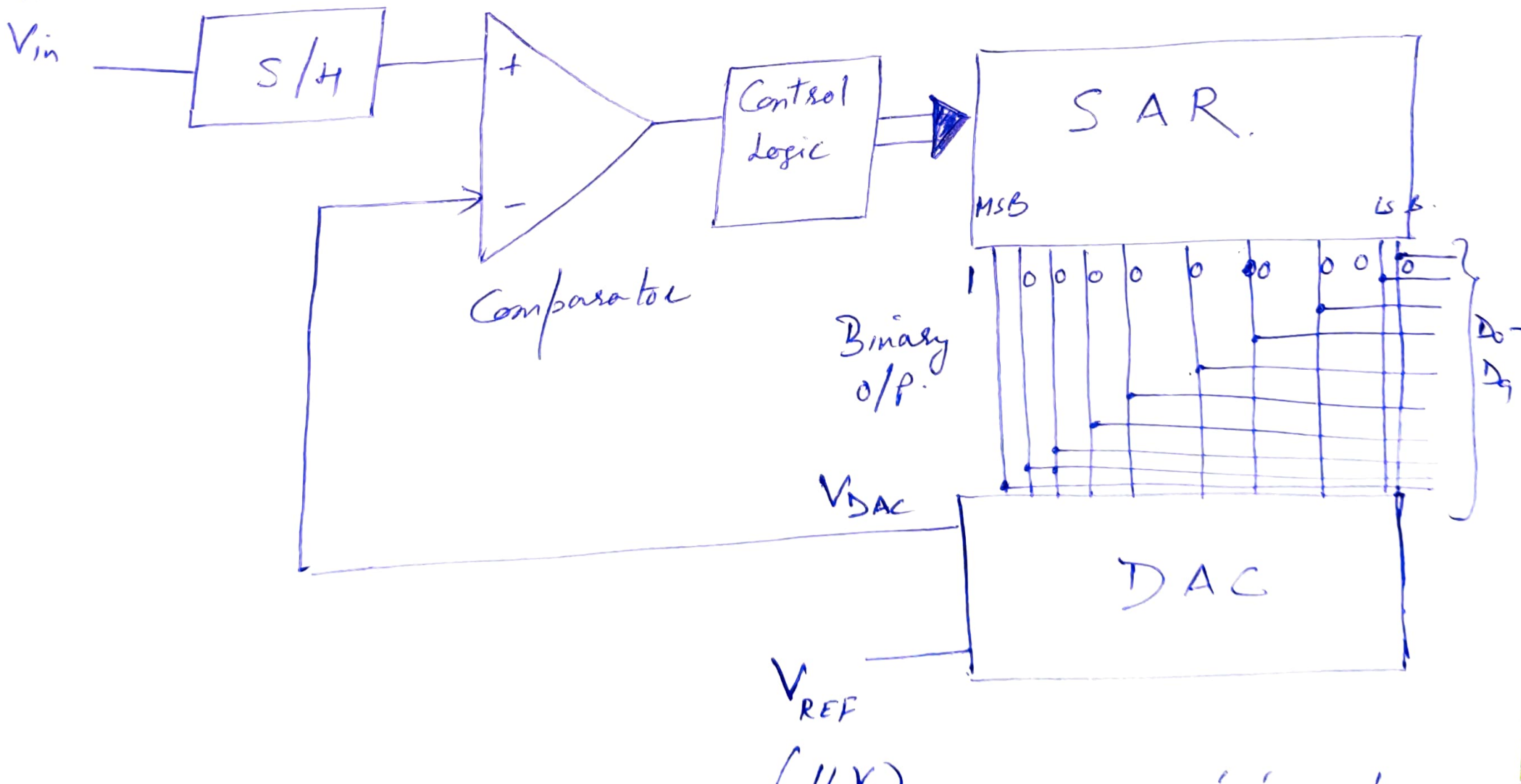
Since Result is achieved in step ⑥, but SA method goes through all steps..

Advantage :- Conversion Time is fixed.

10-bit Resolution ADC.

Range (0 - 16 V) (Method: Successive Approximation)

(11.2 V)



Step size $= \frac{V_{ref}}{1024} = \frac{16}{1024} \therefore 15.62\ mV$

$V_{in} = 11.2\ V$ $\quad n = 10$, 1024 (decimal).

$\frac{1024}{2} = 512$

1. Start with binary. MSB LSB

1	0	0	0	0	0	0	0	0	0
D_9	D_8	D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0

512

$512 \times 15.62\ mV = 7.99\ V < 11.2\ V$

$(V_{DAC}) < (V_{in})$.

D_9 bit is kept.

2.

1	1	0	0	0	0	0	0	0	0
	D_8								

768

$.768 \times 15.62\ mV = 11.99\ V > 11.2\ V$.

$(V_{DAC}) > (V_{in})$

Discard D_8

3.

1	0	1	0	0	0	0	0	0	0
		D_7							

640

~~$11.99 \times 15.62\ mV < 0.18\ V < 11.2\ V$~~

$640 \times 15.62\ mV = 9.99\ V < 11.2\ V$

D_7 is kept.

(D_7 is kept)

4.

1	0	1	1	0	0	0	0	0	0
			D_6						

704

$704 \times 15.62\ mV = 10.99\ V < 11.2\ V$

D_6 is kept.

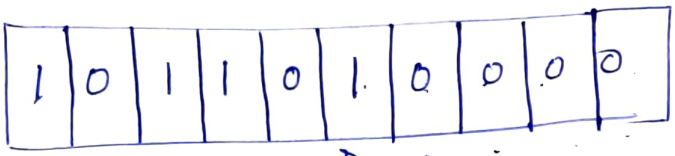
5.

1	0	1	1	1	0	0	0	0	0
				D_5					

736

$736 \times 15.62\ mV = 11.49\ V > 11.2\ V$

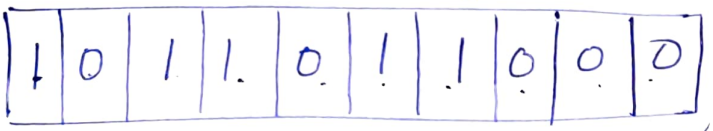
D_5 is discarded.

6. 

720

720 × 15.62 mV = 11.24 V = 11.2 V

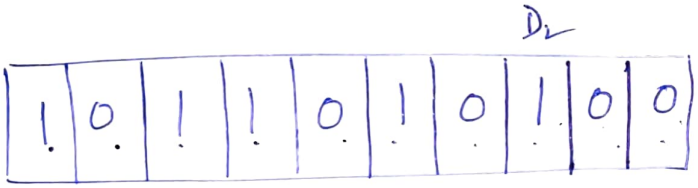
D_4 is kept.

7. 

728

728 × 15.62 mV = 11.37 V > 11.2 V

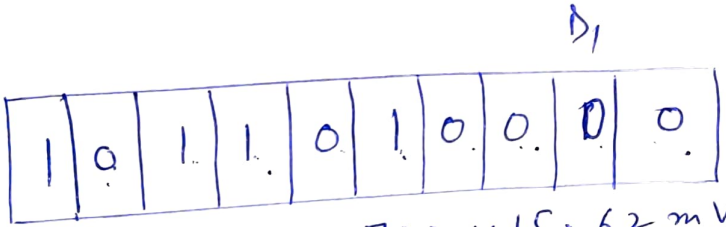
Discard D_3.

8. 

724

724 × 15.62 mV = 11.30 V > 11.2 V

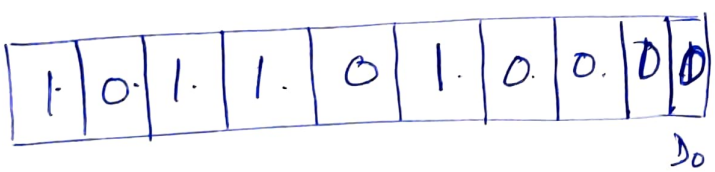
Discard D_2.

9. 

722

722 × 15.62 mV = 11.27 ≥ 11.2 V

D_1 is ~~kept~~ Discard

10. 

= 721

721 × 15.62 mV = 11.26 V ≥ 11.2 V.

D_0 is ~~kept~~ Discarded.