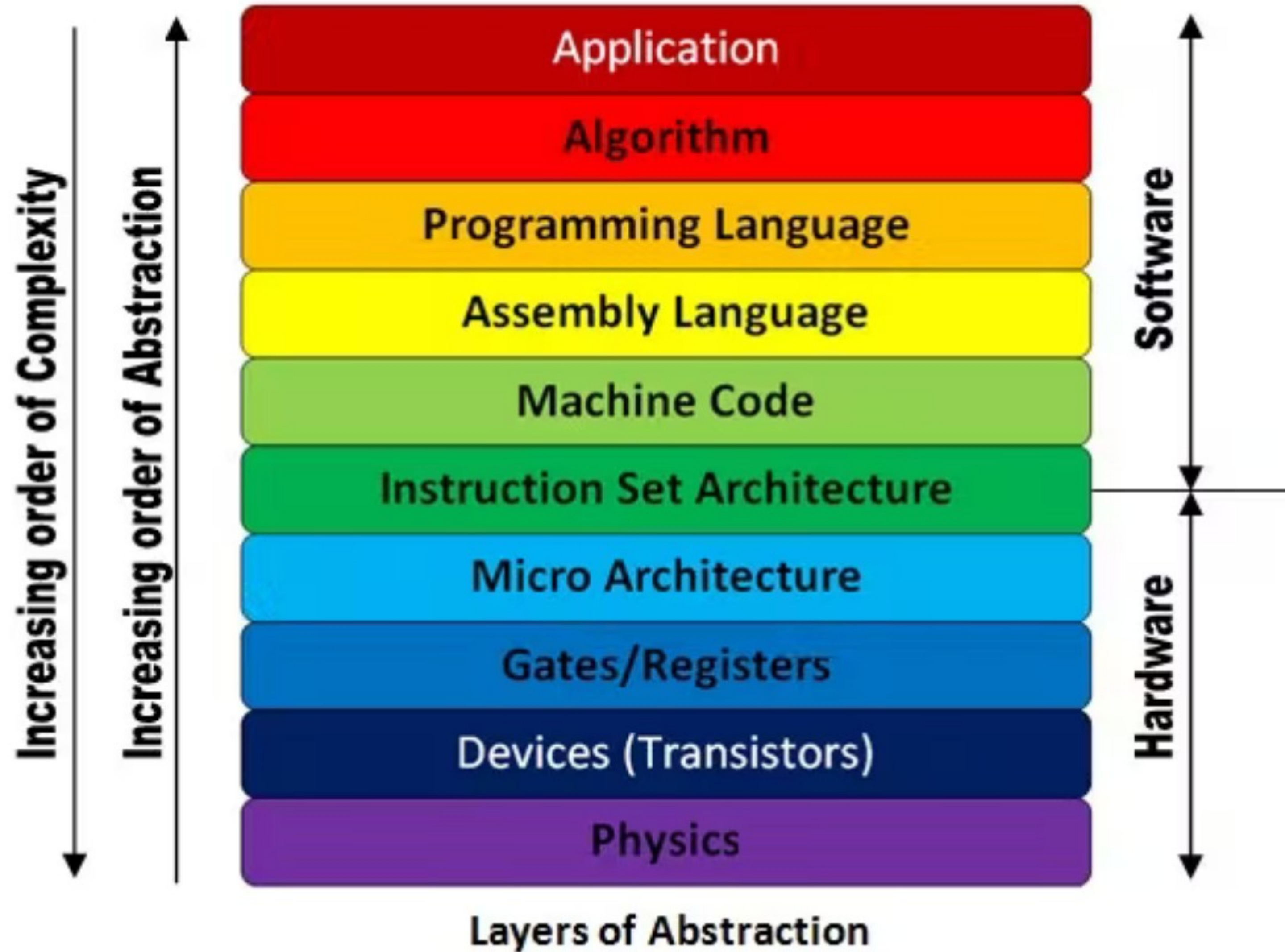


In1020 - Datamaskinarkitektur og ALU

Omid Mirmotahari og Yngvar Berg



Abstraksjonsnivåer for datamaskin

Dagens forelesning

- Hva består en instruksjon av?
- Arkitekturen til LMC
- Lære å kjenne hjernen og hjertet av en datamaskin :)
- Introduksjon til binær addisjon



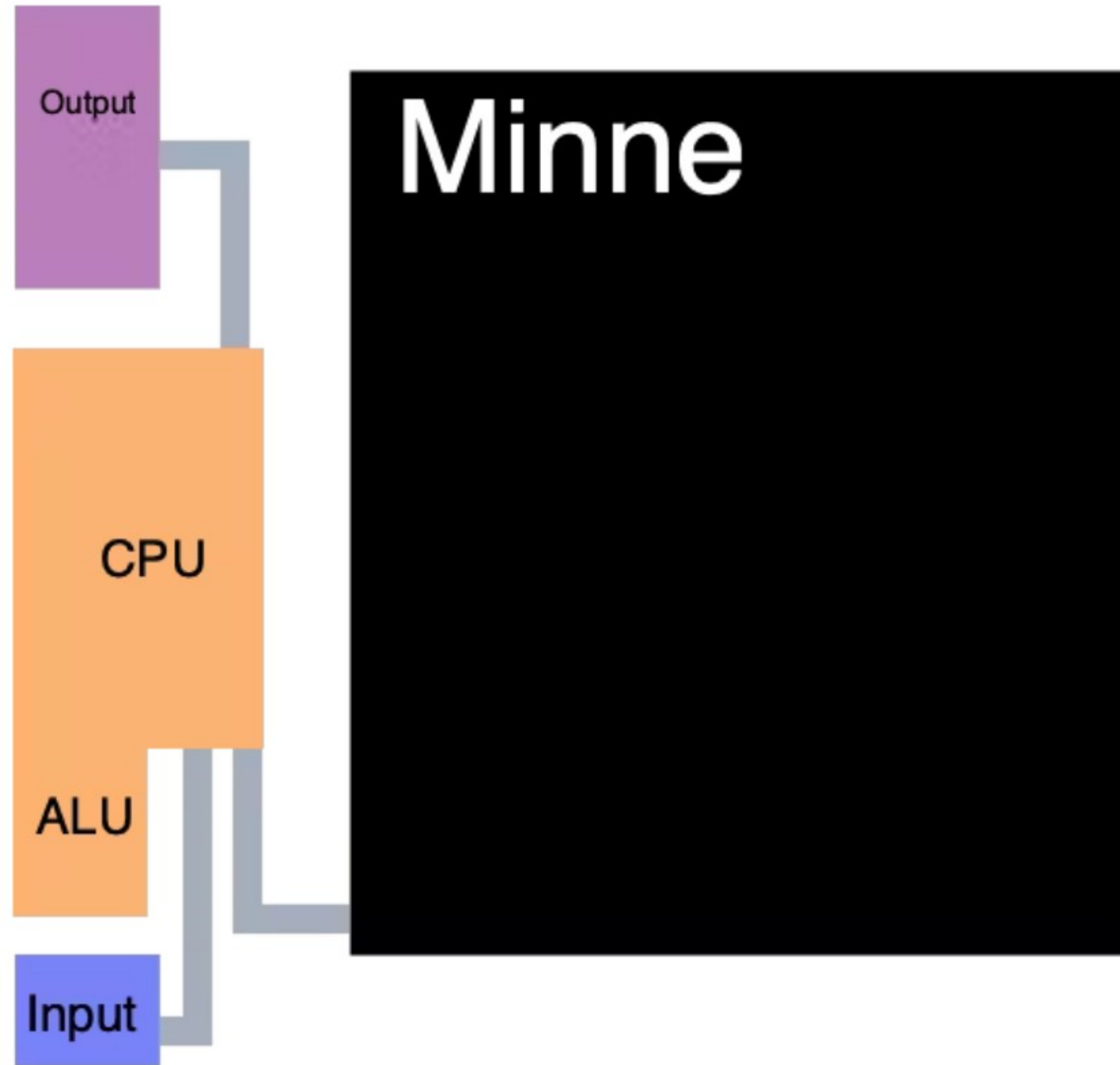


Utførelse av addisjon (instruksjon 199)

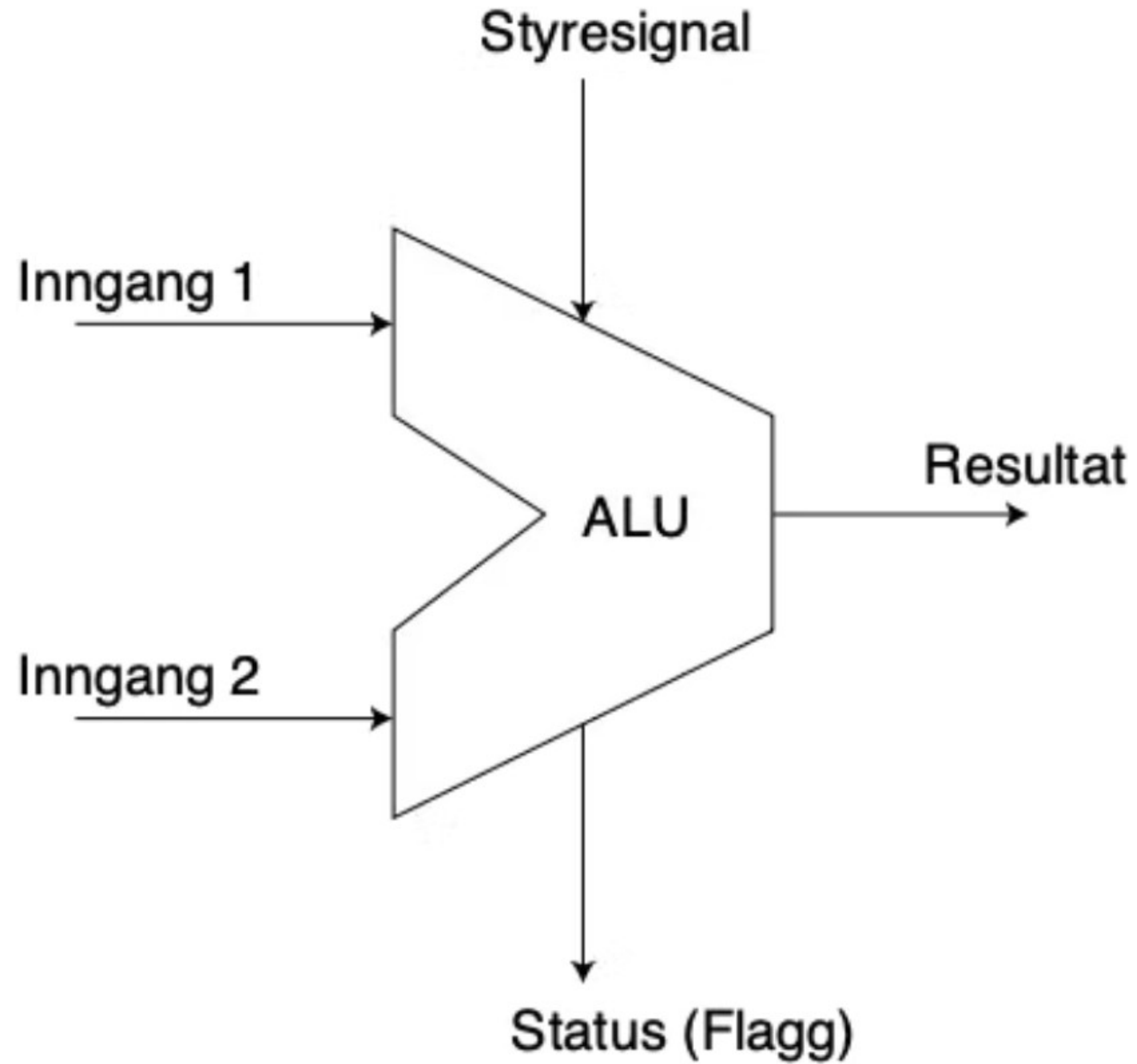
- Hent instruksjonen og øk programtelleren (FETCH)
- Splitt instruksjonen og hent fra minne (DECODE)
- Utfør instruksjonen (EXECUTE)
- Lagre data (WRITE-BACK)

LMC utførelse

<http://www.peterhigginson.co.uk/LMC/>

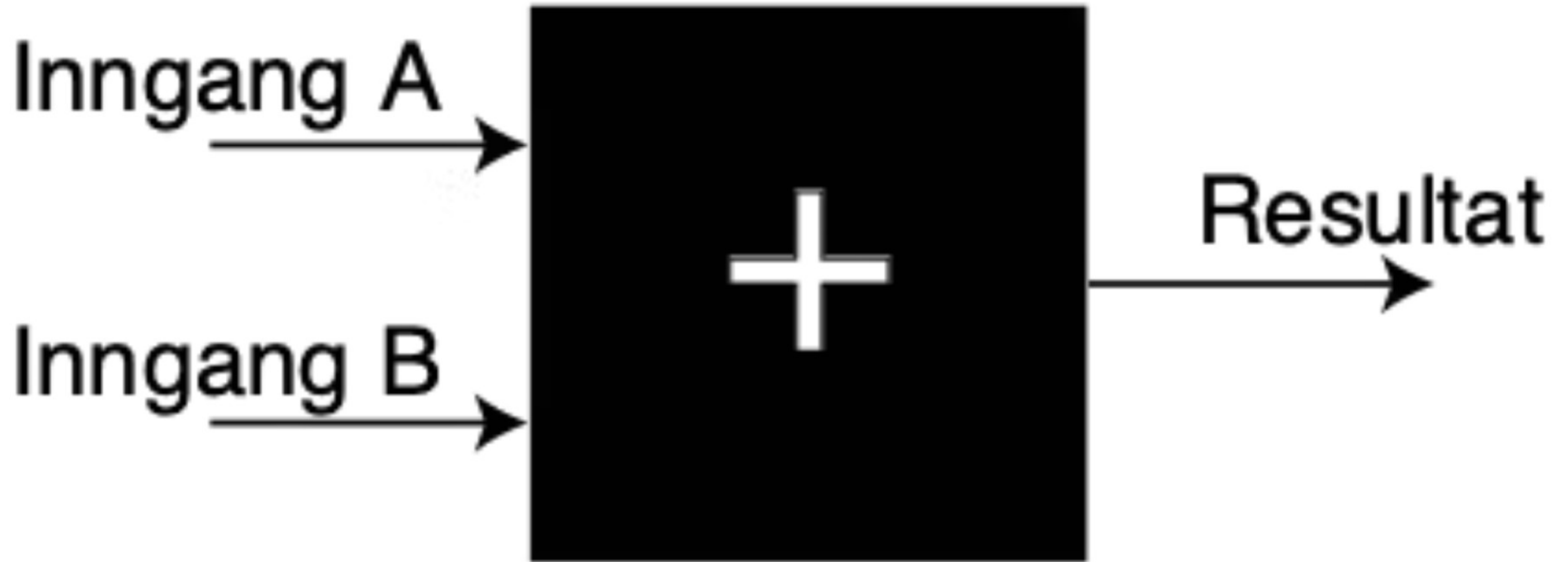


LMC - forenklet



ALU

- Aritmetriske funksjoner
- Logiske funksjoner
- Styresignal som velger operasjon
- Resultat
- Status (flagg)



Binær addisjon



Hvor ble det av mente?

$$\begin{array}{r} 0101 \\ + 0110 \\ \hline = \end{array}$$

$$\begin{array}{r} 1 \\ 05 \\ + 06 \\ \hline = 11 \end{array}$$

$$\begin{array}{r} 0101 \\ + 0110 \\ \hline = 1 \end{array}$$

$$\begin{array}{r} 1 \\ 05 \\ + 06 \\ \hline = 11 \end{array}$$

$$\begin{array}{r} 0101 \\ + 0110 \\ \hline = 11 \end{array}$$

$$\begin{array}{r} 105 \\ + 06 \\ \hline = 11 \end{array}$$

$$\begin{array}{r} 0101 \\ + 0110 \\ \hline = 011 \\ 1 \end{array}$$

$$\begin{array}{r} 1 \\ 05 \\ + 06 \\ \hline = 11 \end{array}$$

$$\begin{array}{r} 1 \\ 0101 \\ + 0110 \\ \hline = 011 \end{array}$$

$$\begin{array}{r} 1 \\ 05 \\ + 06 \\ \hline = 11 \end{array}$$

$$\begin{array}{r} 1 \\ 0101 \\ + 0110 \\ \hline = 1011 \end{array}$$

$$\begin{array}{r} 1 \\ 05 \\ + 06 \\ \hline = 11 \end{array}$$

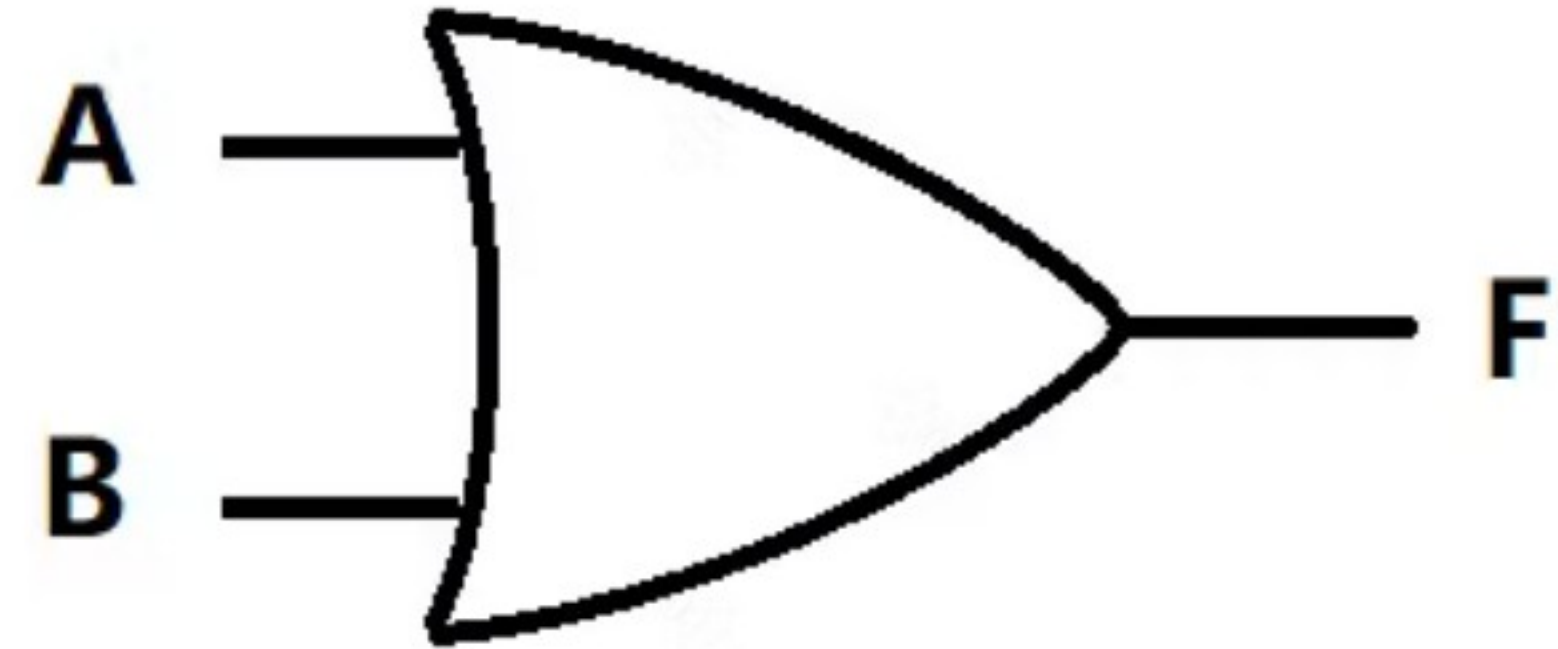




OR - port

$$F = A + B$$

A	B	F
0	0	0
0	1	1
1	0	1
1	1	1



A	B	F
0	0	
0	1	
1	0	
1	1	

Sannhetsverditabell

- Funksjonsbeskrivelse
- Innholder alle mulige kombinasjoner av innganger
- Én sannhetsverditabell kan ha mange funksjonsbeskrivelser
- Én funksjon har bare én sannhetsverditabell

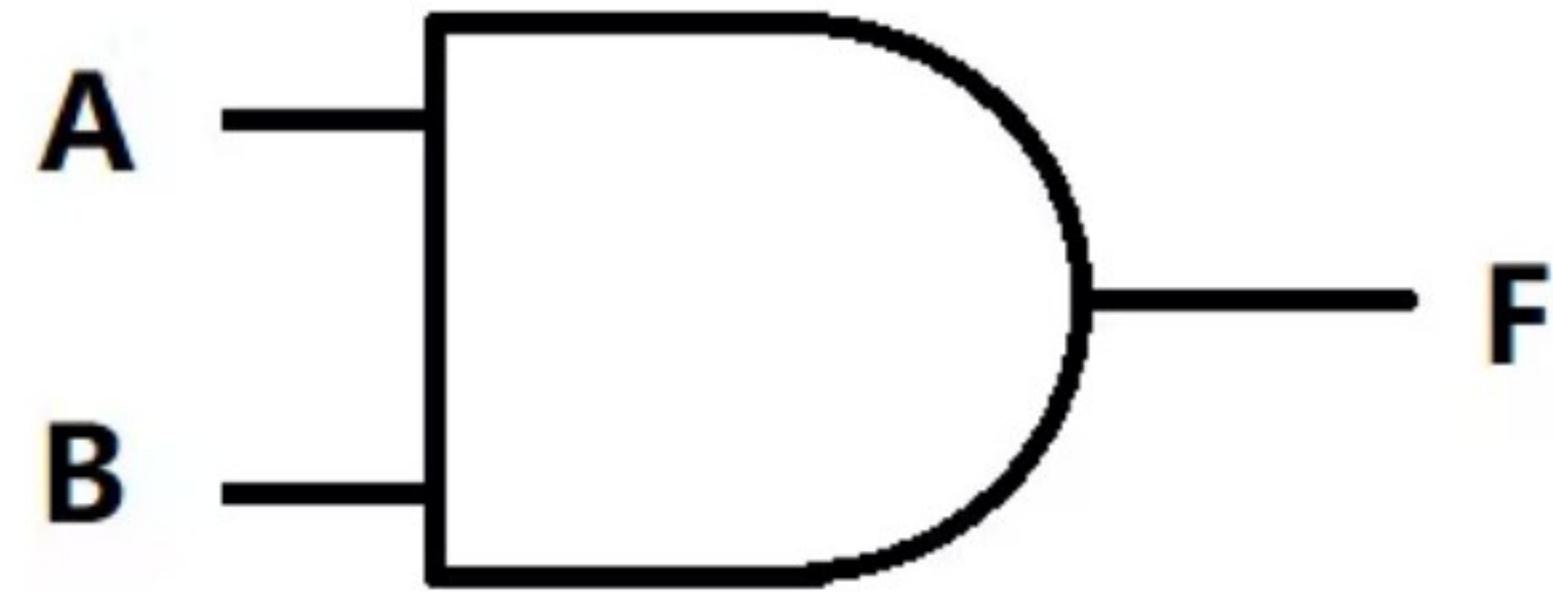




AND - port

$$F = AB$$

A	B	F
0	0	0
0	1	0
1	0	0
1	1	1



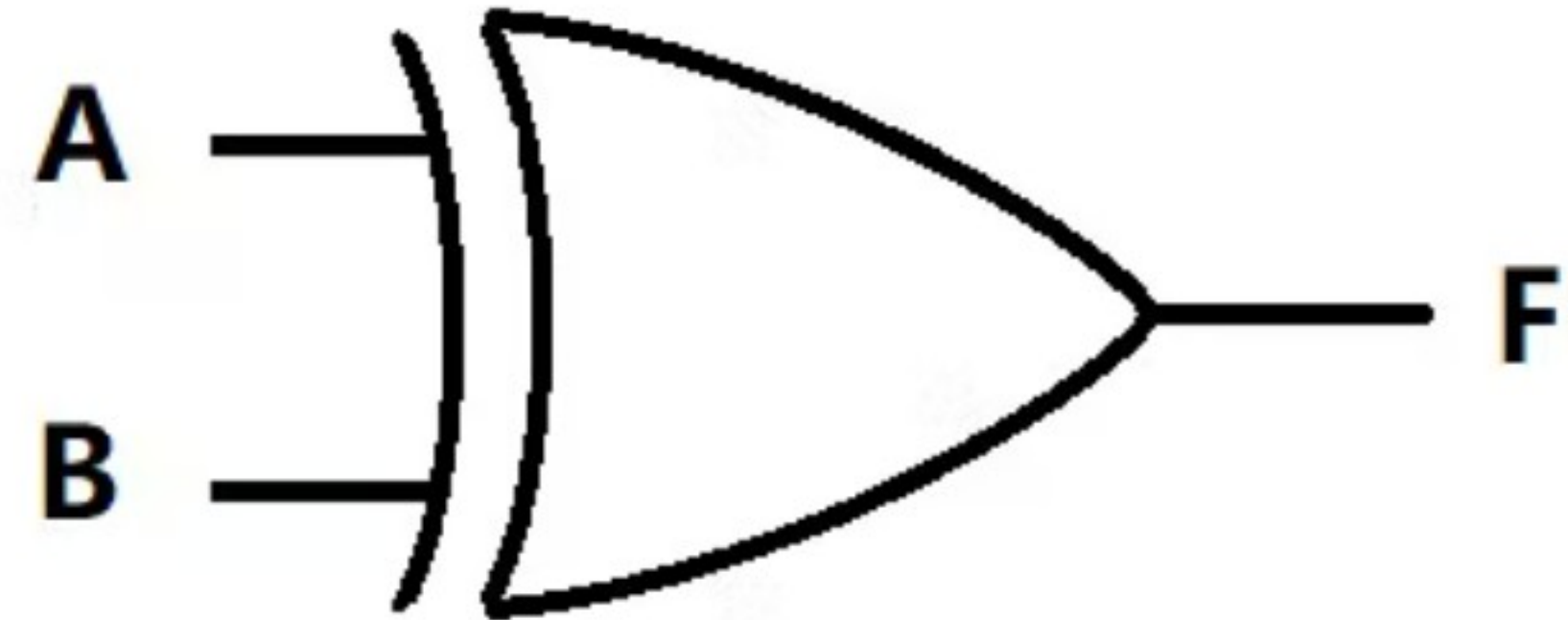




XOR - port

$$F = A \oplus B$$

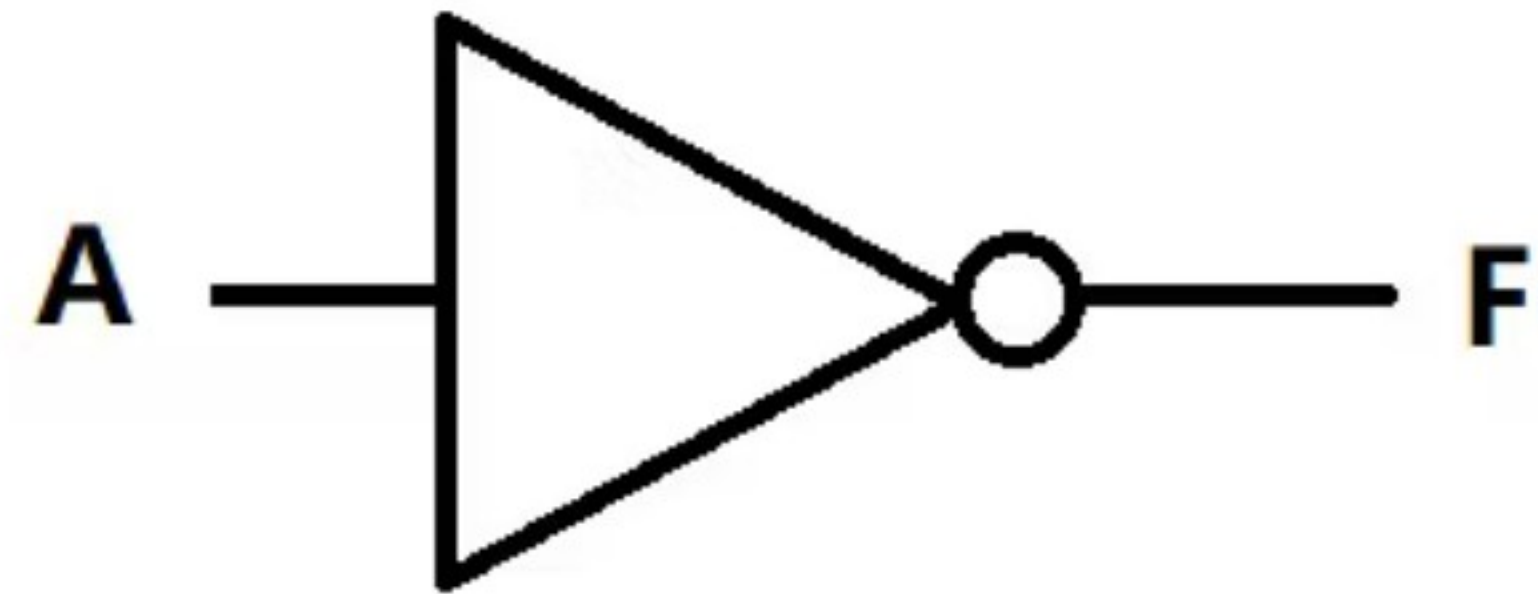
A	B	F
0	0	0
0	1	1
1	0	1
1	1	0



INV - port

$$F = A'$$

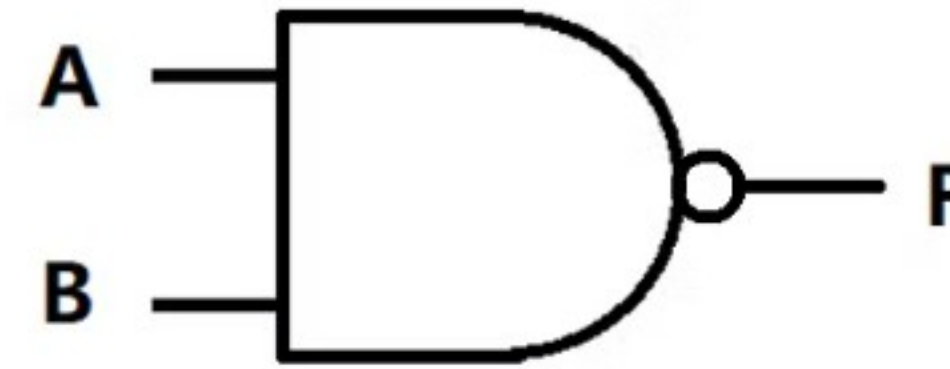
A	F
0	1
1	0



NAND - port

$$F = (AB)'$$

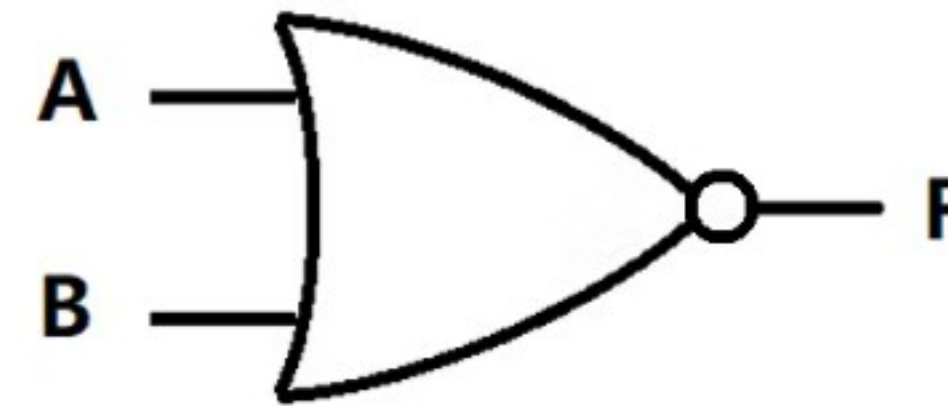
A	B	F
0	0	1
0	1	1
1	0	1
1	1	0



NOR - port

$$F = (A+B)'$$

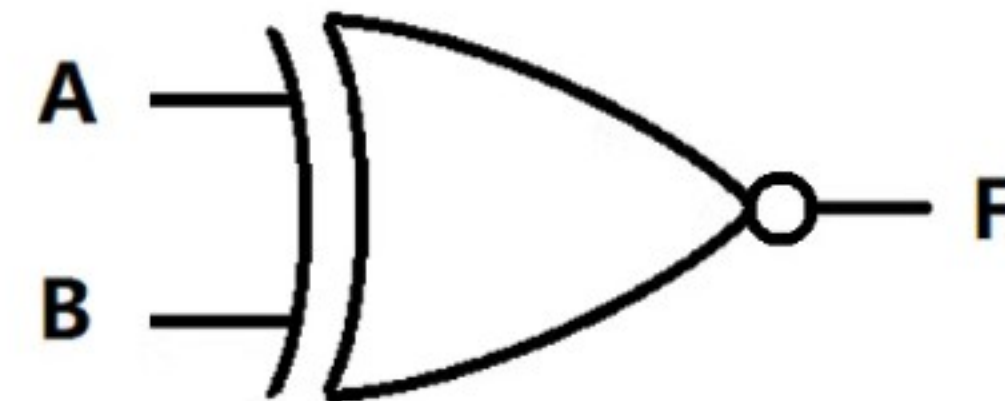
A	B	F
0	0	1
0	1	0
1	0	0
1	1	0



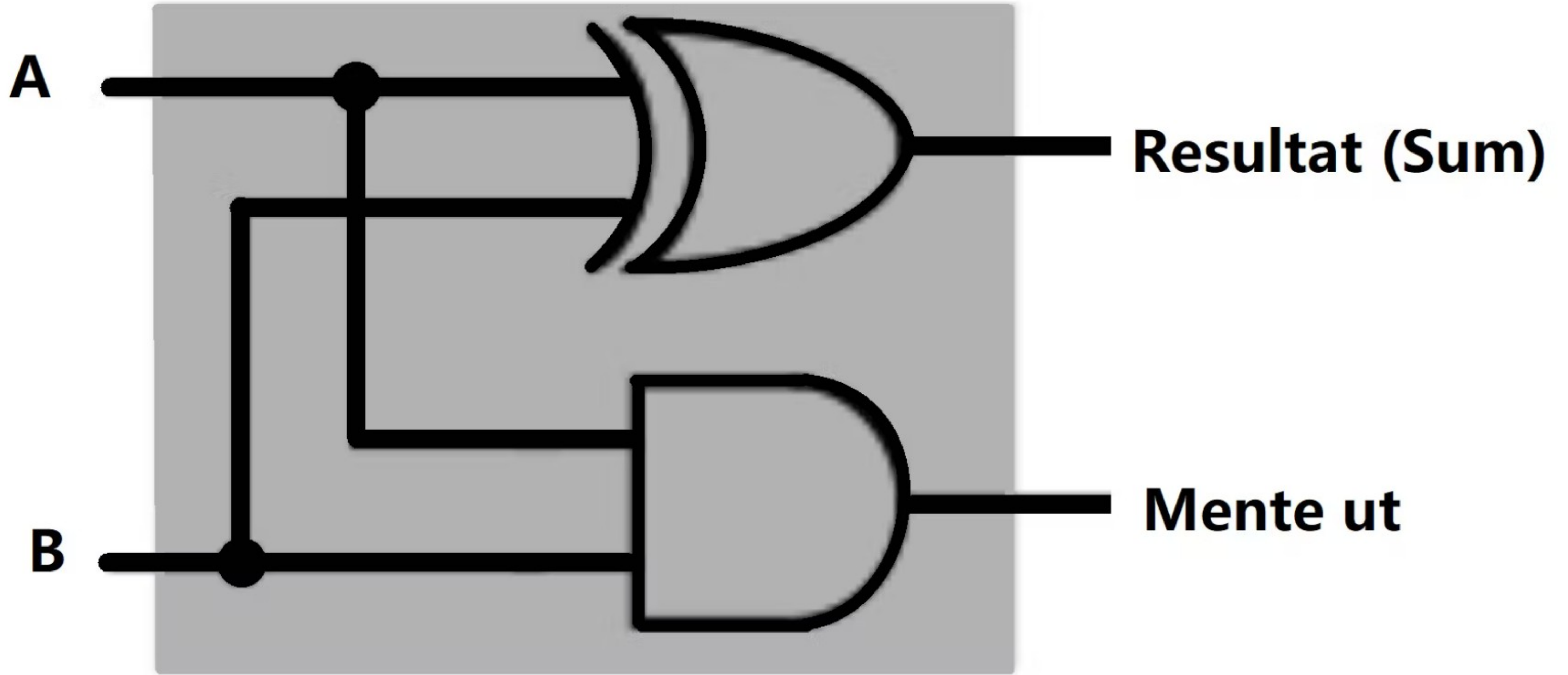
XNOR - port

$$F = (A \oplus B)'$$

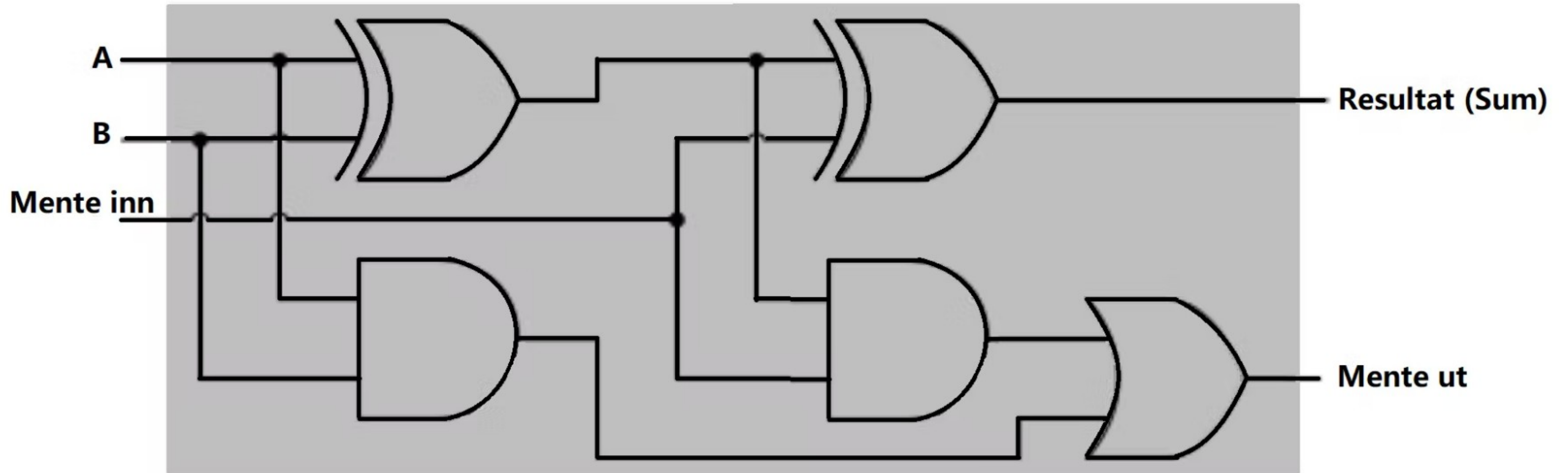
A	B	F
0	0	1
0	1	0
1	0	0
1	1	1



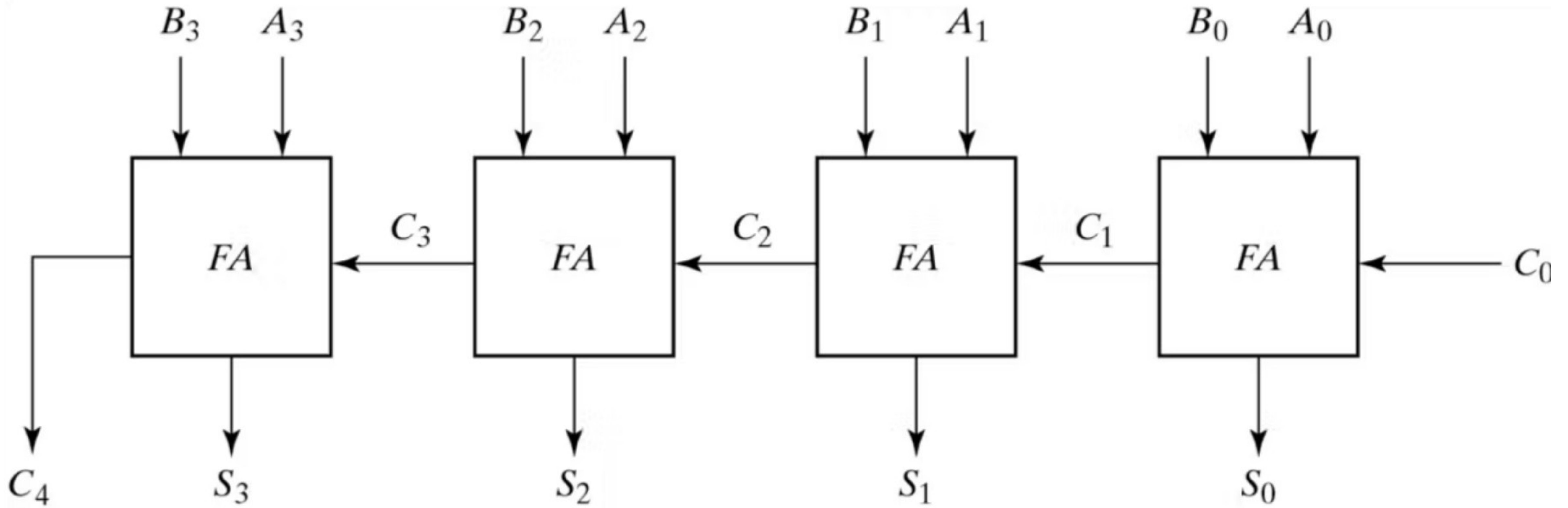




HALV-ADDER (HA)



FULL-ADDER (FA)



SERIELL ADDER?

