Bouhadjar 2023 paper - Binary Synapse model

Run = 1

T = 0ms (input A fires)
- A → B : P = 0 − 1 = −1
- A → E : P = 0 − 1 = −1
- A → D : P = 0 − 1 = −1

T = 40ms (input B fires)
- A → B : ΔT = 40ms ; 4ms < 40ms < 50ms ; P = 0 + 5 = 5
- A → E : P = −1
- A → D : P = −1
- B → C : P = 0 − 1 = −1

T = 80ms (input C fires)
- A → B : P = +5
- A → E : P = −1
- A → D : P = −1
- B → C : ΔT = 40ms ; 4ms < 40ms < 50ms ; P = 0 + 5 = 5
- C → f : P = 0 − 1 = −1

Run = 2

T = 180ms (input A fires)
- A → B : P = +5 − 1 = +4
- A → E : P = −1
- A → D : P = −1

[after ΔT_{ref} = 100ms]

T = 220ms (input B fires)
- A → B : ΔT = 40ms ; 4ms < 40ms < 50ms ; P = +4 + 5 = +9
- A → E : P = −1
- A → D : P = −1
- B → C : P = +5 − 1 = +4

T = 260ms (input C fires)
- A → B : P = +9
- A → E : P = −1
- A → D : P = −1
- B → C : ΔT = 40ms ; 4ms < 40ms < 50ms ; P = +4 + 5 = +9
- C → f : P = −1

Run 3

T = 360ms (input A fires)
- A → B : P = +9 − 1 = +8
- A → E : P = −1
- A → D : P = −1

T = 400ms (input B fires)
- A → B : ΔT = 40ms, 4ms < 40ms < 50ms ; P = +8 + 5 = +13 > $P_{threshold}$.
- A → E : P = −1
- A → D : P = −1
- B → C : P = +9 − 1 = +8

↓

Synapse flips to "STRONG" connection.

↑

P = +8 + 5 = +13 > $P_{threshold}$

T = 440ms (input C fires)
- A → B : P = +13
- A → E : P = −1
- A → D : P = −1
- B → C : ΔT = 40ms, 4ms < 40ms < 50ms ; P = +8 + 5 = +13 > $P_{threshold}$
- C → f : P = −1