INTRODUCTION

The “Binding” Problem

Solution: Temporal Aspects

Spiking neural networks:
- Bio-inspired neurons: Spike out when their internal potential crosses a predefined threshold

SIMULATION

Discrete-time simulation
- Classical methods (Euler, Runge-Kutta, etc.): discretizing time
- Execution time: sub-optimal when the network activity is heterogeneous

Discrete-event simulation
- Computes when events occur
- Update of neurons' dynamics when an event (spike) occurs.
  “Discrete Event System Specification” (DEVS)
  - Universal formalism and tool for discrete-event simulation (by Zeigler).
  - Implementation of the simulator in Java and C++

OSCIALLATORY DYNAMIC LINK MATCHER

Building blocks: Integrate-and-fire or Wang-Terman spiking neurons.

Rate Coding Average (ODLM) → DLM

Steps:
1- Segmentation through temporal correlation
2- Matching through temporal correlation

WHY IT WORKS

The synaptic strength is normalized by the surface ratio, which remains constant in an affine transformation

FACIAL RECOGNITION

A picture from the database

ODLM Network
(Oscillatory Dynamic Link Matching)

Different pictures from the same person

RECOGNITION EXAMPLES

Phase synchronization among similar objects

DIMENSIONALITY REDUCTION

Image Database
Non-Negative Sparse Matrix Factorization
Fiducial Point Extraction
ODLM

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Reference