Gesellschaft zur Förderung angewandter Informatik e.V. (GFaI)

An- Institut an der Technischen Fachhochschule Berlin und der Fachhochschule für Technik und Wirtschaft Berlin
Mitglied der Arbeitsgemeinschaft industrieller Forschungsvereinigungen 'Otto von Guericke' e.V. (AiF)

Dr. Gerd Karl Heinz

Hirnprozesse

Ein physikalisch orientierter Ansatz eröffnet neue Aspekte zu deren Verständnis

Keinem Sterblichen ist es vergönnt, das Leben in der Zerstreuung physikalischer oder chemischer Substanz, in diffuser, wenn man will, geistiger Form zu erkennen, und wenn dies geschehen sollte, so würde dies gewiß der härteste Schlag sein, der die heutige, naturwissenschaftliche Anschauung treffen könnte.

Rudolf Virchow

Vortrag zum **70. Berliner Interdisziplinären Kolloquium** (BIK)
Gastgeber: Frau Dr. Schulze, Berlin-Zehlendorf,
24. August 1996

Theoretische Grundlagen

1. **Zeitfunktionen, Raumzuordnung, Maske**

2. **Eigeninterferenz (Abbildungen: Raum ↔ Raum)**

3. **Fremdinterferenz (Spektren: Code ↔ Raum)**

4. **Biologienahe Modellierungen**

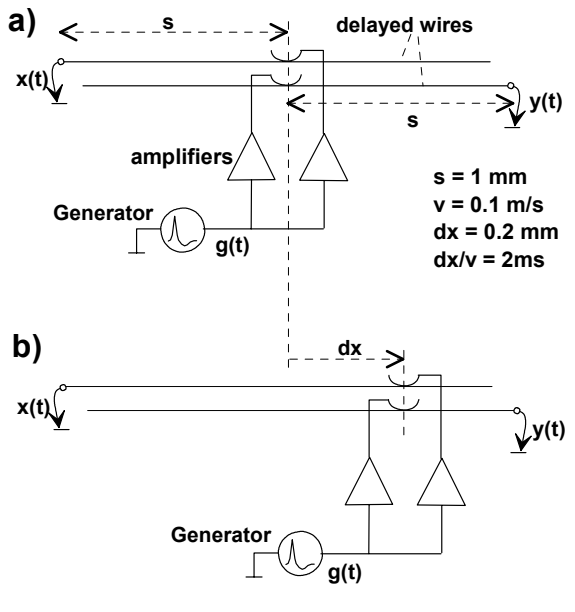
Praktische Ergebnisse

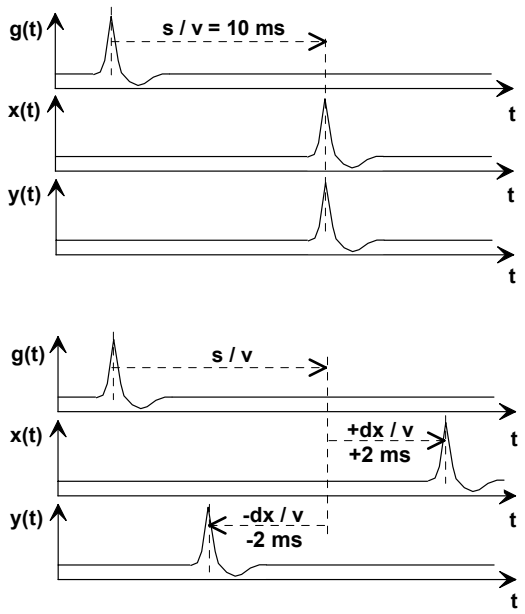
1. **Simulationen**
   (4-Kanal-'S', 30-Kanal-'G', 4-Kanal-'GFaI'

2. **EEG-/ECoG-Analysen**
   (75cm/s ECoG-Wellenfeld-Movie,
   Interferenzintegrale, Klassenanalyse)

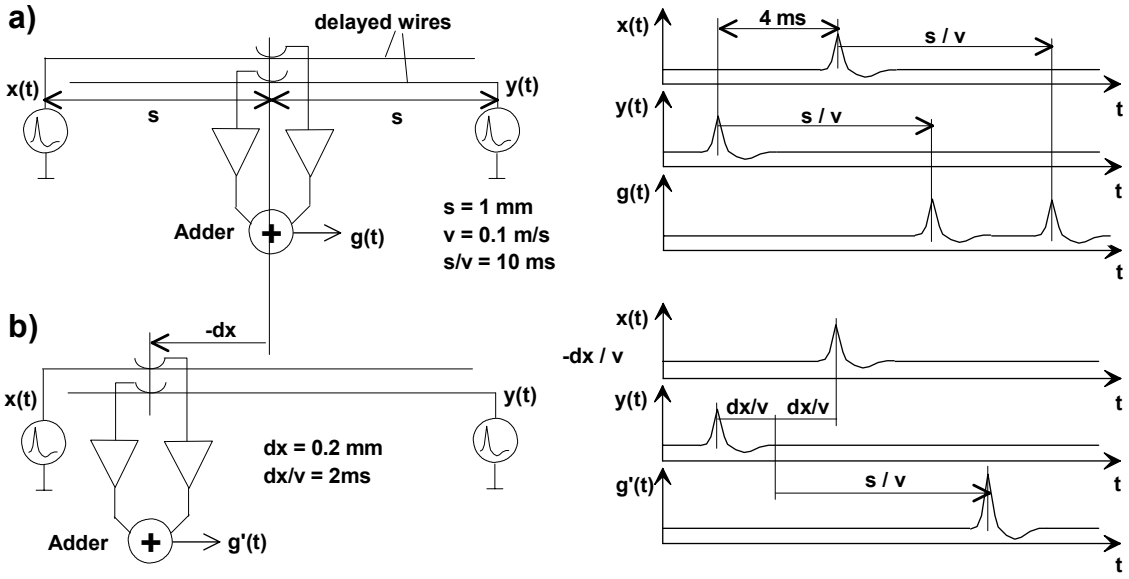
3. **Akustische Bilder**
   16-Kanal-Innenraum & Feldversuche)

Slide Location contra Timing

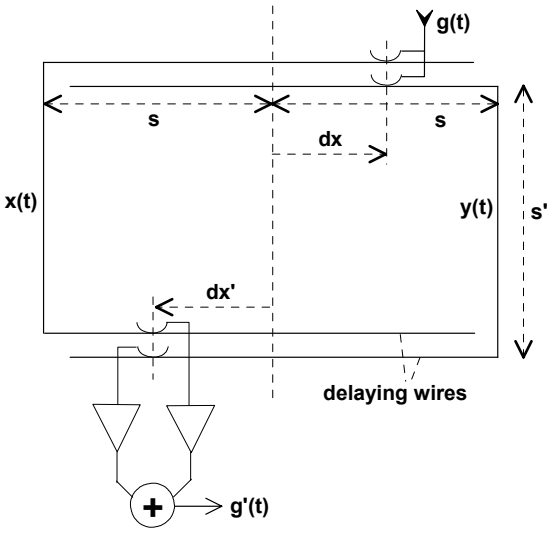


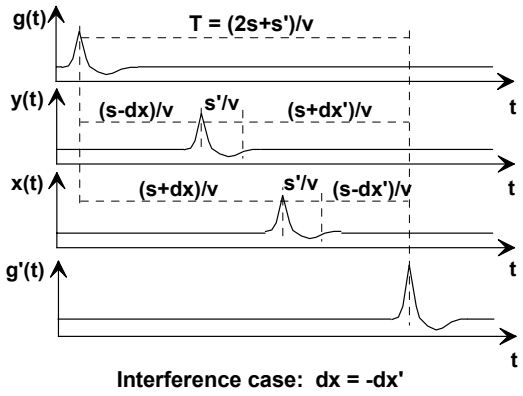


Timing Influences the Location of Excited Neurons



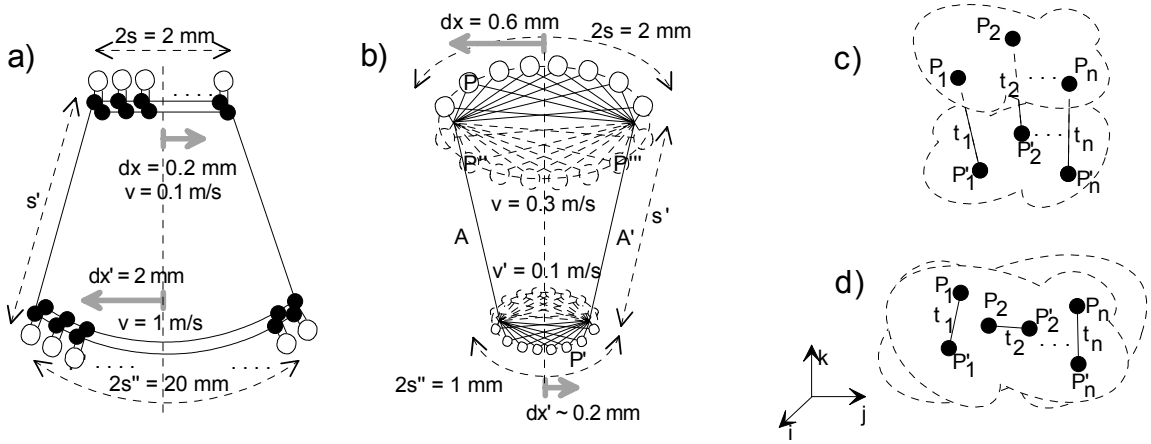
Basic Interference Circuit, 1-dimensional

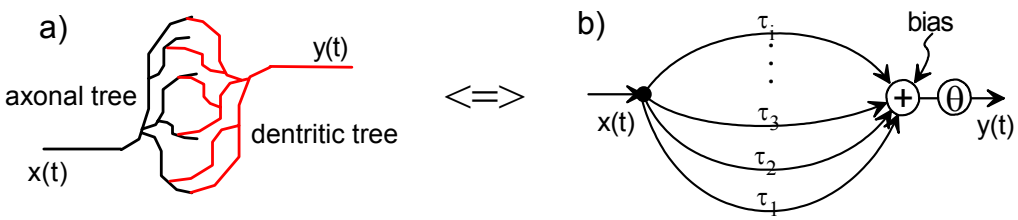




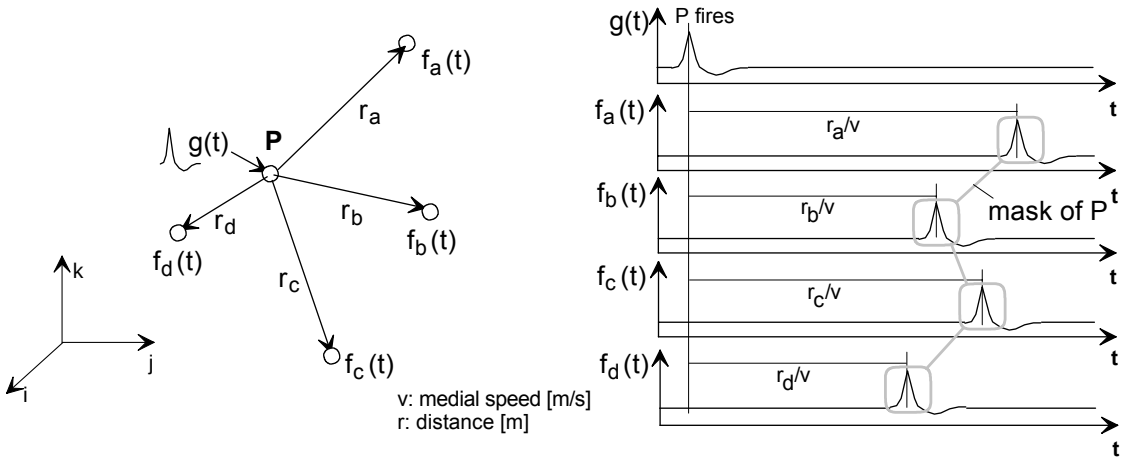
$$\sum_{i=1}^{n} \tau_i = \sum_{j=1}^{n} \tau_i = \ldots = \sum_{k=1}^{n} \tau_k = const.$$

Variantions

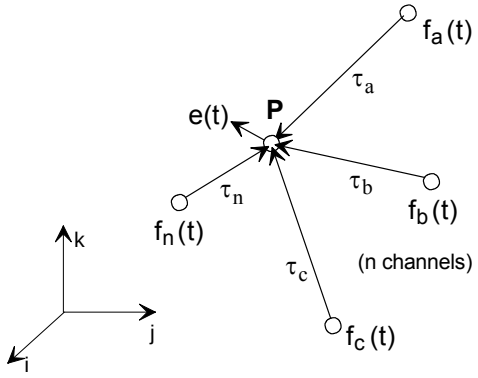


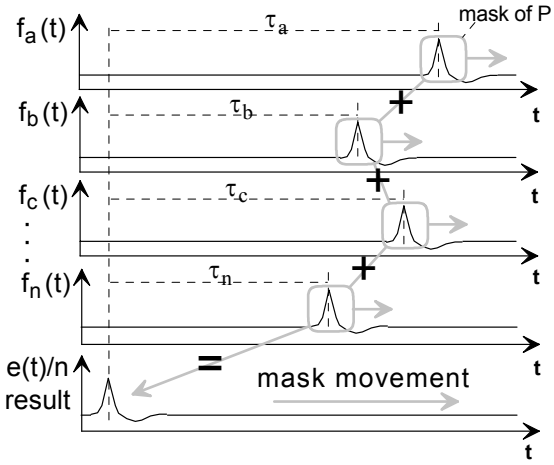


Delay Mask of a Location

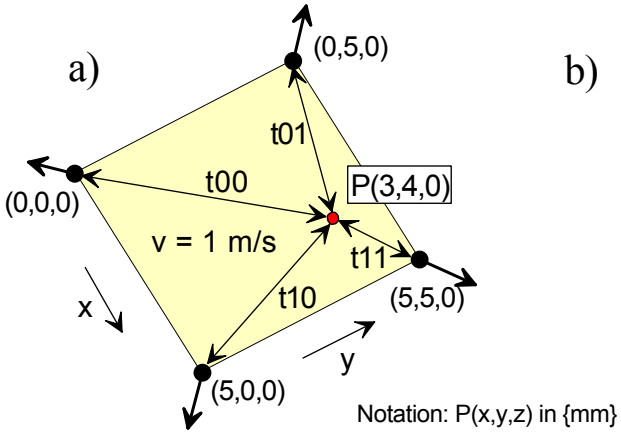


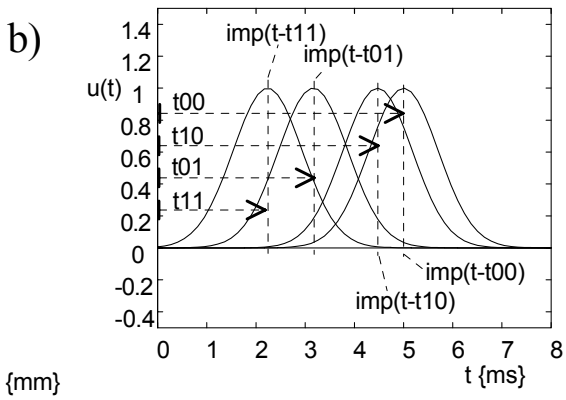
Reconstruction of Channel Data





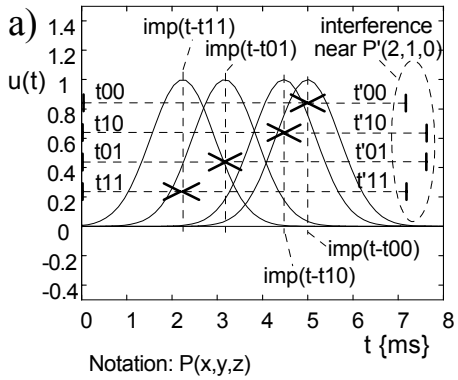
Over Conditioning

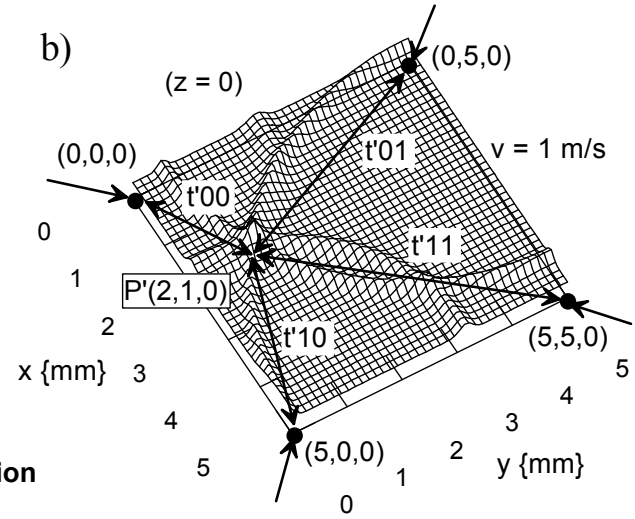




$$\sum_{i=1}^{n} \tau_i = const$$

$$t_{ij} = r_{ij}/v = \tfrac{1}{v}\sqrt{(x_i - x_j)^2 + (y_i - y_j)^2 + (z_i - z_j)^2}$$

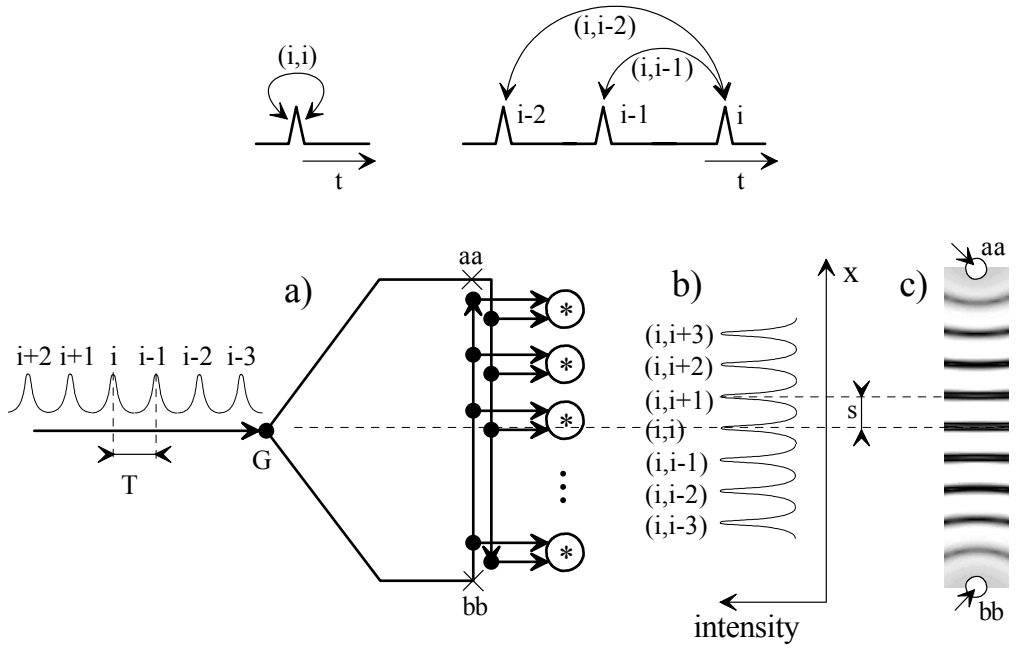


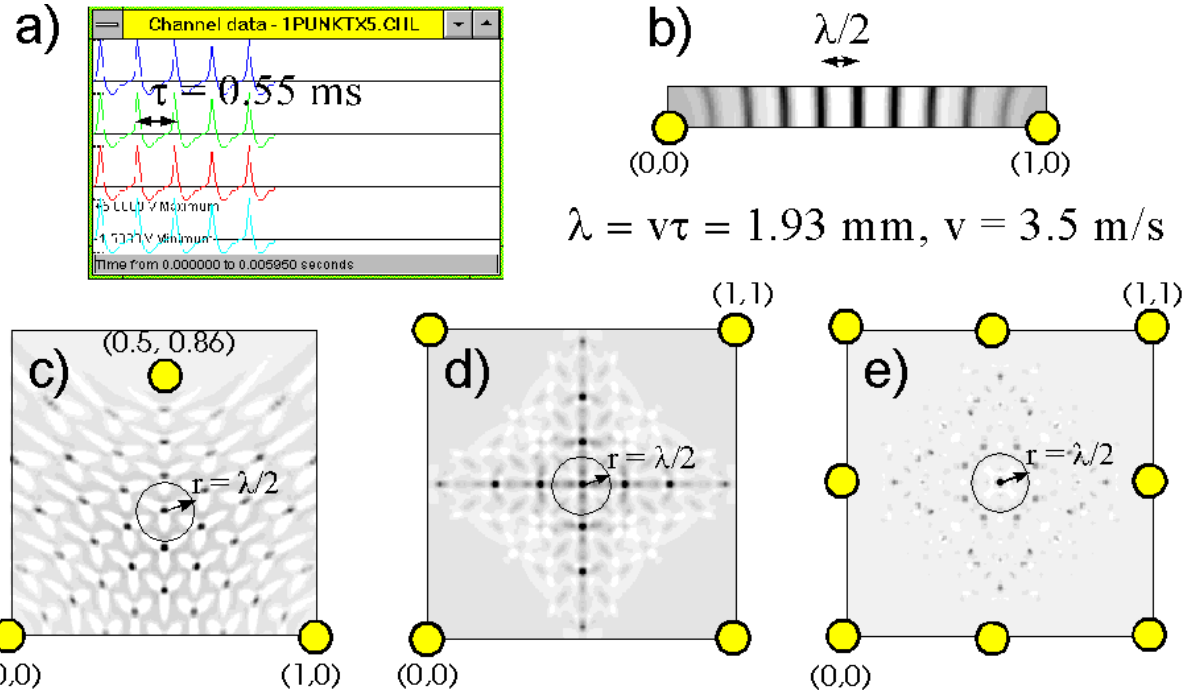


a) Timing Diagramm
b) Wavefield with interference location

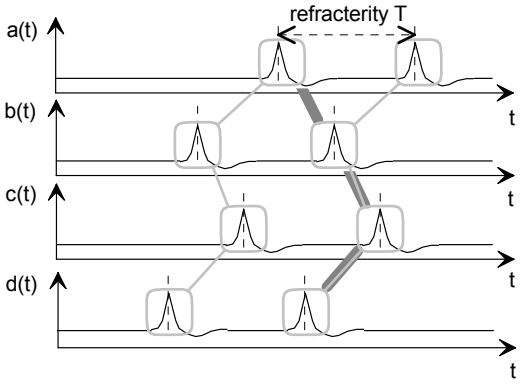
-> four channels do not match on a 2-dim. field (max. 3)
-> channel_number = space_dimension +1 , n = d +1
-> high space dimension for high channel numbers
-> folded, inhomogeneous spaces necessary (!)

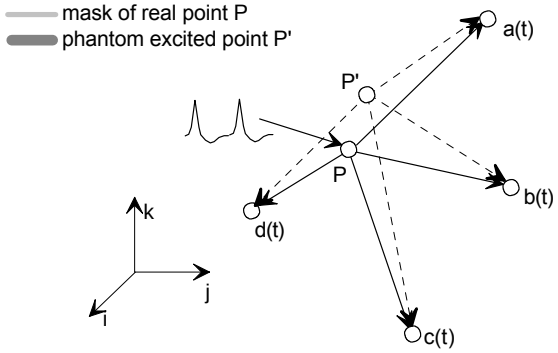
Cross Interference and Spectral Coding

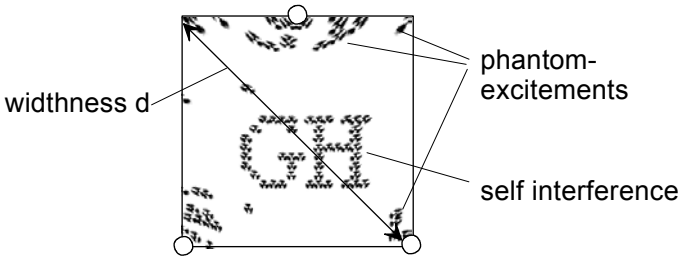




Phantom Excitement

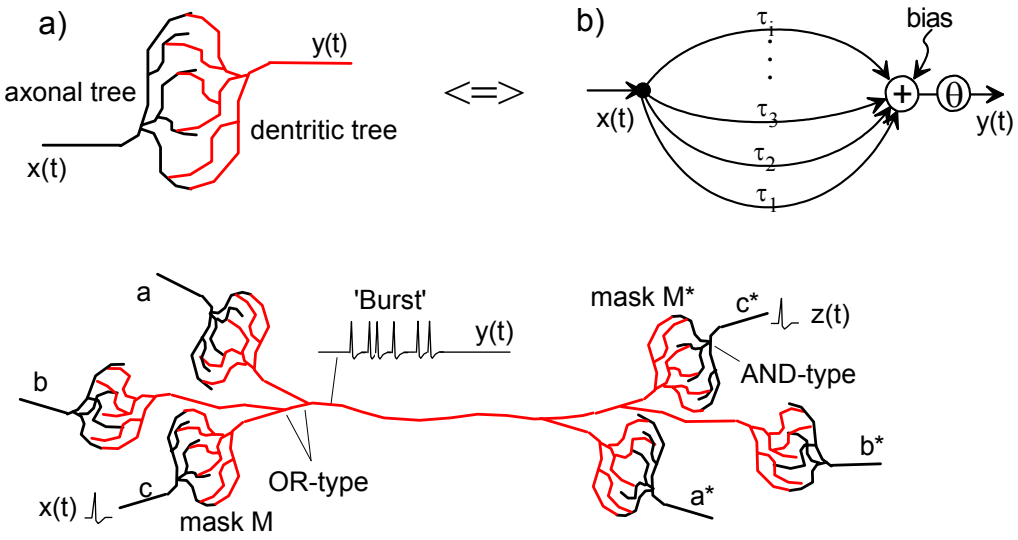






$$T = \frac{1}{f} = \begin{cases} > d/v: & \text{self interference} \quad (1) \\ \leq d/v: & \text{self interference and spectra} \quad (2) \end{cases}$$

Addressing via Single Channels, Coding, Addressing via Bursts

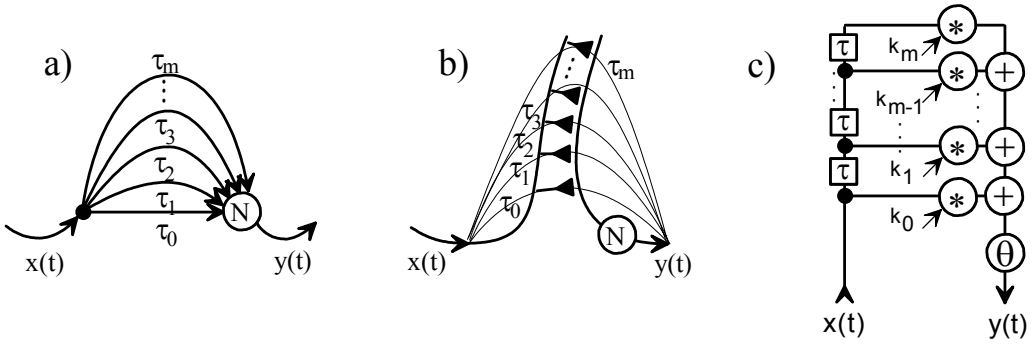


$$\bigvee_{j=1}^{n} \tau_j + \tau_j^* = const. = \tau$$

$$M + M^* = T$$

$$M = \begin{pmatrix} \tau_1 \\ \tau_2 \\ \vdots \\ \tau_i \end{pmatrix}; \quad T = \tau \begin{pmatrix} 1 \\ 1 \\ \vdots \\ 1 \end{pmatrix}; \quad M^* = \begin{pmatrix} \tau - \tau_1 \\ \tau - \tau_2 \\ \vdots \\ \tau - \tau_i \end{pmatrix}$$

Bias Generation



$$\tau_{i+1} = \tau_i + \Delta\tau, \quad 0 \le i < m$$

$$y(t) = \sum_{i=1}^{m} k_i x(t - i\Delta\tau) = const$$

$$\sum_{i=1}^{m} k_i \le c$$