

FIGURE 1 is a high level block diagram illustrating an embodiment of the present "processor".

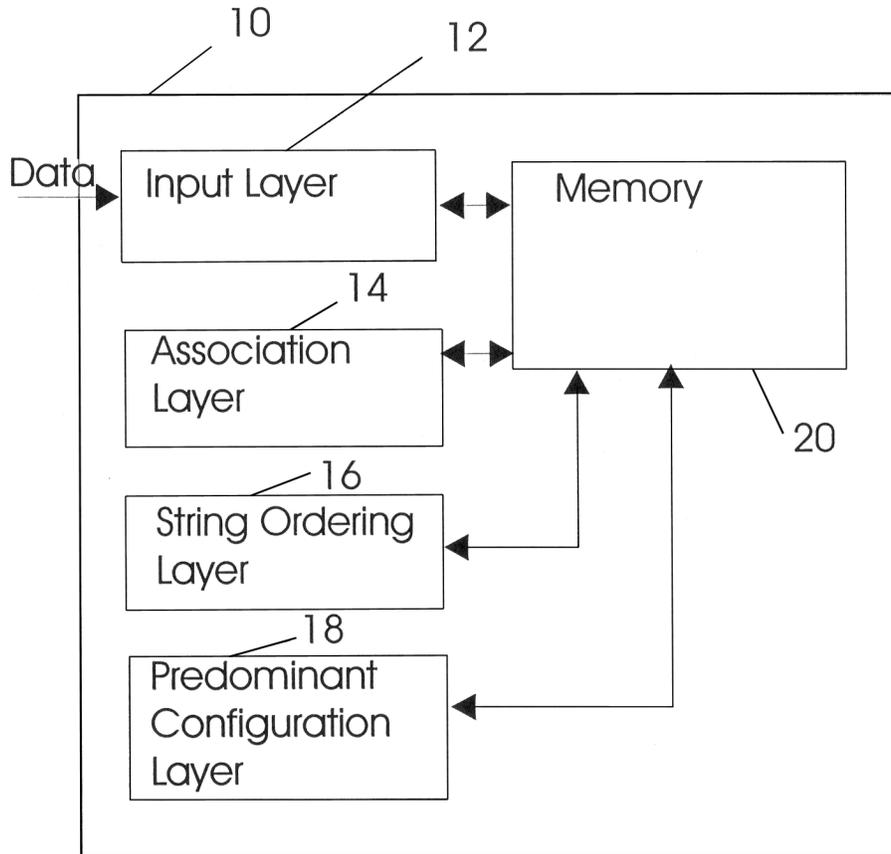


FIGURE 2 is a detailed block diagram illustrating an Input Layer, an Association Layer, and a memory layer of the embodiment of FIGURE 1.

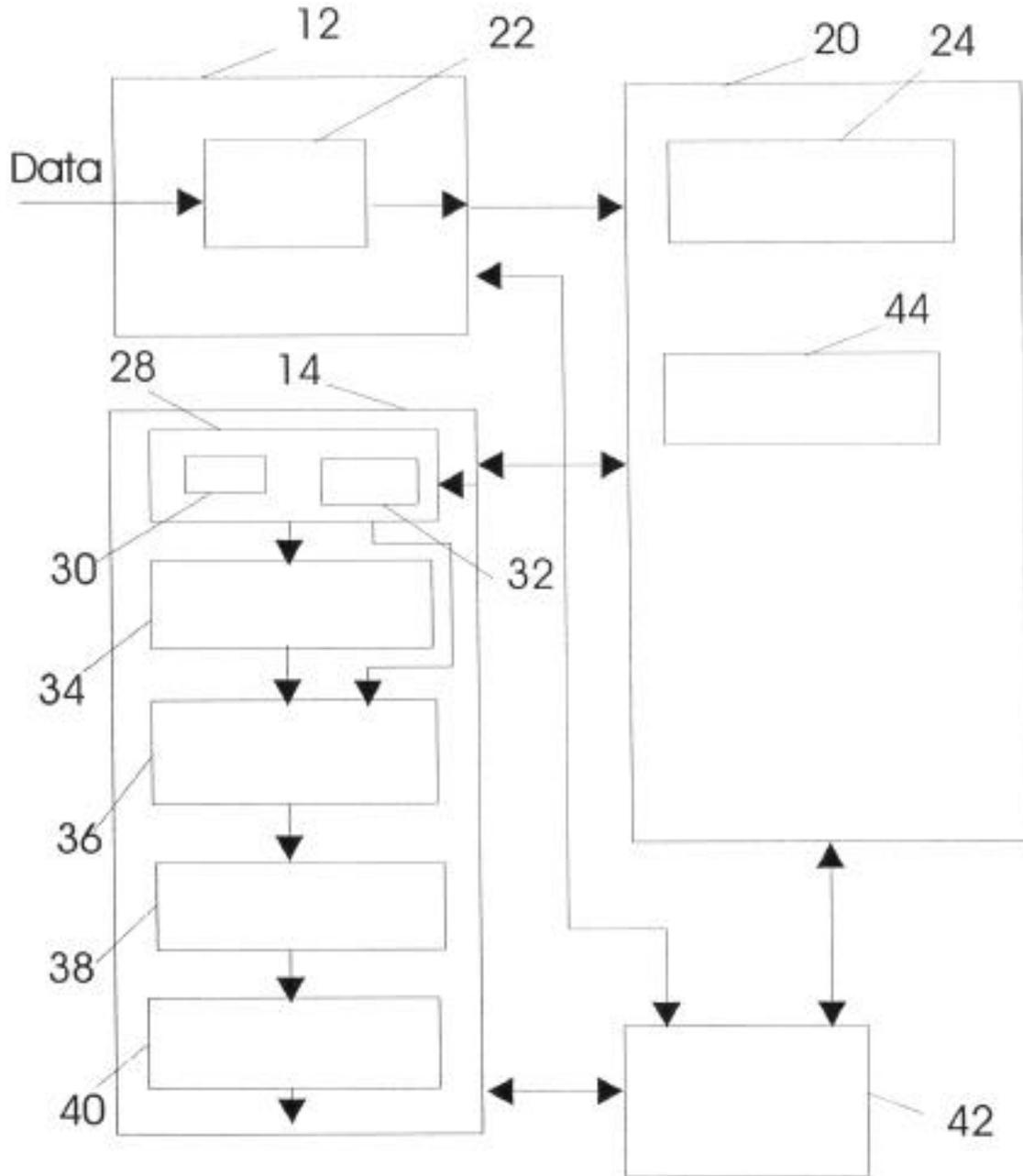


FIGURE 3 is a flow diagram of an exemplary transducer data structure of a time delay interval subdivision hierarchy wherein the data from a transducer having n levels of subcomponents numbering integer m per level is assigned a master time interval with $n + 1$ sub time intervals in a hierarchical manner wherein the data stream from the final n th level transducer element is recorded as a function of time in the $n + 1$ th time coded sub memory buffer.

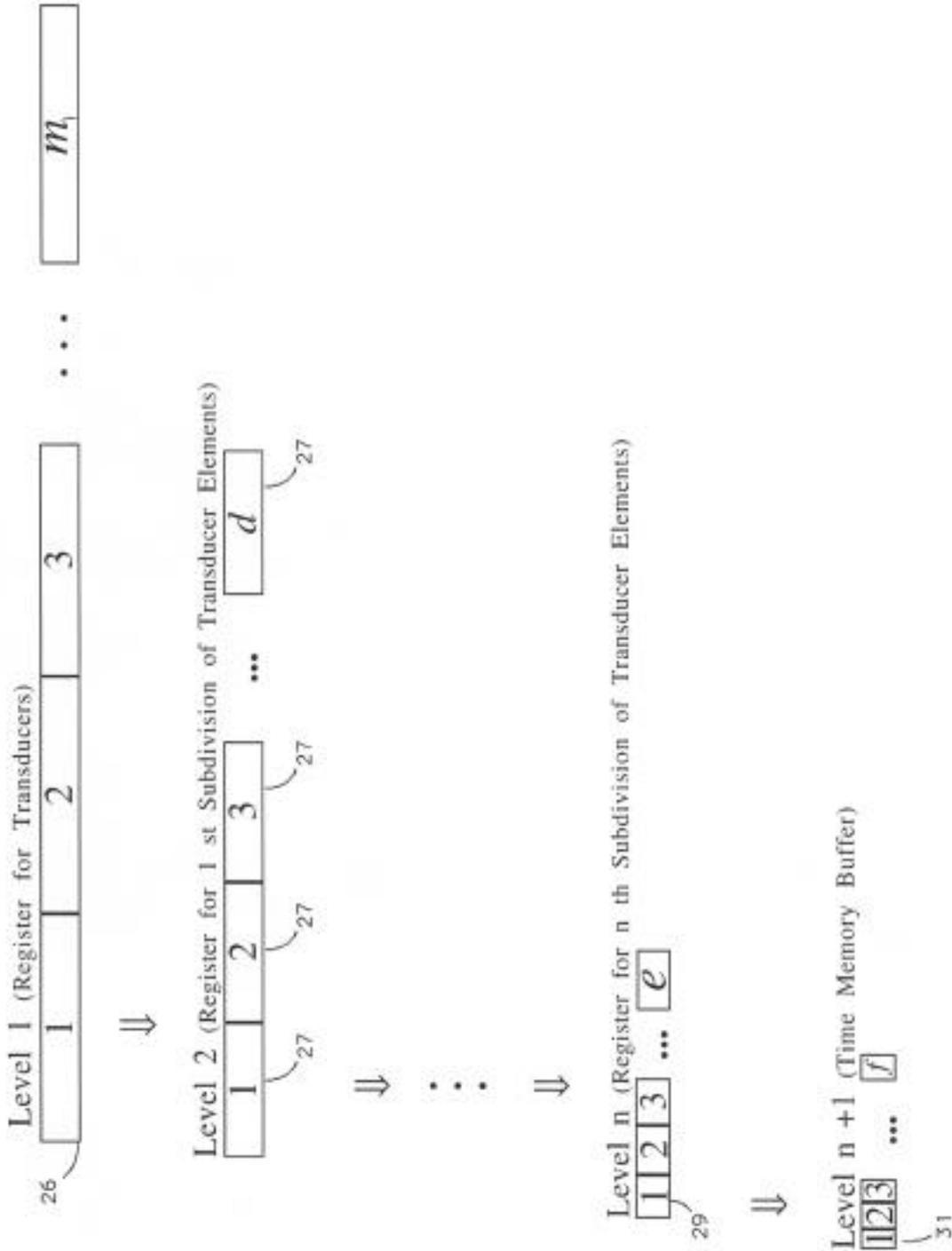


FIGURE 4 is a detailed block diagram illustrating an String Ordering Layer and the memory layer of the embodiment of FIGURE 1.

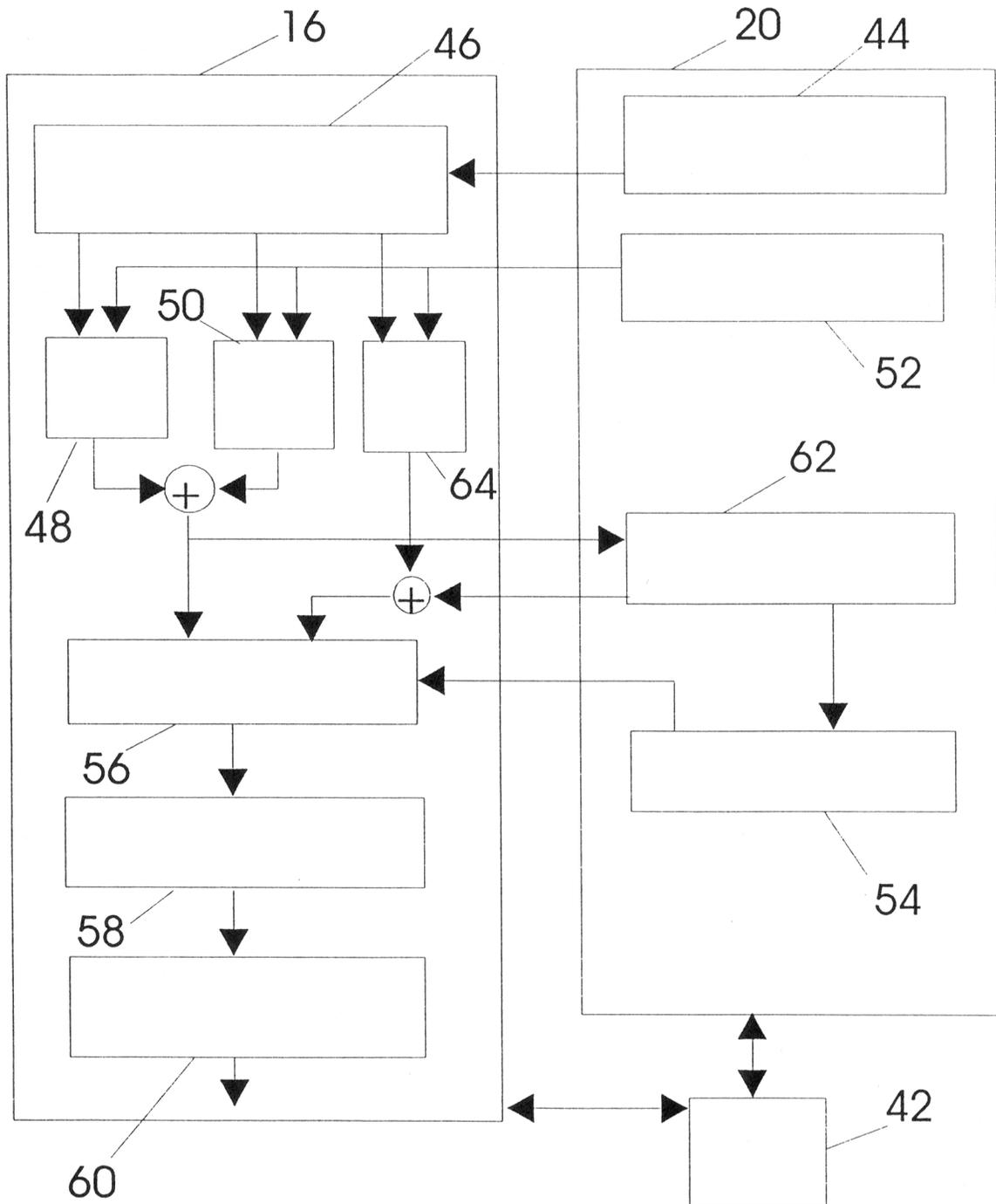


FIGURE 5 is a detailed block diagram illustrating a Predominant Configuration Layer and the memory of the embodiment of FIGURE 1 in relation to the Input Layer, the Association Layer, and the String Ordering Layer.

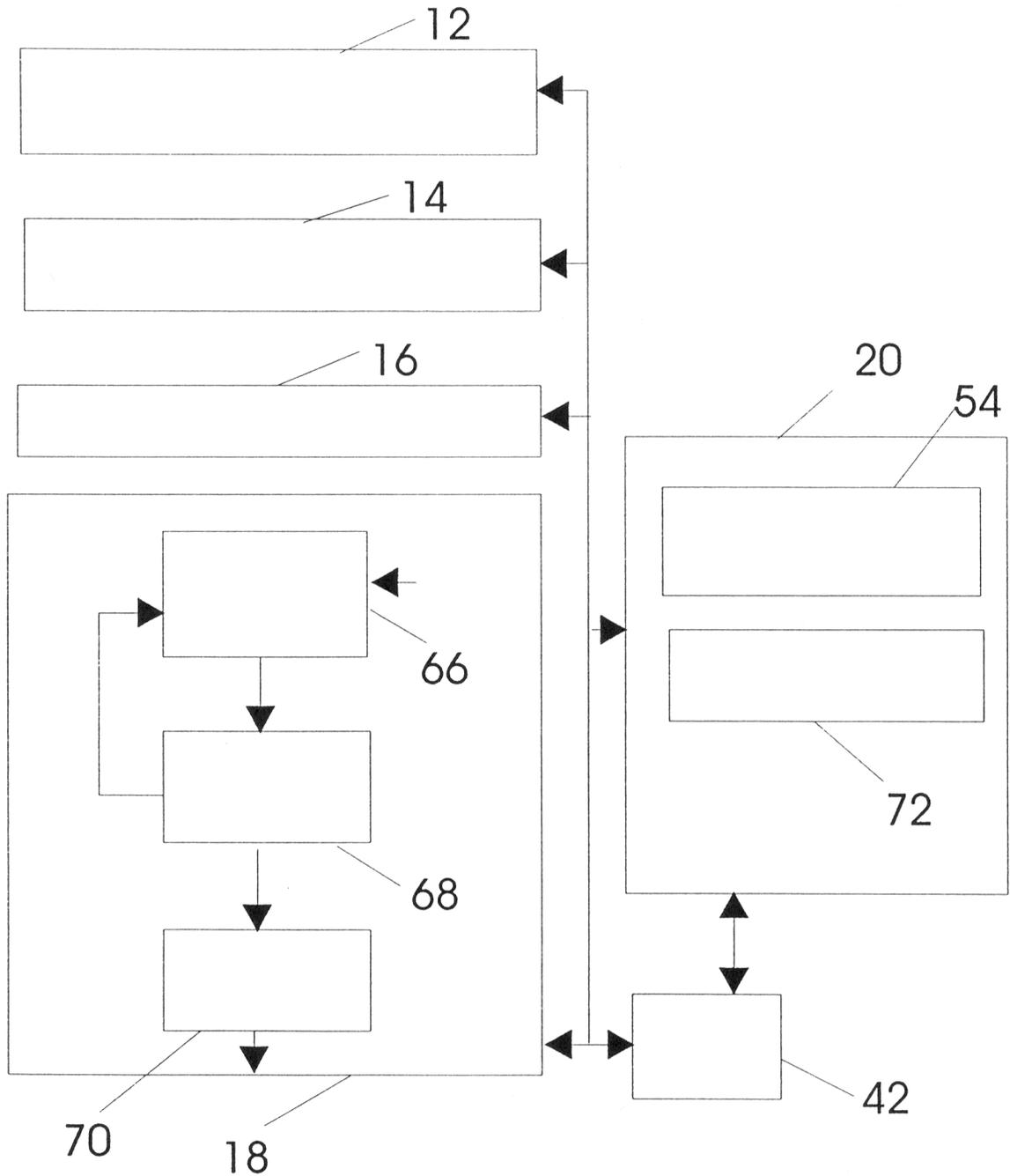


FIGURE 6 is a schematic drawing of the "P or M element response" comprised of a series of seven "impulse responses".

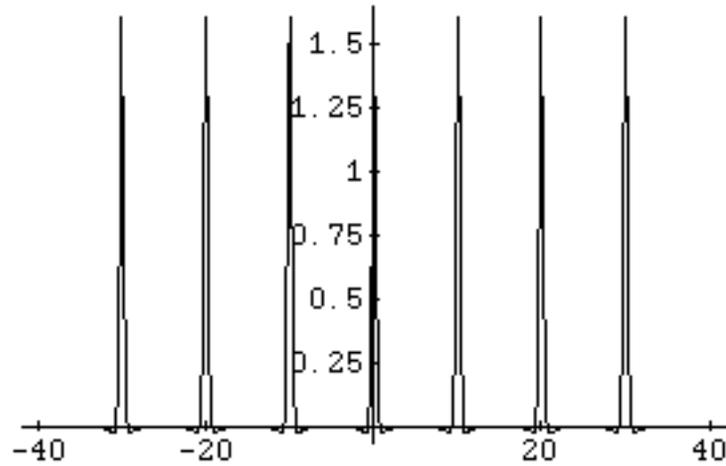
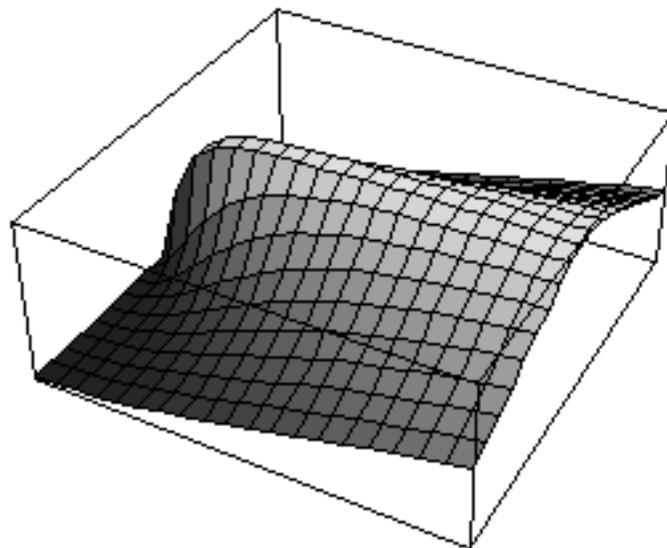


FIGURE 7 is a schematic drawing of the Fourier Transform $H[k_\rho, k_z]$ of the system function $h(\rho, z)$ corresponding to the "impulse response".



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FIGURE 8 is a schematic of $h(t)$ given by Eq. (39.51) where $\alpha = 1$ and $N = 100$.

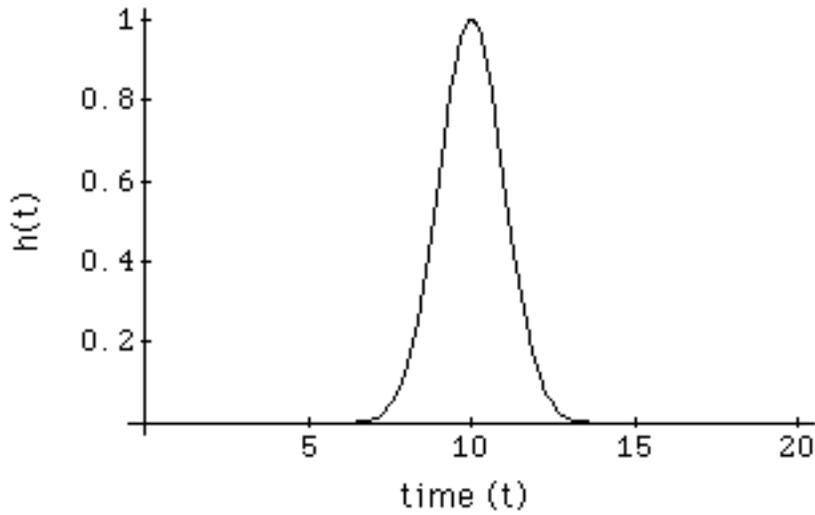


FIGURE 9 is a schematic of $H(f)$ given by Eq. (39.50) where $\alpha = 1$ and $N = 100$.

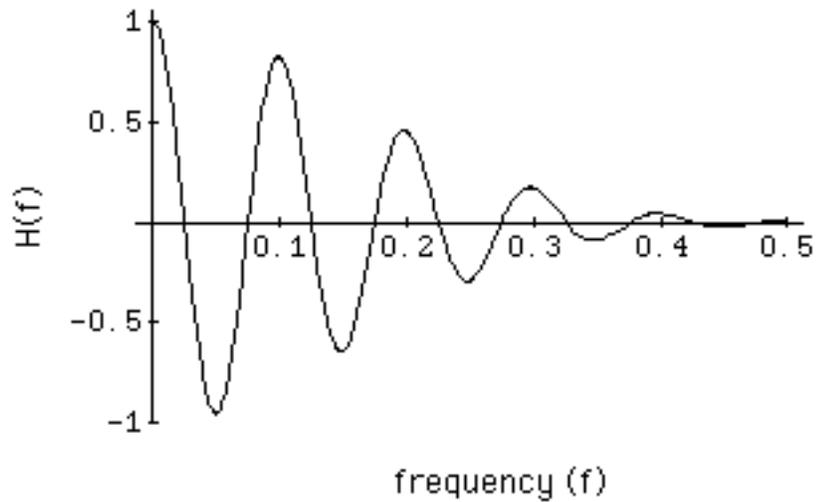


FIGURE 10 is a schematic of $h(t)$ given by Eq. (39.51) where $\alpha = 10$ and $N = 100$.

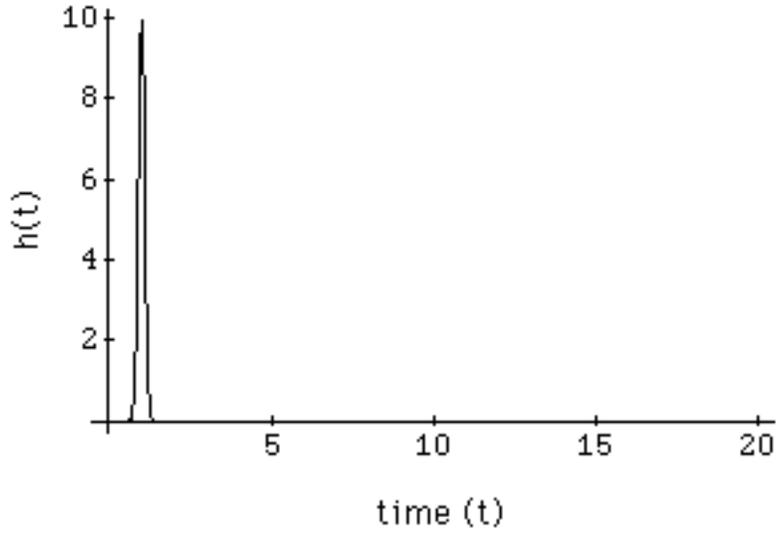
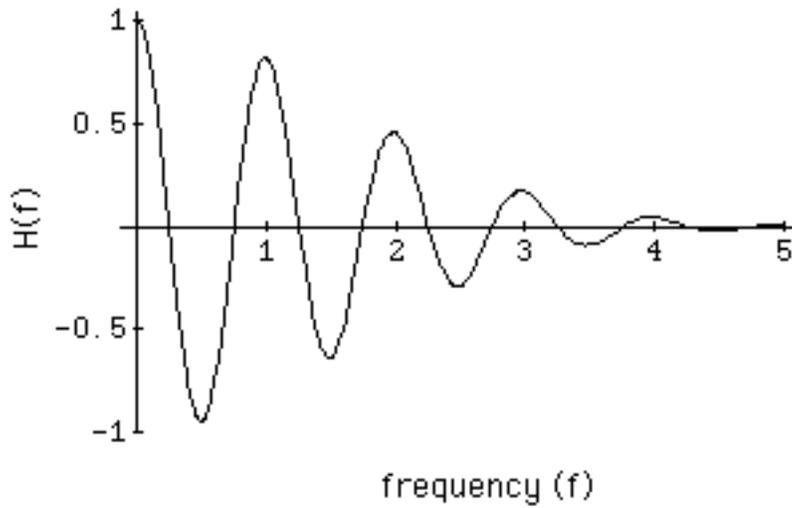


FIGURE 11 is a schematic of $H(f)$ given by Eq. (39.50) where $\alpha = 10$ and $N = 100$.



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FIGURE 12 is a schematic of $h(t)$ given by Eq. (39.51) where $\alpha = 1$ and $N = 500$.

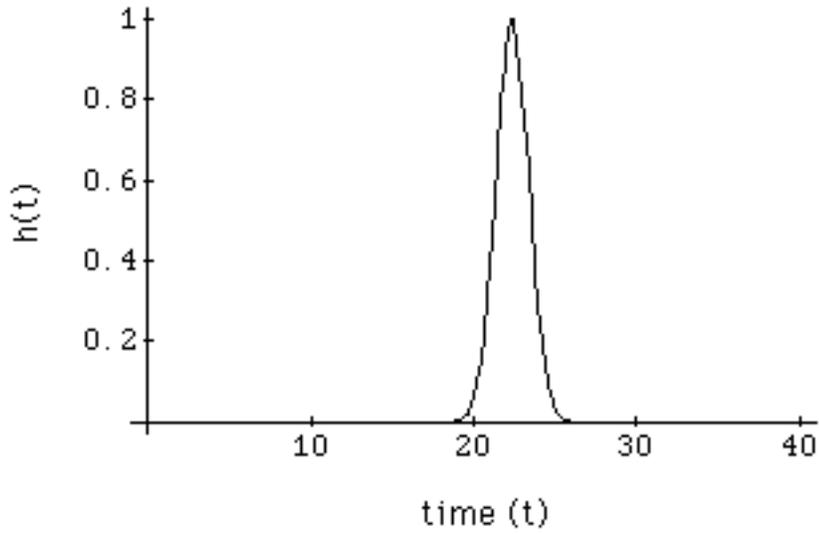


FIGURE 13 is a schematic of $H(f)$ given by Eq. (39.50) where $\alpha = 1$ and $N = 500$.

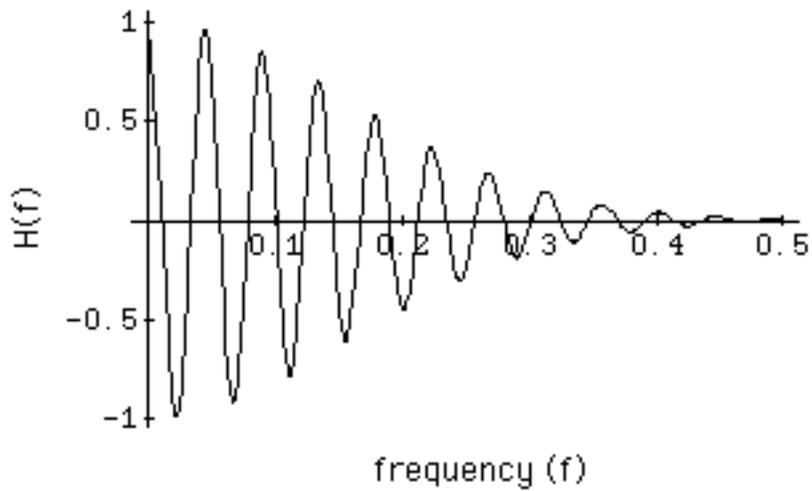


FIGURE 14 is a schematic of $h(t)$ given by Eq. (39.51) where $\alpha = 10$ and $N = 500$.

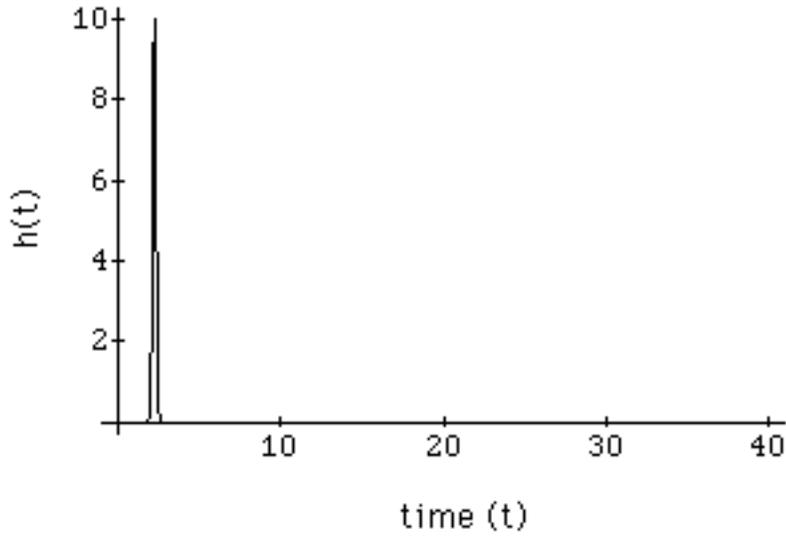
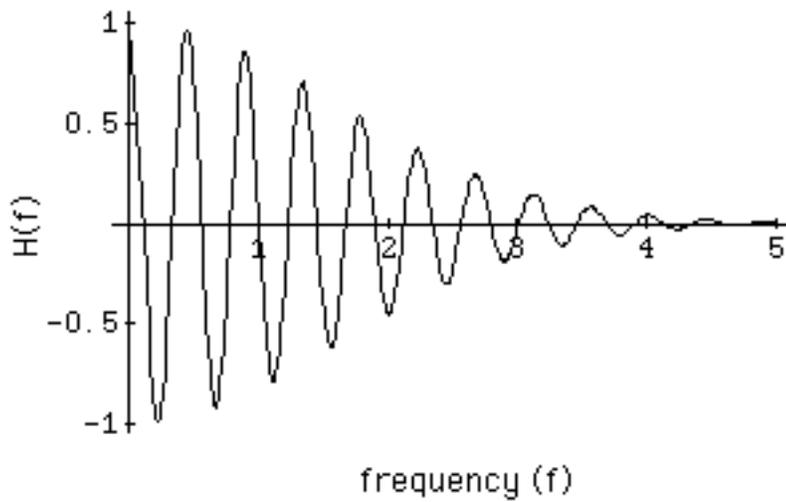


FIGURE 15 is a schematic of $H(f)$ given by Eq. (39.50) where $\alpha = 10$ and $N = 500$.



FIGURES 16A and 16B illustrate plots of the probability $P_A(\phi)$ (Eq. (39.106a)) of association of the corresponding Fourier series based on a first active association ensemble coupling with a second association ensemble as a function of frequency difference angle, ϕ_s , coupling cross section amplitude, β_s^2 , and phase shift, $\delta_s = 0$ wherein the parameter $\beta_s^2 = 0.01$ and 0.25 respectively.

Fig. 16 **A**

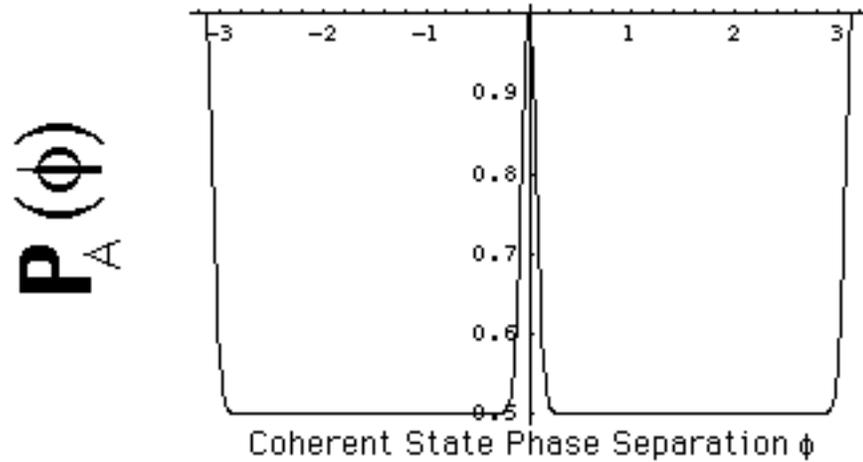
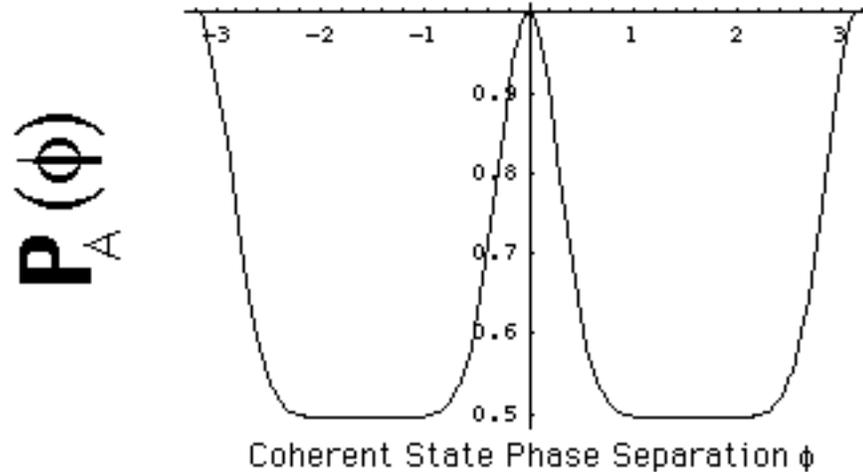
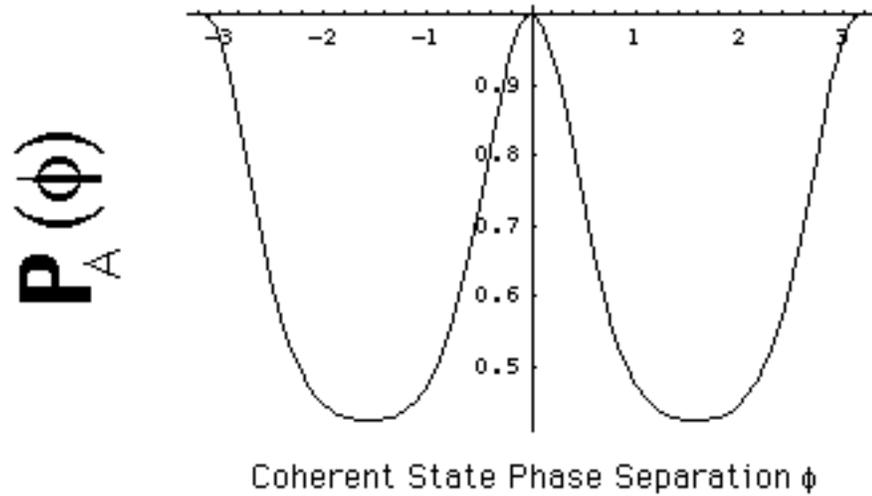


Fig. 16 **B**



FIGURES 16C illustrates a plot of the probability $P_A(\phi)$ (Eq. (39.106a)) of association of the corresponding Fourier series based on a first active association ensemble coupling with a second association ensemble as a function of frequency difference angle, ϕ_s , coupling cross section amplitude, β_s^2 , and phase shift, $\delta_s = 0$ wherein the parameter $\beta_s^2 = 1.00$.

Fig. 16 C



FIGURES 17A and 17B illustrate plots of the probability $P_A(\phi)$ (Eq. (39.106a)) of association of the corresponding Fourier series based on a first active association ensemble coupling with a second association ensemble as a function of frequency difference angle, ϕ_s , and phase shift, δ_s , for the coupling cross section amplitude, $\beta_s^2 = 0.25$, wherein the parameter $\delta_s = 0$ and 0.25π , respectively.

Fig. 17 **A**

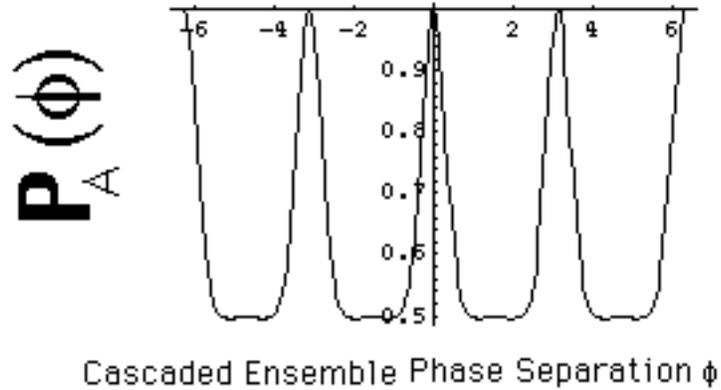
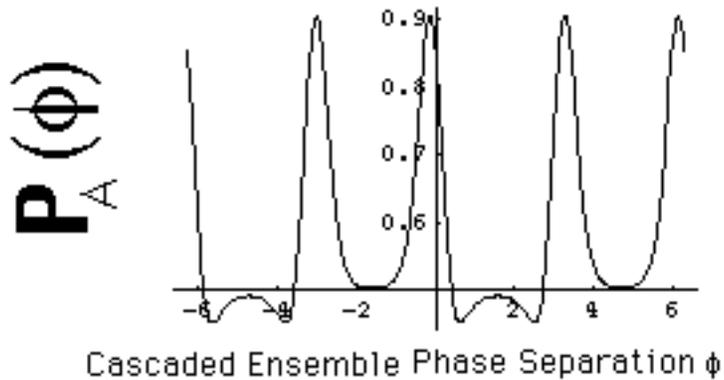


Fig. 17 **B**



FIGURES 17C, and 17D illustrate plots of the probability $P_A(\phi)$ (Eq. (39.106a)) of association of the corresponding Fourier series based on a first active association ensemble coupling with a second association ensemble as a function of frequency difference angle, ϕ_s , and phase shift, δ_s , for the coupling cross section amplitude, $\beta_s^2 = 0.25$, wherein the parameter $\delta_s = 0.50\pi$, and π , respectively.

Fig. 17 C

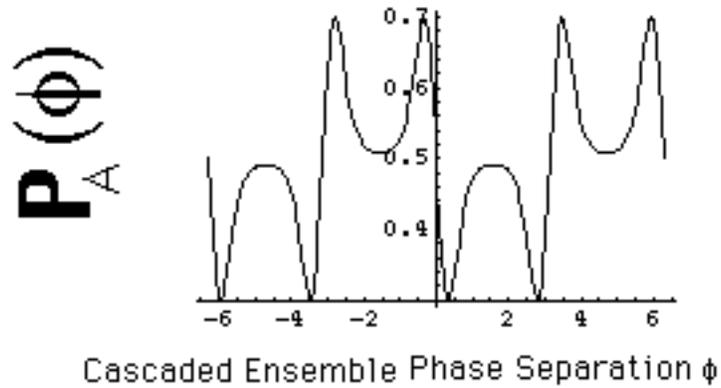


Fig. 17 D

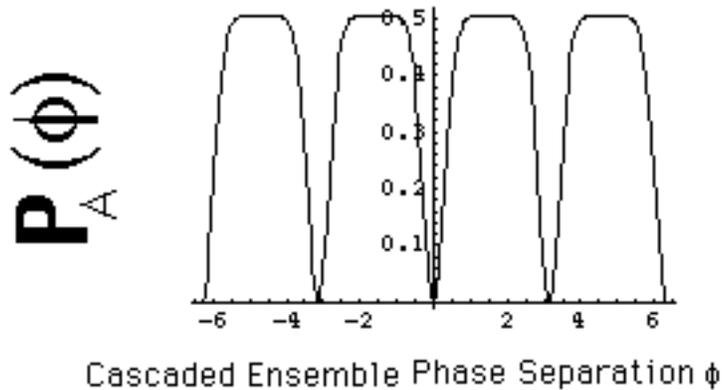


FIGURE 18 is a flow diagram of an exemplary hierarchical relationship between the characteristics and the processing and storage elements.

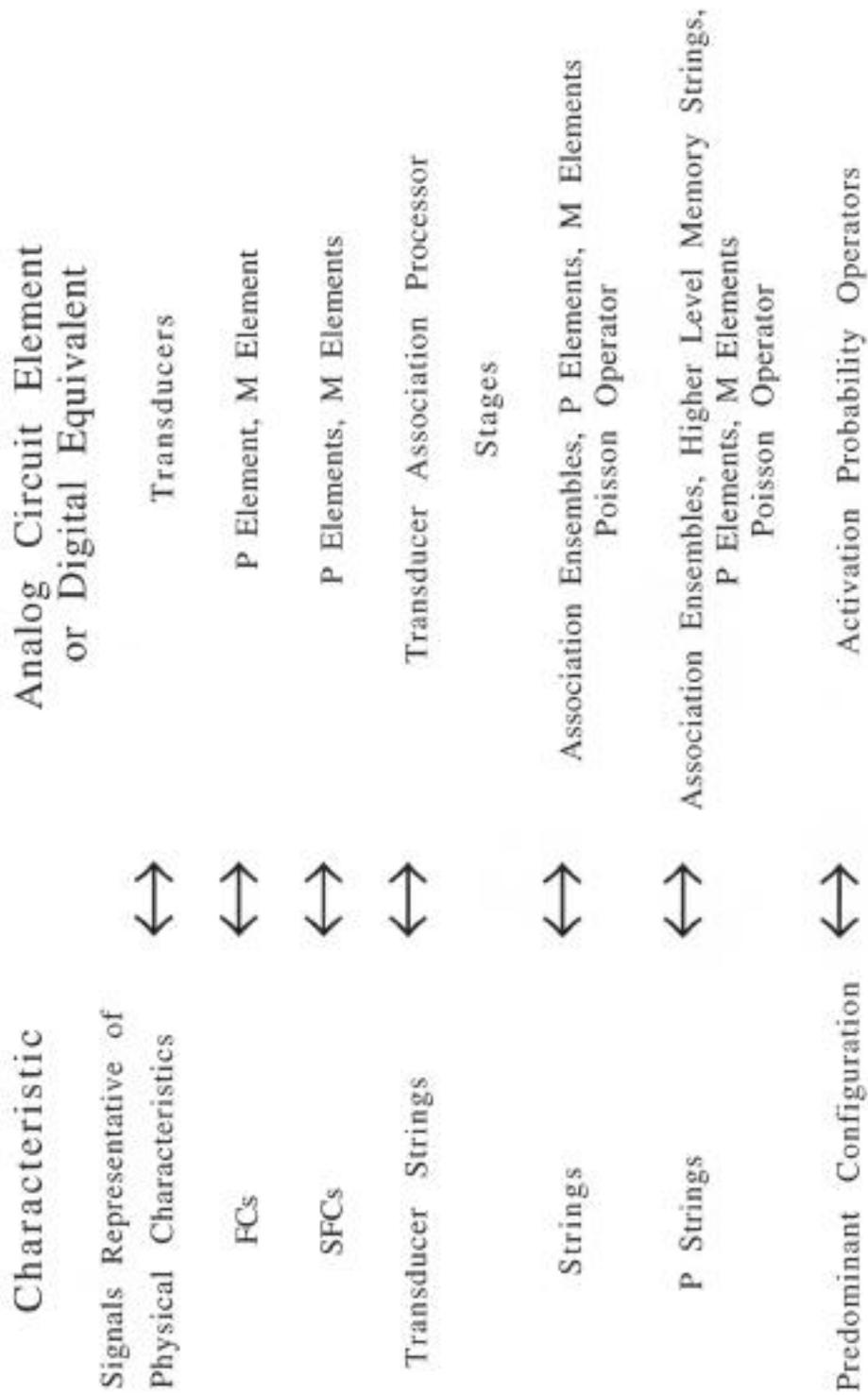


FIGURE 19 is a flow diagram of an exemplary hierarchical relationship of the signals in Fourier space comprising FCs, SFCs, groups of SFCs, and a string.

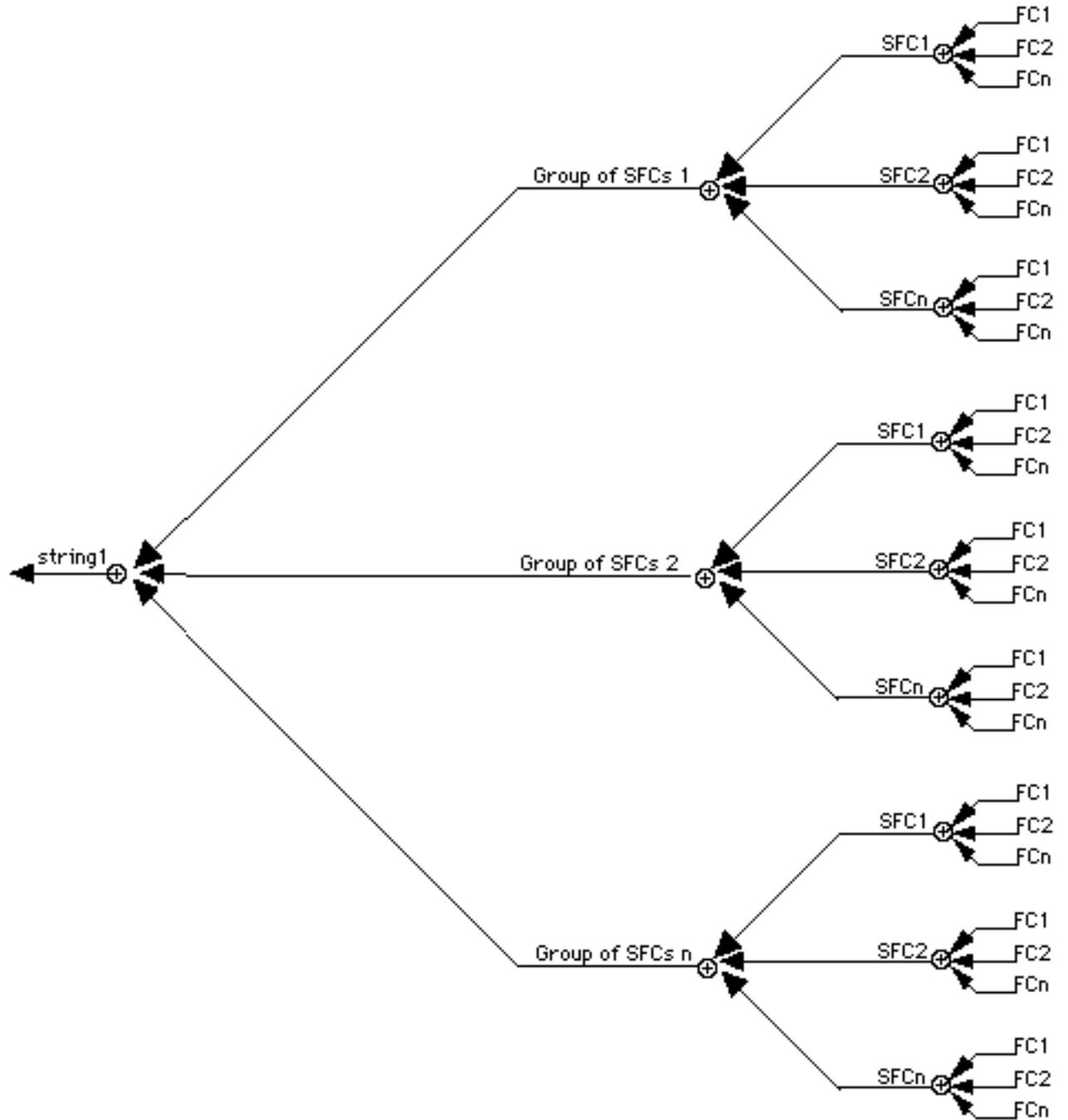


FIGURE 20 is an exemplary layer structure.

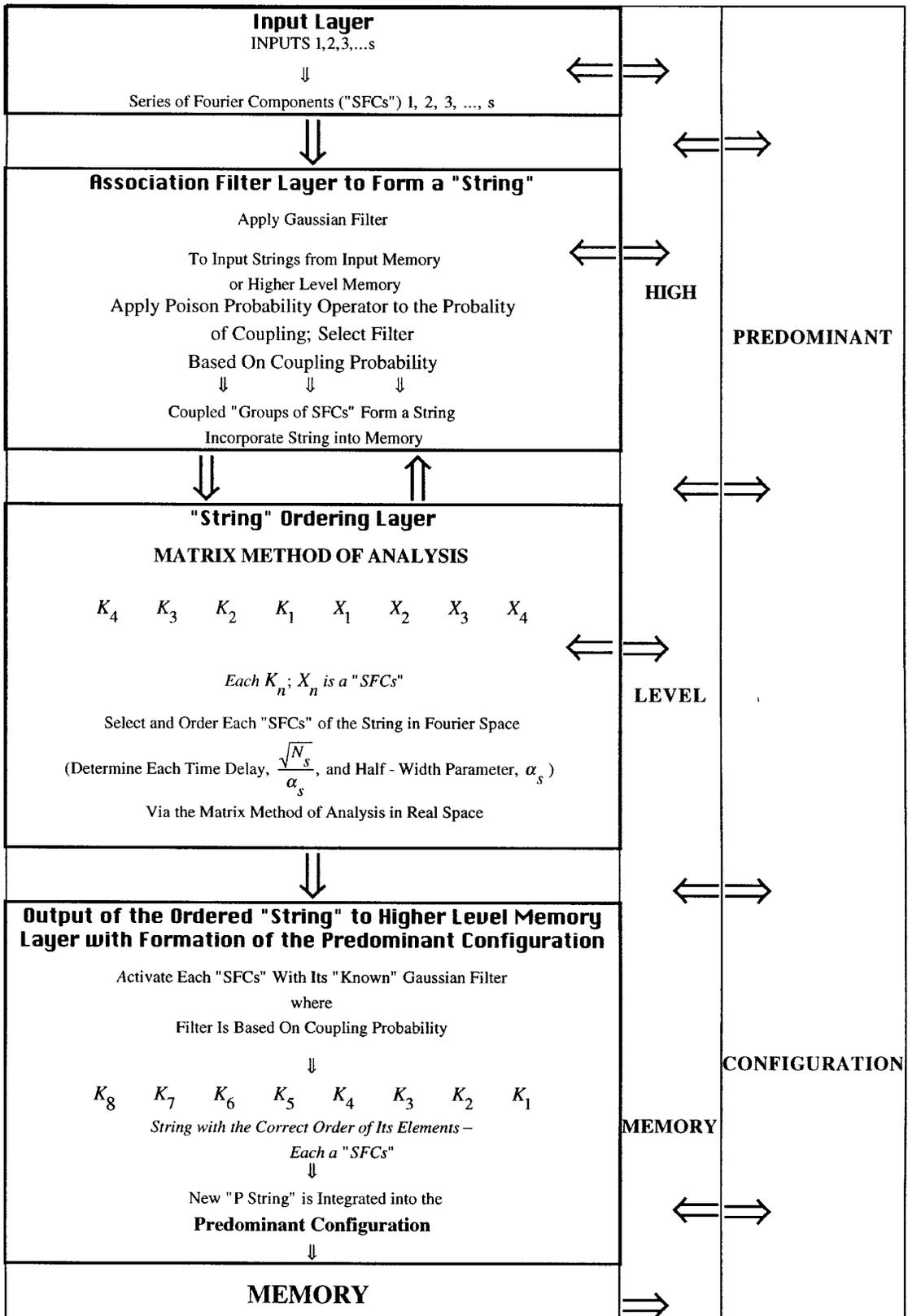


FIGURE 21 is a flow diagram of an exemplary layer structure and exemplary signal format.

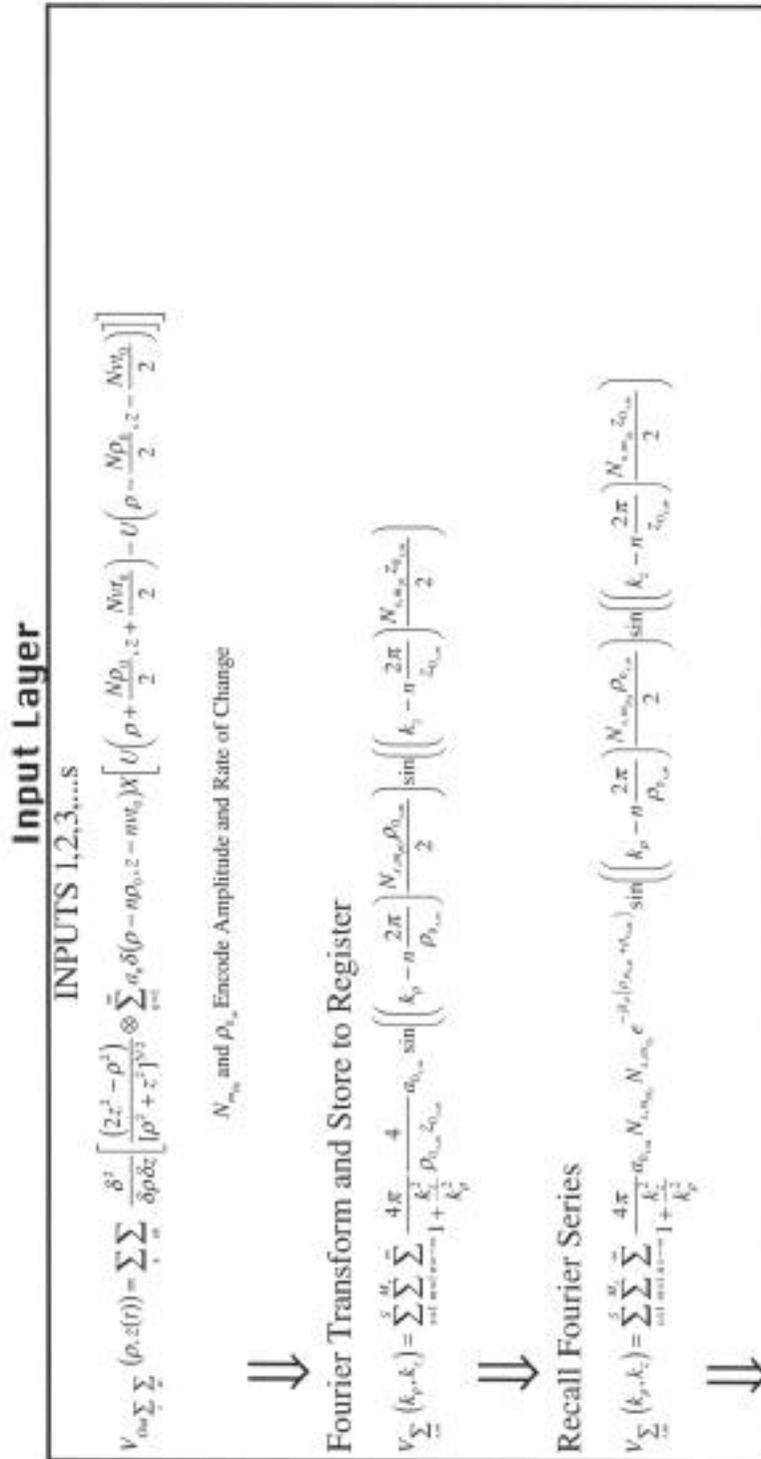


Fig. 21 Continued

Association Filter Layer to Form a "String"

Apply Gaussian Filters

Couple:

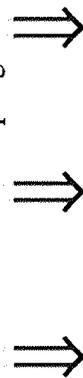
Calculate

$$P_s \left(\frac{\sqrt{N_1}}{\alpha_1}, \frac{\sqrt{N_2}}{\alpha_2}, \dots, \frac{\sqrt{N_s}}{\alpha_s}, \delta_s \right) = \prod_s \frac{1 + \exp \left[-\beta_s^2 \left(\frac{1 - \cos 2\phi_s}{2} \right) \cos(\delta_s + 2 \sin \phi_s) \right]}{2}$$

Apply Gaussian Filters to Recalled Fourier Series

$$H_N(f) \approx e^{-\frac{1}{2} \left(\frac{2\pi f}{\alpha} \right)^2} e^{-j\sqrt{N} \left(\frac{2\pi f}{\alpha} \right)}$$

1,2,3,...S



Coupled "Groups of SFCs" Form a String
Incorporate String into Memory



$$H_N(f) \approx e^{-\frac{1}{2} \left(\frac{2\pi f}{\alpha} \right)^2} e^{-j\sqrt{N} \left(\frac{2\pi f}{\alpha} \right)}$$

1,2,3,...S

To Input Strings from Input Memory or High Level Memory



1,2,3,...S

$$V \sum_{p,m} (k_p, k_z)$$

$$= \sum_{s=1}^S \sum_{m=1}^{M_s} \sum_{n=-\infty}^{\infty} \frac{4\pi}{k_z^2} a_{0,m} N_{s,m} \rho_{0,m} e^{-jk_p(\rho_{0,m} + \rho_{1,m})}$$

$$\sin \left(\left(k_p - n \frac{2\pi}{\rho_{0,m}} \right) \frac{N_{s,m} \rho_{0,m}}{2} \right) \sin \left(\left(k_z - n \frac{2\pi}{z_{0,m}} \right) \frac{N_{s,m} z_{0,m}}{2} \right)$$

Fig. 21 Continued
"String" Ordering Layer

Recall String from Memory

$$V_{\sum_{s,m}}(k_p, k_z) = \sum_{s=1}^S \sum_{m=1, n=-\infty}^{\infty} \frac{4\pi}{k_z^2} a_{0,s,m} N_{s,m\rho_0} N_{s,mz_0} e^{-jk_p(\rho_{s,m} + \rho_{1,m})}$$

$$\sin\left(\left(k_p - n \frac{2\pi}{\rho_{0,s,m}}\right) \frac{N_{s,m\rho_0} \rho_{0,s,m}}{2}\right) \sin\left(\left(k_z - n \frac{2\pi}{z_{0,s,m}}\right) \frac{N_{s,mz_0} z_{0,s,m}}{2}\right)$$

MATRIX METHOD OF ANALYSIS

$$K_4 \quad K_3 \quad K_2 \quad K_1 \quad X_1 \quad X_2 \quad X_3 \quad X_4$$

Each K_n ; X_n is a "SFCs"

$$V_{\sum_n}(k_p, k_z) = \sum_{m=1, n=-\infty}^M \frac{4\pi}{k_z^2} a_{0,m} N_{m\rho_0} N_{mz_0} e^{-jk_p(\rho_{0,m} + \rho_m)} \sin\left(k_p \frac{N_{m\rho_0} \rho_{0,m}}{2} - n \frac{2\pi N_{m\rho_0}}{2}\right) \sin\left(k_z \frac{N_{mz_0} z_{0,m}}{2} - n \frac{2\pi N_{mz_0}}{2}\right)$$

Select and Order Each "SFCs" of the String in Fourier Space

(Determine Each Time Delay, $\frac{\sqrt{N_s}}{\alpha_s}$, and Half - Width Parameter, α_s)

Via the Matrix Method of Analysis in Real Space



Fig. 21 Continued

Output of the Ordered "String" to Higher Level Memory Layer with Formation of the Predominant Configuration

Activate Each "SFCs" With Its "Known" Gaussian Filter

where

Filter Is Based On Coupling Probability

$$V_{\sum_{s,m}}(k_p, k_z) = \sum_{s=1}^S \sum_{m=1}^{M_s} \frac{4\pi}{k_z^2} a_{0,s,m} N_{s,m_0} N_{s,m_0} e^{-\frac{1}{2} \left(\frac{k_z}{v_{p0}} \alpha_{p0} \right)^2} e^{-\frac{1}{2} \left(\frac{k_z}{v_{z0}} \alpha_{z0} \right)^2} e^{-j \frac{\sqrt{N_{s,m_0}}}{\alpha_{z0}} (v_{z0} k_z)} e^{-jk_p (\rho_{0,s,m} + \rho_{z,m})} \sin \left(\left(k_p - n \frac{2\pi}{\rho_{0,s,m}} \right) \frac{N_{s,m_0} \rho_{0,s,m}}{2} \right) \sin \left(\left(k_z - n \frac{2\pi}{v_{s,m} t_{0,s,m}} \right) \frac{N_{s,m_0} z_{0,s,m}}{2} \right)$$



$K_8 \quad K_7 \quad K_6 \quad K_5 \quad K_4 \quad K_3 \quad K_2 \quad K_1$

String with the Correct Order of Its Elements—

Each a "SFCs"



New "P String" is Integrated into the

Predominant Configuration