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# The Mesurement Problem in the Statistical Signal Processing

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Discussing quantum theory foundations, von Neumann noted that the measurement process should not be regarded in terms of a time evolution [1]. The reason for such a claim is the insurmountability of a gap between reversibly and irreversibly evolving systems in physics. The time operator formalism that goes beyond the gap is an adequate framework for elucudation of the measurement problem [2]. It is a straightforward generalization of multiresolution representing the identity through a direct sum of projectors onto subspaces of the signal space [3]. The wavelet base $_{j,k}$ whose elements span a multiresolution is constituted according to the structure of real numbers that concern commensuration of magnitudes in the Euclidean algorithm [4]. These elements are both states and devices of the measurement process, which is an indication of the signal space autoduality. The statistical model of a measurement requires ensembles whose density operators are $= FF^*$, whereby the root $F = f(T)$ is a normed function $\|f\| = 1$ of the time operator $T$. Its coefficients $|D_{j,k} \;\; = F|_{j,k}$ are considered to be random variables, as well as each energy $|D_{j,k}|^2$ which is a distribution density. Due to the measurement process, it is reduced to an expected value $|d_{j,k}|^2 = E|D_{j,k}|^2$ that is the probability of a state $_{j,k}$. Respecting that, the density operator $= \;\; _{j,k}|d_{j,k}|^2|_{j,k} \;\; _{j,k}|$ has become diagonal in the base.

In order to regard distributions $|D_{j,k}|^2$, one considers an alternative density $F^*F = \;\; _{j,k}|D_{j,k} \;\; D_{j,k}|$ whose component $_{j,k} = |D_{j,k} \;\; D_{j,k}|$ corresponds to the Markov variable $S_{j,k}$. The measurement problem concerns statistical causality that operates through causal variables $S_{j,k}$ which evoke a stochastic computation [5]. It represents the time evolution of a complex system, which is related to the measurement process.


References


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## Is this abstract from experiment?

No

## Name of experiment and experimental site

N/A

## Is the speaker for that presentation defined?

Yes

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No

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