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Mathematical Physics

Discrete Quantum Processes

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A discrete quantum process is defined as a sequence of local states \$\rho_t\$, \$t=0,1,2,...\$, satisfying certain conditions on an \$L_2\$ Hilbert space \$H\$. If \$\rho =\lim\rho_t\$ exists, then \$\rho\$ is called a global state for the system. In important cases, the global state does not exist and we must then work with the local states. In a natural way, the local states generate a sequence of quantum measures which in turn define a single quantum measure \$\mu\$ on the algebra of cylinder sets \$\cscript\$. We consider the problem of extending \$\mu\$ to other physically relevant sets in a systematic way. To this end we show that \$\mu\$ can be properly extended to a quantum measure \$\mutilde\$ on a "quadratic algebra" containing \$\cscript\$. We also show that a random variable \$f\$ can be "quantized" to form a self-adjoint operator \$\fhat\$ on \$H\$. We then employ \$\fhat\$ to define a quantum integral \$\\int fd\mutilde\$. Various examples are given

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