

An Invitation to Quantum Coding Theorems

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In 1948, C.E.Shannon initiated a revolution by interpreting Boltzmann's entropy as a measure of information yielded by an elementary statistical experiment and proved two basic coding theorems concerning optimal storage of information and optimal communication of messages through a noisy information channel when the noise is characterized by a transition probability matrix over a finite alphabet. Starting from 1995 there has taken place an interesting development when classical messages are transformed into quantum states and the original messages are retrieved by appropriate generalized measurements. Through the works of Schumacher, Holevo, Winter and others we now have a nice quantum avatar of Shannon's coding theorem when Shannon's entropy and capacity are replaced by von Neumann entropy and Holevo capacity. Our lecture will be an expository account of this new development.