Quantum Correlations in Problems of Quantum Information Science

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Because of quantum computation is one of the most rapidly developing scientific areas there are a lot of problems associated with analysis of quantum states. A lot of basic quantum algorithms are based on quantum correlation (entanglement). Therefore, numerical research of dependences between different subsystems is an important task in quantum information science.

Schmidt’s decomposition underlies the new method of correlation analysis. Complements of classical probability distribution to quantum state permit the extension of this method to case of classical statistical tasks. The presented formalism is the natural approach for the analysis of correlations. Algorithms of calculation partial correlation coefficient and multiple correlation coefficient using Schmidt decomposition were studied. If the initial researched probability distribution is a normal distribution, Schmidt’s correlation coincide with Pearson’s correlation. For non-gaussian distributions Schmidt’s correlation coefficient is effective and adequate tool of statistical data analysis. Numerical estimates of this correlations coefficients were calculated for different classical probability distributions.

The developed method can be used in various applied tasks related with correlation analysis. As an example to demonstrate the concept of Schmidt’s correlations the texts processing method (based on latent semantic analysis) has been chosen. Quantum analogue of automatic texts classifier is developed and results of this algorithm are shown.