Measurement

Tags: Part I, SubUnit II

Date: @Feb 12, 2020

Topic: Measurement

Recall	Notes
	Prob. of each outcome is the coeff. squared.
Measuring Qubits	• After the measurement, the system acts as if it had been in the measured state all along.
	$$\text{Basis: } \|e_0\rangle_A, \|e_1\rangle_A, \ldots, \|e_{d-1}\rangle_A.$$ $$\|\psi\rangle_{AB} = \sum_{i=0}^{d-1} \|e_i\rangle_A \|v_i\rangle_B$$
Partial Inner Product	Measure system A against a basis: $$\text{After measurement, system B is in the state: } = \frac{\|v_i\rangle}{\|\|v_i\rangle\|}$$
Hermitian Matrix	Another way of doing the measurement: $$\text{Measure A in that basis, prob. of } \|e_i\rangle = \|\|v_i\rangle\|^2$$ $$\text{Prob. of } e_i = \|\langle e_i\|\psi\rangle\|$$ $$\|{}_A\langle e_i\|a_k b_j\rangle_{AB}\| = \delta_{e_i a_k}\|b_j\rangle$$
Both matrices of dim. d have d	

orthonormal eigen vectors. Unitary Matrix	$$U^{-1} = U^\dagger,\ U = \sum_{i=0}^{d-1} e^{i\theta} \vert e_i\rangle\langle e_i\vert$$ $$H = H^\dagger,\ H = \sum_{i=0}^{d-1} \lambda_i \vert e_i\rangle\langle e_i\vert,\ \forall i, \lambda_i \in \mathbb{R}$$
Expected value of observable	$$\langle\psi\vert H\vert\psi\rangle$$
(Hermitian Matrix) in state:	
Spin for two particles	$$S_x = \text{spin of first one} + \text{spin of second one} = I \otimes \sigma_x + \sigma_x \otimes I$$ $$\frac{1}{2}(\alpha_x\sigma_x + \alpha_y\sigma_y + \alpha_z\sigma_z)$$
observable for spin in a specific direction:	$$\frac{\vert 00\rangle + \vert 11\rangle}{\sqrt{2}}, \dots$$
Bell States(EPR Pairs)	