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Contents

Chapter 1

Methods

1.0.1 Evolution equation for tensor network coefficients

Let the IR and UV states contain m and N entangled momentum states, with N of course larger than m. We assume that the reverse unitary to re-entangle the M^{th} state can be written as

$$U_M^\dagger = \sum_{n<M} (\alpha_{n,M}^{(M)} O_d c_n^\dagger c_M + \text{h.c.}) \ . \tag{0.1}$$

By introducing the coefficient matrix $\alpha^{(M)}$ with matrix elements $\alpha_{n,M}^{(M)}$ and the $M-$spinor $\chi_M = (c_1\ c_2\ \ldots\ c_M)^T$, we can write the reverse unitary operator as

$$U_M^\dagger = O_d \chi_M^\dagger \alpha^{(M)} \chi_M \ . \tag{0.2}$$

The matrix $\alpha^{(M)}$ can be diagonalised: $\mathcal{U}_M^{-1} \alpha^{(M)} \mathcal{U}_M = D^{(M)}$, leading to a simpler form for the unitary:

$$\tilde{U}_M^\dagger = \mathcal{U}_M^{-1} U_M^\dagger \mathcal{U}_M = O_d \tilde{\chi}_M^\dagger D^{(M)} \tilde{\chi}_M = O_d \sum_n D_n^{(M)} \tilde{c}_n^\dagger \tilde{c}_n \ , \tag{0.3}$$

where the rotated $M-$spinor $\tilde{\chi}_M$ is given by $\tilde{\chi}_M = \mathcal{U}_M^{-1} \chi_M \mathcal{U}_M = (\tilde{c}_1\ \tilde{c}_2\ \ldots\ \tilde{c}_M)$.

We start with the last unitary U_N that entangles the last N^{th} state.

Bibliography