

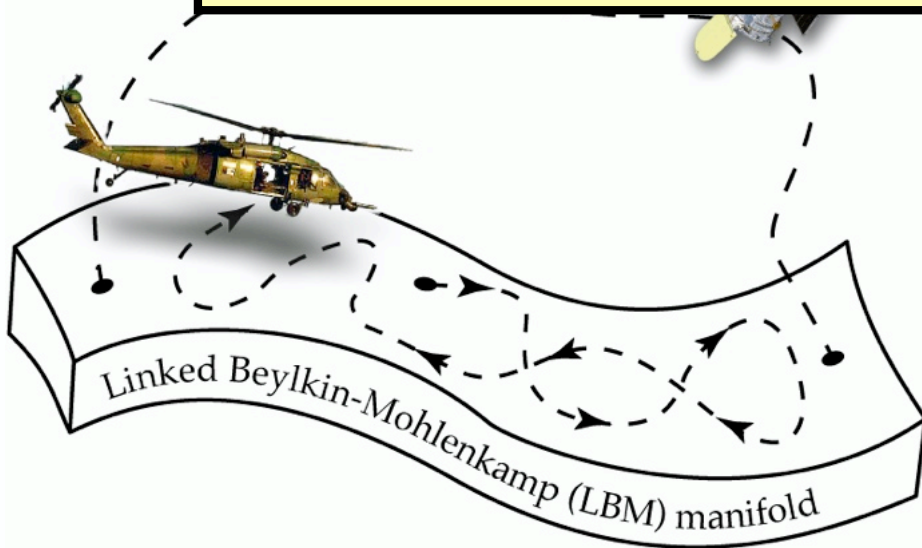
Q5: Are we confident that quantum spin microscopy will work?

A5: Product-sum representations provide a vital QMOR technique

ALGORITHMS FOR NUMERICAL ANALYSIS IN HIGH DIMENSIONS*

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**Quantum MOR is efficient:
compressed trajectories
can be stored in P-space
and computed in P-time**



$$|\psi\rangle = \begin{Bmatrix} \begin{bmatrix} c_1^{3,1} \\ c_2^{3,1} \end{bmatrix} \otimes \begin{bmatrix} c_1^{3,2} \\ c_2^{3,2} \end{bmatrix} \otimes \begin{bmatrix} c_1^{3,3} \\ c_2^{3,3} \end{bmatrix} \otimes \begin{bmatrix} c_1^{3,4} \\ c_2^{3,4} \end{bmatrix} \otimes \begin{bmatrix} c_1^{3,5} \\ c_2^{3,5} \end{bmatrix} \otimes \begin{bmatrix} c_1^{3,6} \\ c_2^{3,6} \end{bmatrix} \otimes \begin{bmatrix} c_1^{3,7} \\ c_2^{3,7} \end{bmatrix} \dots \\ \begin{bmatrix} c_1^{4,1} \\ c_2^{4,1} \end{bmatrix} \otimes \begin{bmatrix} c_1^{4,2} \\ c_2^{4,2} \end{bmatrix} \otimes \begin{bmatrix} c_1^{4,3} \\ c_2^{4,3} \end{bmatrix} \otimes \begin{bmatrix} c_1^{4,4} \\ c_2^{4,4} \end{bmatrix} \otimes \begin{bmatrix} c_1^{4,5} \\ c_2^{4,5} \end{bmatrix} \otimes \begin{bmatrix} c_1^{4,6} \\ c_2^{4,6} \end{bmatrix} \otimes \begin{bmatrix} c_1^{4,7} \\ c_2^{4,7} \end{bmatrix} \dots \\ \begin{bmatrix} c_1^{5,1} \\ c_2^{5,1} \end{bmatrix} \otimes \begin{bmatrix} c_1^{5,2} \\ c_2^{5,2} \end{bmatrix} \otimes \begin{bmatrix} c_1^{5,3} \\ c_2^{5,3} \end{bmatrix} \otimes \begin{bmatrix} c_1^{5,4} \\ c_2^{5,4} \end{bmatrix} \otimes \begin{bmatrix} c_1^{5,5} \\ c_2^{5,5} \end{bmatrix} \otimes \begin{bmatrix} c_1^{5,6} \\ c_2^{5,6} \end{bmatrix} \otimes \begin{bmatrix} c_1^{5,7} \\ c_2^{5,7} \end{bmatrix} \dots \end{Bmatrix}$$

- Separated representations provide a “JPEG format” for compressing quantum state trajectories
- They efficiently compress all Hilbert states *except* the high-rank states employed in quantum computation
- They are well-suited to quantum system engineering