LCT Sample Code

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Lightcone Conformal Truncation (LCT) is a novel algorithm for studying strongly-coupled quantum field theories in real time and infinite-volume. At present, LCT is written in `Mathematica`. This repository contains LCT code samples to give the reader a sense of what goes on behind the scenes computationally. There are two folders: one for the two dimensional (2D) code and one for the three dimensional (3D) code. The files within each folder are as follows:

2D Code Sample (co-authored)

- `2D_Phi4_Demo.nb`: This notebook demonstrates how to use LCT to study 2D ϕ^4 theory, including computing the spectrum and two-point correlation functions at arbitrary coupling. This demo was created by Zuhair and Matt based on the analysis done in the two papers arXiv:1704.04500 and arXiv:2005.13544. The demo calls the packages `Basis-Scalar.wl` and `MatrixElements-Scalar.wl`.

- `Basis-Scalar.wl`, `MatrixElements-Scalar.wl`: These are the latest packages for generating the 2D LCT scalar field basis and Hamiltonian matrix elements, respectively. These packages were written primarily by Yuan, taking original code written by Zuhair, Matt, and Nikhil in arXiv:1704.04500 and implementing the analytical improvements developed in arXiv:2005.13544.

3D Code Sample (written by Zuhair)

- `GenerateBasis_3D.nb`: **Runnable**. This is the code for generating the 3D LCT scalar field basis. The algorithm is described step-by-step in Appendix B of arXiv:2010.09730. This was the code used to analyze 3D ϕ^4 theory in the same paper.

- `Other files`: **Not Runnable** (builds on prior output). Included to give a sense of the scope of the project.