Simulation Setup for Planck-Scale Scalar Field Theory

1 Environment Requirements

Simulations require a Linux/macOS/Windows system with:

- CPU: 8 cores (e.g., Intel i7 or AMD Ryzen)
- RAM: 16 GB
- Storage: 10 GB for data outputs
- Python 3.8+

2 Dependencies

Install dependencies using:

```
pip install -r SimulationCodes/requirements.txt
```

Contents of `requirements.txt`:

- numpy==1.24
- scipy==1.10 (Paper 1, 3), scipy==1.14.1 (Paper 2)
- cython

3 Compilation

Compile Cython modules:

```
cythonize -i SimulationCodes/paper1/lattice_cy.pyx
cythonize -i SimulationCodes/paper2/lattice_cy.pyx
cythonize -i SimulationCodes/paper3/lattice_cy.pyx
```

4 Data Storage

Simulation outputs are saved in:

- `SimulationCodes/paper1/data/`
- `SimulationCodes/paper2/data/`
- `SimulationCodes/paper3/data/`