

Homework 3

October 3, 2016

1 To Do

1. Write plot functions for individual time steps in 1D and 2D
2. Check scaling laws for KPZ in 1D in and 2D
3. Email s about FRW and convergence
4. Read about sandpile
5. Write sandpile
6. Visualize sandpile
7. Detect avalanches?
8. Write it all up
9. Lax discretization
10. Implicit Time Step
11. Dynamic Time Step

2 Planning

Assignments:

1. Solve the 1D Burgers equation ✓

2. Solve the Burgers equation with FRW cosmology
3. Solve KPZ in $d = 1$ and check the scaling laws
4. Same in $d = 2$
5. Code and run the sandpile, and detect avalanches
6. Extension: Lax discretization
7. Extension: Implicit time step
8. Extension: Dynamic Time-Stepping

2.1 Solve the Burgers equation with FRW cosmology

1. Code solution for FRW
2. Visualize and discuss

2.2 Solve KPZ in $d = 1$ and check scaling laws

1. Solve KPZ equation ✓
2. Visualize solutions ✓
3. Check convergence for $\text{rand} = 0$
4. Check scaling laws

2.3 Same in $d = 2$

1. Code 2D solution of KPZ ✓
2. Visualize ✓
3. Check convergence properties
4. Check scaling laws

2.4 Code and run the sandpile, and detect avalanches

1. Code sandpile
2. Visualize sandpile
3. Come up with avalanche criterion and detect

2.5 Solve the 1D Burgers equation ✓

1. Code numerical solution for 1D Burgers ✓
2. Visualize solutions ✓
3. Test grid convergence properties ✓
4. Test against simple analytic solutions if any (checked against youtube video) ✓

3 Introduction

4 Problem

5 Methods

6 Experiments