

Homework Assignments

Flow Chart

due Febr. 14, 10am, hard copy

Write a flow chart for your main project program. Be as detailed as possible. This can be handwritten, whatever is easiest. This might even mean that you have one less detailed flow chart and then more detailed flow chart elements. For the more detailed flow chart(s) you may want to list the main variables for your program

You find examples for flow charts for the random walk analysis (see your class notes) and the DLA flow chart. In the case of the DLA program you would specify the lattice array as one of your variables and x,y as integer variables for the random walker position.

Optional now (will be due in near Future, Febr. 23):

You will need this flow chart (and list of variables) for writing your program. You might even want to start working on the core parts of your main project program. My major advice, however, is that you write your program successively. Do not write the whole program at once, but instead step by step and test each step as you go.

Background

will be due Febr. 16, 10am, hard copy: bibliography and descriptions (can be keywords)

Goals: As part of your first talk you will also describe the **background** for the model you will use for your project. In case of the traffic flow model this would mean that you find out (by finding and reading the appropriate references) which other traffic models have been studied (e.g. two lane, city grid, ...) and what the main results are (including some theoretical and experimental results). You should become an expert in the topic of your project. You will find this information in scientific papers in a paragraph usually called "introduction" or "background" or "theory".

Your bibliography should include all relevant papers you found. Your background should be a summary of what you have found.

Wuji, you could look up different stock market models. You could also check who has used the model you are using and what has been studied, what are the results.

Gwynne, you could look up for what the Eden model has been used and similarly for what has the DLA model been used. You could also read about fractal growth. You could also look up which other models have been used to simulate tumor growth.

Michael, you could check whether you find other studies on the spread of racism. Are there spatial models? Are there maybe real world data on the spread of racism. You could also

look up population models and which type of analysis has been done. You might find some non-linear dynamics analysis.

Amin, you already name a few applications of the DLA model. Try to find scientific papers for some of these applications. You could also check which other dielectric breakdown models have been used. You already have a good start. Continue looking up the papers referenced in your main paper and also check who cited your main paper. Which quantities have been studied to characterize electric breakdown.

Yicheng, you could look up papers who have used the KALJ model. What did they study? (glass, liquid, crystal, interface, . . .) Which quantities did they measure (mean squared displacement, correlation function, susceptibility, coordination number, . . .). Which other models have been used for similar many particle systems?

Will, you could look into the analysis of the Euler disk studies. You might try to grasp what they did in Campus, et al. paper. Are there some analytic results for special cases. Which type of analysis has been done. Are there more complex equations to model the Euler disk?

Chris, you had earlier found some way more complicated simulation models for parachute. You could give a one or two sentence description of these models. You also could look into what has been studied so far with the model you use. Maybe you can find some overview about plane flight simulations, so which variety of tasks and models exist.

How to Read Papers:

To scan efficiently through the papers and to read more carefully through the papers, indicate on a copy of each paper (and/or take careful notes about each scientific paper): motivation, previous models, model/simulation, results. These keywords will help you to identify most important papers and to summarize all your findings for your papers.

How to Give Reference: (Examples; format as in APS journals)

Article: D. Chowdhury, L. Santen and A. Schadschneider, *Curr. Sci. India* **77**, 411 (1999).

Book: M.E.J. Newman, *Computational Physics*, Revised and expanded, (Createspace, North Charleston, SC, 2013).

Gould, H.; Tobochnik, J.; Christian, W. *An Introduction to Computer Simulation Methods : Applications to Physical Systems*, Revised third.; ComPADRE: Place of publication not identified, 2017.

Upcoming Deadlines:

- Febr. 14: 1st Version of Flow Chart for Main Project
- Febr. 16: 1st Version of Background
- Febr. 21: 1st Version of Talk Slides (Backgr. Final Vs.)
- Febr. 23: 1st Version of Program for Main Project
- March 25: Final Version of Flow Chart for Main Project