First Paper
(due: Tuesday, February 22 (next class), 9:30 am)

At the beginning of next class, the "first version of the first paper" on your own main project is due. For more details on the assignment please see below the Paper description you had gotten a week ago. The first paper should include the title, the "introduction/background", the "model/method" and the "references", which are cited in these parts of the paper. For you this should not be the "first version" but the final version. By handing in an already complete and well written paper (instead of a preliminary version), you will profit of getting from me most useful comments which will help you for the revisions for your "final version." As guideline for the paper of your main project use my comments to your bibliography/model and your background/methods (which you will get back this Friday or Saturday) and also the following description of a scientific paper. For the paper use a more formal writing style than you will use in your oral presentation.

Audience: Your audience will be juniors and seniors who most likely do not have your background. Include therefore all information which is necessary to understand your project.

Examples:

- D. Chowdhury, L. Santen and A. Schadschneider, "Vehicular Traffic: A System of Interacting particles Driven Far From Equilibrium," Curr. Sci. India **77**, 411 (1999).
- all scientific papers you have read for your project.

Contents:

- Title
- Author(s), Address
- Abstract: An abstract is a summary of what you did and your results. The abstract is for a reader who might not have time to read the rest of your paper or who decides depending on your abstract if she or he reads the whole paper. The abstract should be understandable without the rest of the paper and should contain: the system you study, the model, the method and the results.
- Text: The following text should be understandable by itself. Reference any information which you used from other sources or which includes details not necessary for the reader's understanding.
  - Introduction/Background[5]:
    This section might give some historical background and/or necessary background information. You might talk about other models than the one you use. The Introduction also serves as a motivation for why your project is of specific

[5]Sometimes this is split into two sections

interest and importance. The main purpose of the introduction is to put your project into context: What has been done in previous work? Which models have been used? Which experiments have been done? Which theory has been done? What were the results? Which of the models are you using, or if you build your own model, what are the reasons for altering the previously used models? As part of the introduction you might give a general description of your project. You might end your introduction with an outline of the rest of the paper.
Please note my comments on your bibliography/model papers for a more specific description of this section for your project.

- Model:
  In this section you describe your model exactly. This includes for example the dimension of your system, whether you use a lattice and all applied rules (as e.g. the steps in the Nagel-Schreckenberg traffic flow model). In principle, after reading your description any reader should be able to write the program with exactly the same model as yours. For a more specific description what this section should contain for your projects, use my comments to your bibliography/model.
- Theory:
  You may not need this section. This is a section one uses if there are analytical calculations possible. For theoreticians this is the main section.[6]
- Simulation:[7]
  This section includes the method you use. For the second paper you will include in this section a specification of all parameters used in your simulation. Your description needs to specify all details which are necessary to reproduce your simulation results, for example for the traffic flow model you specify the initial configuration (how do you put on cars and which velocities do you give them), the number of time steps, the lattice size, and the boundary conditions (what happens at the ends of the road).[8]
- Results:
  This section describes the results of your project. It can include tables, formulae and figures. Tables and figures should have captions. Figure captions should have text which describes what the figure shows. All formulae should be numbered which will be done automatically with latex.
- Conclusions/Discussion:
  In this section you draw conclusions of your results and you might include what one could do in future work.
- References:
  This is the bibliography of all references to which you refer in the text.

[6] **Ryan**, you might include here some of the analytically solvable differential equations for Faraday waves and their solution. **Mark**, you should include here some of the SIR analytical results.

[7] This section is often combined with the section "Model."

[8] **Ryan**, you will include here how you will discretize the differential equations numberically. **Mark**, once you incorporate flow, you will have to include a section on how to propagate the fluid. **Clayton**, you would include here details like the number of players, the tile specifications (e.g. how many with 8 and which resources).

Mini-Project I

(due: Thursday, February 24, 9:30 am)
paper due at beginning of class, presentations in class

Goal of this Mini-Project I is to give you a free hand for your creativity and to get more practice with scientific paper writing.

1. Use your program of the game of life or the solution programs to the in-class work (see below). Do some variation on the game of life. For example you might change the rules of the game of life, or you might change the boundary conditions, or you might add or take out cells from time to time, or you might try more complicated initial configurations than we used in class, or any other change of your choice.

2. Watch carefully the patterns how they evolve over time and/or measure for example $N(t)$, the number of life cells N of the lattice at time t. What do you observe? (periodic behavior? dying out?...) Another variation might be that you are not changing the model but instead work on a more elaborate analysis, e.g. how would you measure if a pattern does no longer change after a certain number of steps, and if so, how would you measure how many steps it took to get to the no longer changing pattern.

3. Write a **paper** about 1. and 2. The paper (figures included about one latex-page) should contain a short **introduction** which explains clearly which task you tried to do (e.g. change of boundary conditions from periodic boundary conditions to absorbing boundary conditions). This can be a section of only one or two sentences. The next section should explain what exactly your new model is, such that everybody in class could write a program, which does exactly the same as what your program does. View this section as the **Model/Simulation** section. For completeness include the rules of game of life (even if you did not change them) and a reference (e.g. the book of Gaylord and Wellin of which I gave you copies). Include a description of all parameters you used (e.g. what is your initial condition and the lattice size you used). Then continue with a mini-**results** section, in which you show a figure or two and a description/interpretation of your results. End with a short **conclusions** section and possibly some ideas for future work. Since you will have only two days for this project each section can be relatively short.

4. Prepare a mini **talk** (8 min each student) which has the same content as your paper (model, variation(s), results). Prepare what you will say and some slides (In next class, Tue, Feb.22, you will learn the necessary tools: latex beamer and xmgrace). Make sure that you can get to your presentation/slides on the computer on the front desk in BERT012. If you plan to use DynamicLattice, then have a file prepared with the commands for compiling, running the program and using DynamicLattice. This file of commands has the purpose to safe you time for typing in commands (instead you will just copy the commands) and therefore will allow you more time for explanations.

5. Put the sourcecode (file.cc) into your ~/share.dir/ and make it readable. Please send to me an email in which you tell me the name of your sourcecode.

Solutions: `~kvollmay/classes.dir/capstone_s2011.dir/game_of_life.dir/game2.cc` etc.