Peer feedback form

Feedback from group:	16
Feedback to group:	27

A. Implementation and experimental design

Obstacle implementation: the assignment was to implement obstacles according to certain criteria: they had to be round(ish), static, roughly half the cell size, and regularly spaced. Please assess if the chosen obstacle implementation meets these criteria:

1	2	3	4	Selection:
There are no obstacles or the implementation is so flawed that it does not allow an answer to the research question.	*Obstacles are implemented but not (fully) satisfy the criteria, which might affect the ability to answer the research question.*	*Obstacles mostly match the criteria. Any issues/bugs/artefacts are minor and have little impact on the answer to the research question.*	*Obstacles are implemented correctly to complete the assignment and answer the research question.*	**4**

Implementation of migrating cells: the assignment was to study collective cell migration where cells keep moving at high densities, using the parameters from self-study exercise 1.3 (the correct choice was max_{act}=80). Please assess to what extent the implementation allows for collective cell migration:

1	2	3	4	Selection:
The implementation is strongly flawed (e.g. cells completely fall apart or do not actively migrate at all).	*The team used somewhat valid parameters, but the chosen max_{act}/λ_{act} do not allow collective motion at high density.*	*The team did not use the correct parameters from ex1.3. Their cells could move at high densities but did not align as in ex1.3.*	*The team chose correct parameters from ex1.3, or equivalent ones allowing migration at high densities and alignment as in ex1.3.*	**4**

Experimental design: to assess the effect of obstacles on collective migration as asked, the simulations should (a) have sufficient cells to exhibit collective migration, (b) be compared against a proper baseline, and (c) ensure that while assessing the effect of a variable of interest, everything else is held constant. Please assess the experiment according to these criteria:

1	2	3	4	Selection:
The # of cells was too low to speak of collective migration; cells mostly did not touch at all.	*There were enough cells that some of them were touching, but not enough to speak of "high densities" per the exercise.*	*The simulation contained an appropriate number of cells to allow for collective migration.*	*There were enough cells for collective migration, and the experiment varied the number of cells to test sensitivity of conclusions.*	**3**
There was no baseline (e.g. only a simulation without obstacles or only a simulation with obstacles), making it impossible to assess the effect of obstacles on	*There was a control (e.g. comparing "few" to "many" obstacles), but a no-obstacle baseline was missing making the effect of obstacles on collective motion hard to*	*There was a comparison between a no-obstacle baseline and a run with obstacles, allowing the team to assess how obstacles changed collective motion in this*	*Obstacles were varied in a meaningful range (no obstacles to sparse grid to closely packed), allowing a general assessment of the effect of obstacles across*	**4**

collective motion.	*assess.*	*one obstacle setting.*	*various densities.*	
Comparisons between simulations always changed multiple variables at once (e.g. both # cells and # obstacles), preventing meaningful conclusions.	*Some (but not all) comparisons between simulations changed multiple variables at once, limiting meaningful conclusions.*	*[There is no meaningful intermediate here]*	*All comparisons between simulations kept all but one of the variables fixed, allowing a fair assessment of the impact of the changing variable.*	**4**

Other potential problems: there can be other choices in the experimental set-up that might stand in the way of a robust answer to the research question. Check the right column with an X if these problems are present in the report:

Problem	**Explanation**	**Does this apply? (yes/no/maybe)**
Initialization artefacts	In simulations with many cells, you might run into issues where cells fragment into pieces because they are initialized too close together. You are then looking at artefacts, not modelling what real cells might do.	***Yes some cells fragment into pieces.***
Stochasticity not considered	The CPM is stochastic, and results may vary between runs. To draw robust conclusions, you should run each simulated condition multiple times – especially in quantitative analyses.	***Yes, it has been considered, but no multiple runs.***
Dynamics not considered	CPM behavior is dynamic and may change over time (e.g. in exercise 1.3: the alignment increased gradually over time). If not considered, you might: - miss important observations (e.g. because you did not wait long enough) - unfairly compare simulations at different time points	***Yes, dynamics have been sufficiently considered***
Other (please specify):		

Group assessment and feedback: Based on the above, please assess how well the experiment(s) in this report were designed to answer the research question as posited in the assignment. Please write at least 150 words of constructive feedback to help them fix any issues and/or show explicitly which parts were done well. Be specific (which experiment(s) are you talking about?), offer concrete suggestions for improvement and explain why these changes will result in a better report.

The experiments that have been outlined in this report successively address the research questions regarding the influence of obstacles on collective cell migration using Cellular Potts models. The way these experiments have been structured is logical and they explore various factors that can affect CCM, such as obstacle density, cell-obstacle adhesion, and cell deformability. The inclusion of the control conditions allows for a comparative analysis, which enhances the validity of the findings.
There are still some areas for improvement. The experiments lack robustness due to the limited number of runs for each condition, leading to poor reproducibility. It is thus unclear if the results show genuine relationships or if they are just consequences of random variability. I recommend starting earlier next time to run the experiments multiple times.
As was noted by the team, the lack of quantification for CCM limits the interpretation of the findings as well. Quantitative metrics would enhance this analysis a bit more.
Lastly, the experiments could also benefit from expanding the parameter space and exploring the interactions between the different variables. This would enhance the understanding of the various factors interacting or influencing CCM behavior.

Overall, the experiment does provide valuable insights, but by improving reproducibility and incorporating quantitative analysis, you can step it up even more!

B. Analysis and visualizations

Quantifications: the most robust evidence of any effect of obstacles on collective migration can be provided through some sort of quantification. This does require that your quantification metric(s):

- Is/are measuring the right thing(s)
- Is/are implemented correctly

Please assess the quantitative analysis in this report (if there are none, skip this part):

1	2	3	4	Selection:
There are quantitative analyses in the report, but they do not provide useful information to answer the research question.	*There are quantitative analyses in the report, but their added value is limited.*	*There are quantitative analyses in the report that help answer the research question.*	*There are quantitative analyses in the report that help answer the research question, and they are clearly well-designed and robust (e.g. through proper statistical testing).*	*[choose 1-4]*
The implementation seems incorrect, yielding outcomes that make no sense.	*[There is no meaningful intermediate here]*	*[There is no meaningful intermediate here]*	*The implementation seems correct, yielding reasonable outputs.*	*[choose 1 or 4]*

Visualizations: you were asked in the assignment to add visualizations, which can complement quantitative analyses to show effects of interest. This is most effective if your visualizations:

- Are appropriate in relation to what you are showing (i.e. don't provide a link to a video if a simple screenshot would have sufficed)
- Have a clear and self-explanatory message (e.g., compare simulations side by side, not in different figures on different pages, and provide a meaningful caption)
- Draw attention to the points of interest (e.g. by using colors and/or annotations appropriately)

Please assess the quality of visualizations and figures in this report:

1	2	3	4	Selection:
There are no visualizations at all.	*There are visualizations, but they are not showing behaviors that are relevant for the report.*	*Visualizations are present and mostly relevant and appropriately chosen.*	*Visualizations are present, relevant, and well-chosen for the effects they are showing.*	**4**
Visualizations are not very informative (for example: the message is that cells align, but you cannot see directions in the screenshot).	*Visualizations are somewhat informative, but some relevant information is missing (e.g. comparing two screenshots without a timestamp).*	*The visualization shows the relevant behaviors with necessary information, but presentation could be improved to draw attention where needed.*	*The visualization shows and draws attention to the relevant behaviors, using colors, annotations, and time stamps appropriately.*	**3**
The figures do not support the message (e.g. the relevant simulations are not shown together).	*The figures somewhat support the message, but it is not clear what the message is without reading the main text.*	*The figures are reasonably self-explanatory, but not well supported by captions.*	*The figures are self-explanatory, supported by captions highlighting the message and any relevant details.*	**4**

Description: Any figures/tables should be coherently described and referenced in the results section of the main text, which provides a narrative around the experiment(s) performed. Please assess the quality of this description:

1	2	3	4	Selection:
There is no or barely any text explaining the figures and tables.	*There is a narrative text explaining the results, but it does not reference the figures/tables appropriately.*	*The narrative text explains the results and references figures/tables appropriately.*	*The narrative text explains the results very clearly and references figures/tables appropriately.*	**4**
The text provides some explanations but many relevant observations in figures/tables are left unexplained.	*The text mostly explains the observations but is at times unclear or contradictory.*	*The text explains the observations in detail and correctly, but this causes the main point to be lost.*	*The text explains the observations correctly and in sufficient detail while also remaining to the point.*	**4**

Group assessment and feedback: Based on the above, please assess the quality of the visualizations and analyses in this report. Please write at least 150 words of constructive feedback to help them fix any issues and/or show explicitly which parts were done well. Be specific (which experiment(s)/figures/text sections are you talking about?), offer concrete suggestions for improvement and explain why these changes will result in a better report.

The visualization of the experiments has been done very well, and it is clear to me what is happening in the figures. The interpretation of each figure has been clearly explained and it is clear what the differences between each figure is. However, the figures could benefit from a legend, indicating what color stands for what.

For example: black meaning the migrating cells, pink the obstacles, and the red arrows as the direction in which the individual cells migrate.

This addition would make it a bit clearer for those a little less familiar with these concepts, which would prevent misinterpretation of the figures.

Additionally, perhaps something like a time stamp could be included to indicate how much time has passed in the current simulation. This would allow you to demonstrate that each simulation has been running for X amount of time for a fair comparison. This would make it clear to the reader that each simulation has indeed ben running for the same amount of time!

C. Conclusions and evidence

Validity: Claims and conclusions in the report should be backed-up by evidence (figures/tables/etc); please assess to what extent this is the case:

1	2	3	4	Selection:
The report makes several claims that are not backed up by any evidence.	*Most claims are supported by evidence, but the claims are too strong for the evidence presented (e.g. the results could be due to noise).*	*Most claims are supported by evidence, any overclaiming is minor.*	*All claims are thoroughly supported by evidence; there is no doubt that they are valid.*	**4**

Clarity: Ideally, a report should clearly answer the research question with a main conclusion after presenting the results. Assess how clearly the (main) conclusions are communicated:

1	2	3	4	Selection:
There was no clear conclusion, just a description of results.	*Some conclusions were drawn, but there was unclear which were the major and minor points.*	*The main conclusion was clearly highlighted, but it could be explained better.*	*The main conclusion was clearly highlighted and well explained.*	**2**

In addition, please answer the following with Y/N:

	Yes/No
Does this report answer the research question posed in the assignment (and hopefully in the report introduction)? I.e. are the differences between obstacle simulations and the no-obstacle baseline clearly discussed?	***Yes***
Does the answer mention the alignment of directions in the scenario without obstacles, which is disturbed when obstacles are present?	***No***
Do you otherwise agree with the conclusions made?	***Yes***
Is it easy to find the main conclusions in the report (e.g. in a separate section) and to distinguish it from other observations made?	***No***
Is it clear which statements are factual observations ("the cells did X in context Y") and which are interpretations thereof ("these findings suggest that obstacles do X")?	***Yes***

Group assessment and feedback: Based on the above, assess how well the report answered the research question. Please write at least 150 words of constructive feedback to help the other team fix any issues and/or show explicitly which parts were done well. Be specific (e.g. quote specific claims you disagree with, or specific figures that seem to contradict the conclusion, etc), offer concrete suggestions for improvement, and explain why these will improve the report.

The report has answered the research questions sufficiently. However, the answers to the research questions could have been outlined a bit better. I think the discussion section does a good job in interpreting the results, but the report did have some limitations which prevented the team from making concrete and concise conclusions about some of the research questions. The report does outline the results in a sufficient manner and often refers to the figures to interpret the results. I think the team did a good job in reflecting on their limitations and recognizing these, while also not jumping to hasty conclusions. Findings like the effect of the 6x6 grid on cell migration makes a lot of intuitive sense, and referring to the stochasticity of the system seems correct. The weakness and extensions section does a good job at recognizing the limitations of the approach taken by the team, and shows how critical they are about their own work.

D. Report

Finally, use the questions below to assess if the report is properly structured, clear, and self-contained enough to completely interpret and reproduce the work:

	Yes/No
Does the report clearly state the main research question in the introduction?	***No***
Does the report contain ALL the relevant sections: introduction, methods, results, discussion/conclusion?	***Yes***
Are there sections of the report that are difficult to read and/or interpret? (If so, please mention those in the textbox below).	***No***

If any literature references are cited: do they seem relevant to the presented work?	***Yes***
Are there any claims where you think a literature reference is missing?	***No***
Are the methods described sufficiently well that you could reproduce the work *without looking at the code?* This means the report should include: • All the relevant parameters used, including the temperature T and boundary conditions • If adhesion values J are given in a matrix, it should be clear which celltypes are in the rows and columns; • Densities of cells and obstacles (or numbers, but then the size of the simulation field should be included)	***Yes***
Are methods justified?	***Yes***
Is it clear how long simulations were running before outputs (data/screenshots) were generated?	***Yes***
Are there any other reasons why results may not be reproducible?	***No***

Group assessment and feedback: Based on the above, assess how the report can be improved. Please write at least 150 words of constructive feedback to help the other team fix any unclear sections and/or show explicitly which parts were done well. Be specific (e.g. quote specific parts where you get confused and explain what you find confusing, etc), offer concrete suggestions for improvement, and explain why these will improve the report.

There are a couple of things that could be added to this report to make it better.

You can incorporate a quantitative analysis, which is crucial for the objective assessment and comparison of experimental conditions. Introducing quantitative methods such as migration distance and coherence would likely provide more robust findings. It would strengthen the validity of the findings as well.

To improve the readability of the report, be more concise in what research questions you want to answer, and **when** you answer each research question. The findings in the report are nice but if they don't concretely answer any research question then it is hard to interpret them. Possibly start off with this in the introduction before jumping into the Cellular Potts model semantics.

Other than that, I really like the setup of the paper. The introduction really shows the understanding of the Cellular Potts model, and you clearly state and explain all the decisions made in the process.

Good Job!

E. Bonus simulations (if any)

Some groups may have chosen to perform additional experiments on top of those requested in the assignment. Please assess their added value using the table below:

1	**2**	**3**	**4**	**Selection:**
There are additional experiments, but it is unclear what their goal was.	*There are additional experiments answering specific questions, but their relation to the main research question is unclear.*	*There are additional experiments that allow a somewhat better answer to the research question.*	*The additional experiments add substantial value to the report.*	*[choose 1-4]*
Additional experiments are not well-designed (e.g. missing baseline or	*Additional experiments are mostly well-designed; with some minor flaws.*		*Additional experiments are well-designed to answer a specific*	*[choose 1,2 or 4]*

varying too many variables at once).			*question.*	
Additional experiments are not analyzed or the analysis is flawed.	*Additional experiments are analyzed in a mostly sensible manner, with only minor flaws.*	*Additional experiments are analyzed in a sensible manner.*	*Additional experiments are analyzed thoroughly.*	*[choose 1-4]*
Conclusions of additional experiments are missing or not supported by the data.	*Conclusions of additional experiments are mostly supported by the data, with minor problems.*	*Conclusions of additional experiments are supported by the data.*	*Conclusions of additional experiments are supported by the data and well-explained.*	*[choose 1-4]*

Group assessment and feedback: Based on the above, please offer suggestions to improve any additional experiments that were performed (if there were none, you can leave this empty).

Your feedback goes here.