

Peer feedback form

Feedback from group:	25
Feedback to group:	12

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:
<i>There are no obstacles or the implementation is so flawed that it does not allow an answer to the research question.</i>	<i>Obstacles are implemented but not (fully) satisfy the criteria, which might affect the ability to answer the research question.</i>	<i>Obstacles mostly match the criteria. Any issues/bugs/artefacts are minor and have little impact on the answer to the research question.</i>	<i>Obstacles are implemented correctly to complete the assignment and answer the research question.</i>	4: The obstacles are spaced correctly and multiple variations of the problem were tried. The simulations helped to answer the research question.

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:
<i>The implementation is strongly flawed (e.g. cells completely fall apart or do not actively migrate at all).</i>	<i>The team used somewhat valid parameters, but the chosen \max_{act}/λ_{act} do not allow collective motion at high density.</i>	<i>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.</i>	<i>The team chose correct parameters from ex1.3, or equivalent ones allowing migration at high densities <u>and</u> alignment as in ex1.3.</i>	"We used the ActivityConstraint with $\lambda_{act} = 200$ and \max_{act} ranging from 20 to 80. This ensures that cells with high past activity

				<p><i>tend to remain active, contributing to persistent migration."</i></p> <p>2: It's not clear what value of MAX_act was used for each simulation.</p> <p>Also, the adjacency / Jacobian matrix J was not clearly defined.</p>
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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:
<i>The # of cells was too low to speak of collective migration; cells mostly did not touch at all.</i>	<i>There were enough cells that some of them were touching, but not enough to speak of "high densities" per the exercise.</i>	<i>The simulation contained an appropriate number of cells to allow for collective migration.</i>	<i>There were enough cells for collective migration, <u>and</u> the experiment varied the number of cells to test sensitivity of conclusions.</i>	4: A good number of cells were inputted. This allows for conclusions on collective movement in high density spaces.
<i>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 collective motion.</i>	<i>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 assess.</i>	<i>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 one obstacle setting.</i>	<i>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 various densities.</i>	1: No baseline.
<i>Comparisons between simulations always changed multiple variables at once (e.g.</i>	<i>Some (but not all) comparisons between simulations changed multiple variables at</i>	<i>[There is no meaningful intermediate here]</i>	<i>All comparisons between simulations kept all but one of the variables fixed, allowing a fair</i>	2: MAX_act should have

both # cells and # obstacles), preventing meaningful conclusions.	once, limiting meaningful conclusions.		assessment of the impact of the changing variable.	either (1) stayed the same, or (2) have been a separate experiment on its own.
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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.	Maybe in the last picture, figure c and d. As these figures look cramped with cells, which does not allow any movement at all.
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, since 2 parameters were changed in one experiment: the MAX_act and the number of evenly spaced grid cells.
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: <ul style="list-style-type: none"> - miss important observations (e.g. because you did not wait long enough) - unfairly compare simulations at different time points 	No, it looks like the cells have converged into collective movement.
Other (please specify):	[COULD BE IMPROVED]: Not enough variety in experiments.	This group only has one experiment. Admittedly, they did this one experiment well. However, the lack of variety comes across as a bit low-effort, as these experiments are the bare-minimum of what you would expect in such a report.

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.

This group did one experiment, which was overall done quite nicely. However, the MAX_act values not being clear for each experiment and the lack of a baseline made it confusing at times, and also hindered the ability to draw a clear conclusion for the research question.

In order to improve the report, this group should note down the exact values for each experiment. Additionally, a baseline should be defined. Furthermore, this group would benefit from trying out more experiments.

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:
<i>There are quantitative analyses in the report, but they do not provide useful information to answer the research question.</i>	<i>There are quantitative analyses in the report, but their added value is limited.</i>	<i>There are quantitative analyses in the report that help answer the research question.</i>	<i>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).</i>	<i>0: No quantitative analysis was given. Only observations.</i>
<i>The implementation seems incorrect, yielding outcomes that make no sense.</i>	<i>[There is no meaningful intermediate here]</i>	<i>[There is no meaningful intermediate here]</i>	<i>The implementation seems correct, yielding reasonable outputs.</i>	<i>0: No quantitative analysis was given. Only observations.</i>

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:
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<i>There are no visualizations at all.</i>	<i>There are visualizations, but they are not showing behaviors that are relevant for the report.</i>	<i>Visualizations are present and mostly relevant and appropriately chosen.</i>	<i>Visualizations are present, relevant, and well-chosen for the effects they are showing.</i>	4 <i>There are image visualisations for each experiment. Moreover, a link for the video simulations is provided.</i>
<i>Visualizations are not very informative (for example: the message is that cells align, but you cannot see directions in the screenshot).</i>	<i>Visualizations are somewhat informative, but some relevant information is missing (e.g. comparing two screenshots without a timestamp).</i>	<i>The visualization shows the relevant behaviors with necessary information, but presentation could be improved to draw attention where needed.</i>	<i>The visualization shows and draws attention to the relevant behaviors, using colors, annotations, and time stamps appropriately.</i>	2 <i>The screenshots are placed side by side to facilitate comparison . However, there is no timestamp and the behaviour is not self-explanatory from the images and no other information is presented in the images..</i>
<i>The figures do not support the message (e.g. the relevant simulations are not shown together).</i>	<i>The figures somewhat support the message, but it is not clear what the message is without reading the main text.</i>	<i>The figures are reasonably self-explanatory, but not well supported by captions.</i>	<i>The figures are self-explanatory, supported by captions highlighting the message and any relevant details.</i>	2 <i>It is not clear what behaviours the authors observed without reading the main text. Captions are not relevant for the behaviour, they only mention the number and position of the obstacles</i>

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

Visualization

There are visualizations for each setup of the experiments, along with a link for videos with the simulations. The narrative text explains very well and clearly each experiment and observed behavior while appropriately referencing the figures. Also, the videos you provided via link clearly illustrate the behaviour you explained in the main text. This is very good.

However, the figures are not self-explanatory. Their caption consists of information only about the number and placement of obstacles. Also, there are no annotations. From the images, I can see that you varied the number of obstacles from one to many, and I can sense that your goal is to see how the number of obstacles influence cell migration. Still, without reading the main text I can't draw any informed conclusion about the visualizations. What was your hypothesis before running the simulation and do they hold after seeing the results? Are the observed behaviors the same over all the duration of the simulation or only at that point when you took the screenshot?

Moreover, there are no timestamps in the images, thus it's not clear if you compare images from the same step of the simulations. If you manage to add all this information in the captions, I consider that the visualisation will be self-explanatory and it will be easier to have a summarization of the most important details about the simulation without relying only on the main text.

Analysis

There was no quantitative analysis for the experiments to accompany the empirical observations.

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:
<i>The report makes several claims that are not backed up by any evidence.</i>	<i>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).</i>	<i>Most claims are supported by evidence, any overclaiming is minor.</i>	<i>All claims are thoroughly supported by evidence; there is no doubt that they are valid.</i>	<p>4: The figures especially make the conclusion immediately clear.</p> <p><i>Tiny note: Because the CPM loops (from edge to edge), your obstacles in (c) and (d) actually aren't evenly spaced around the border, not that it harms the conclusion.</i></p>

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:
<i>There was no clear conclusion, just a description of results.</i>	<i>Some conclusions were drawn, but there was unclear which were the major and minor points.</i>	<i>The main conclusion was clearly highlighted, but it could be explained better.</i>	<i>The main conclusion was clearly highlighted and well explained.</i>	<p>4: The main conclusion indeed is clearly highlighted, as it is the only thing really discussed. The bulk of its argumentation is handled in the discussion part.</p>

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

	Yes/No
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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?	In the conclusion: "results in slower, less organized movement", so I would say Yes
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?	Yes
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")?	To me, 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 research question is answered concretely. The discussion handles most of the findings which can be drawn from the observations of the results.

Things are, however, also handled in the discussion which I personally think shouldn't be there, like : "The red portions of the cell indicate those portions that are experiencing the most activity or movement, while black is the least", should, to me, be something discussed in either 'Methods' or 'Results' as you describe how to read the findings/data.

In the discussion, you mention that figure (c) (the 6 x 6) demonstrates "complete deterioration of the collective migration", however, when looking at the figure, I can still point out streams. In particular, it is noticeable that the whole grid seems to move diagonally from top-left to bottom-right, suggesting that there is still global movement, even though it indeed is more chaotic.

It might be cool to see what, in a certain setting, the minimum amount of obstacles is for the grid to be truly deteriorated regarding collective cell migration.

In the conclusion: "...this change in behaviour is directly proportional to the number of obstacles that are introduced." might be subject to misinterpretation. I think that the amount of obstacles is not directly proportional to the change in behaviour. Rather, there is likely a turning point somewhere, on a curve which kind of looks like a sigmoid function. It is true, I think, that every obstacle introduced is indeed harmful to the migration factor, making it a monotonic phenomenon.

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?	yes
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).	yes, the background section.
If any literature references are cited: do they seem relevant to the presented work?	No cited literature
Are there any claims where you think a literature reference is missing?	Yes, background
Are the methods described sufficiently well that you could reproduce the work <u>without looking at the code</u> ? This means the report should include: <ul style="list-style-type: none"> • 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) 	No, parameter values are incomplete. Explanation is also required for cell initialization. The coordinates of the cells and the obstacles have to be mentioned along with the seed for reproducing the same simulation
Are methods justified?	Yes.
Is it clear how long simulations were running before outputs (data/screenshots) were generated?	No.
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.

Use a table/list for the parameters explained in the Background section. The section is a large compact block of text very hard to read. Additionally, you can use literature citation in this section to provide credibility to your statements.

Additionally, the parameter values are incomplete in such a way that it is not possible for a reader to reproduce your experiments. For example, you don't define an adjacency matrix J, your MAX_act values range without explanation, and your grid values are not clear.

It is not clear at which timestamp you took the screenshots and how long you ran the simulation until that point. To make your results reproducible, you have to give more details regarding the parameters and the setup.

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:
<i>There are additional experiments, but it is unclear what their goal was.</i>	<i>There are additional experiments answering specific questions, but their relation to the main research question is unclear.</i>	<i>There are additional experiments that allow a somewhat better answer to the research question.</i>	<i>The additional experiments add substantial value to the report.</i>	[choose 1-4]
<i>Additional experiments are not well-designed (e.g. missing baseline or varying too many variables at once).</i>	<i>Additional experiments are mostly well-designed; with some minor flaws.</i>		<i>Additional experiments are well-designed to answer a specific question.</i>	[choose 1,2 or 4]
<i>Additional experiments are not analyzed or the analysis is flawed.</i>	<i>Additional experiments are analyzed in a mostly sensible manner, with only minor flaws.</i>	<i>Additional experiments are analyzed in a sensible manner.</i>	<i>Additional experiments are analyzed thoroughly.</i>	[choose 1-4]
<i>Conclusions of additional experiments are missing or not supported by the data.</i>	<i>Conclusions of additional experiments are mostly supported by the data, with minor problems.</i>	<i>Conclusions of additional experiments are supported by the data.</i>	<i>Conclusions of additional experiments are supported by the data and well-explained.</i>	[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.