

Tricking your cerebellum with a reaching task

Exercise 1 – Perturbation & after-effect

General structure & grading

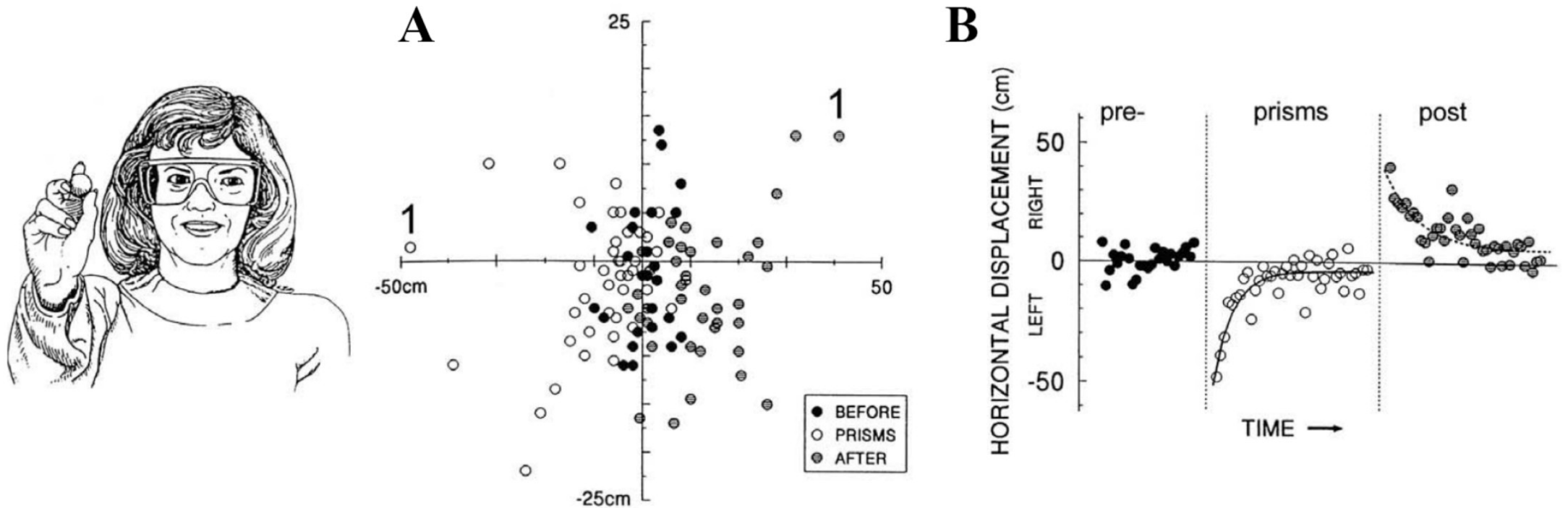
- TASK 1: Implementation of new aspects in reaching experiment (3 points [*])
- TASK 2: Analysis of experiment on unbiased(!) subjects (3 points [*])
- TASK 3: Discussion, full-text, < 200 words (3 points [*])
- Bonus TASK 4: Try out your ideas, just state what you did and why it was interesting to you (1 point [y/n])

solid -> 3 , missed detail -> 2, right direction -> 1, nothing related -> 0,
→ max. 10 points for each exercise, max. 40 points in total

What you submit

- Get together in teams of two and ideally keep these teams for all 4 exercises.
- Decide which of you will correspond with me (Magnus Ostertag) in Slack via 'direct message'.
- One jupyter notebook or text document per team
(filename: Reaching_Task_2026_Ex<no>_<lastname1>_<lastname2>):
 - Task 1: Copy the relevant sections of code.
Describe in two short sentences the core issues solved.
 - Task 2: Calculations, tables and/or plots with captions.
 - Task 3: Answer at least all given questions briefly (< 200 words total).
 - Task 4: One sentence on what you did and one sentence why it was interesting to you.
- + Executable copy of your code ([filename '_code'])
- Deadline: 1 week, on the day of the next lecture at 8 p.m.
- I will reply to your message with the grading for each task: e.g. [3 2 2 1]
- Next tutorial: Two random groups will present their solutions and we discuss.

Prism goggles experiment



[Martin et al.: *Throwing while looking through prisms* (1996)]

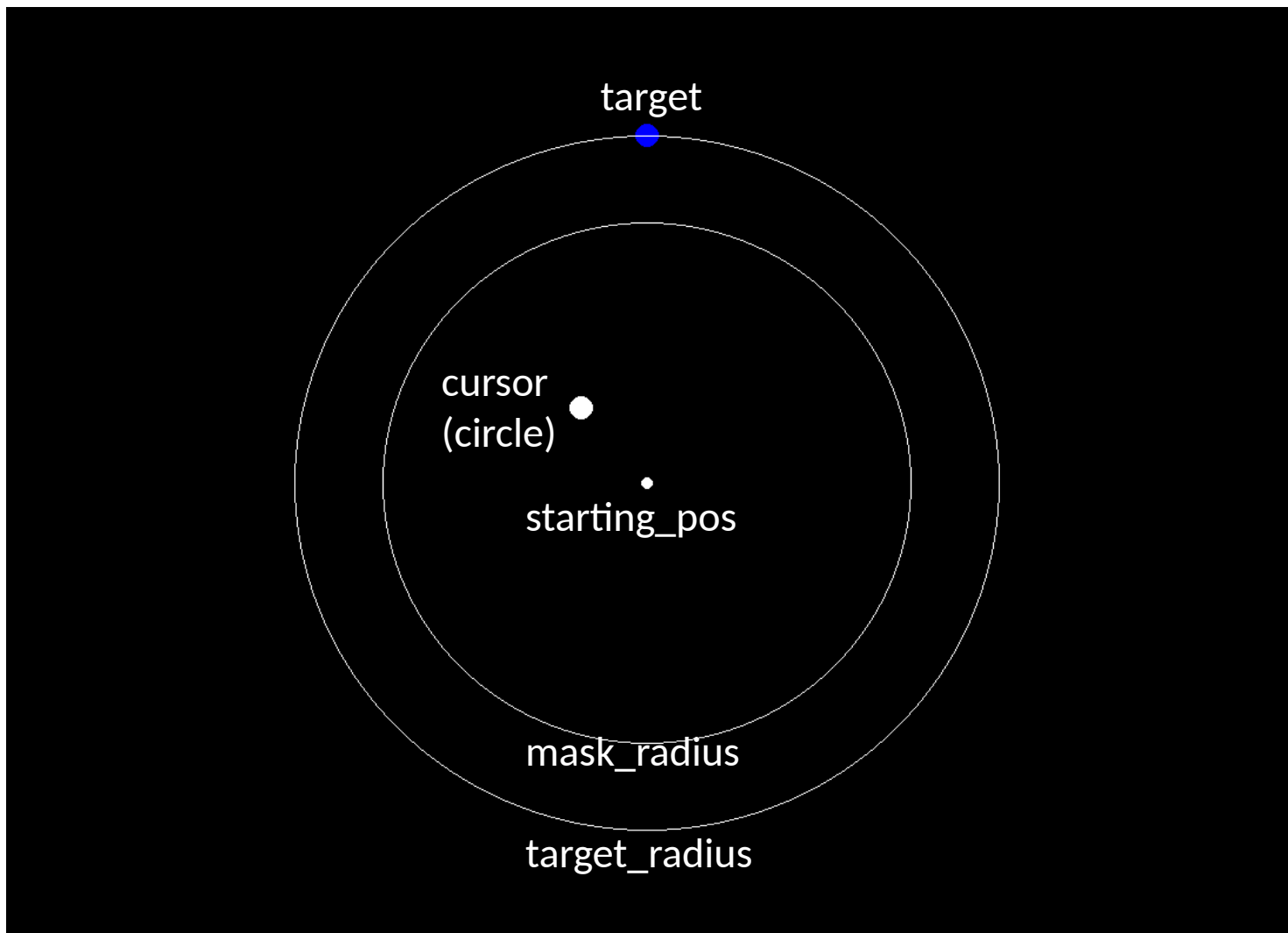
Reaching task

Score: 24
Attempts: 32

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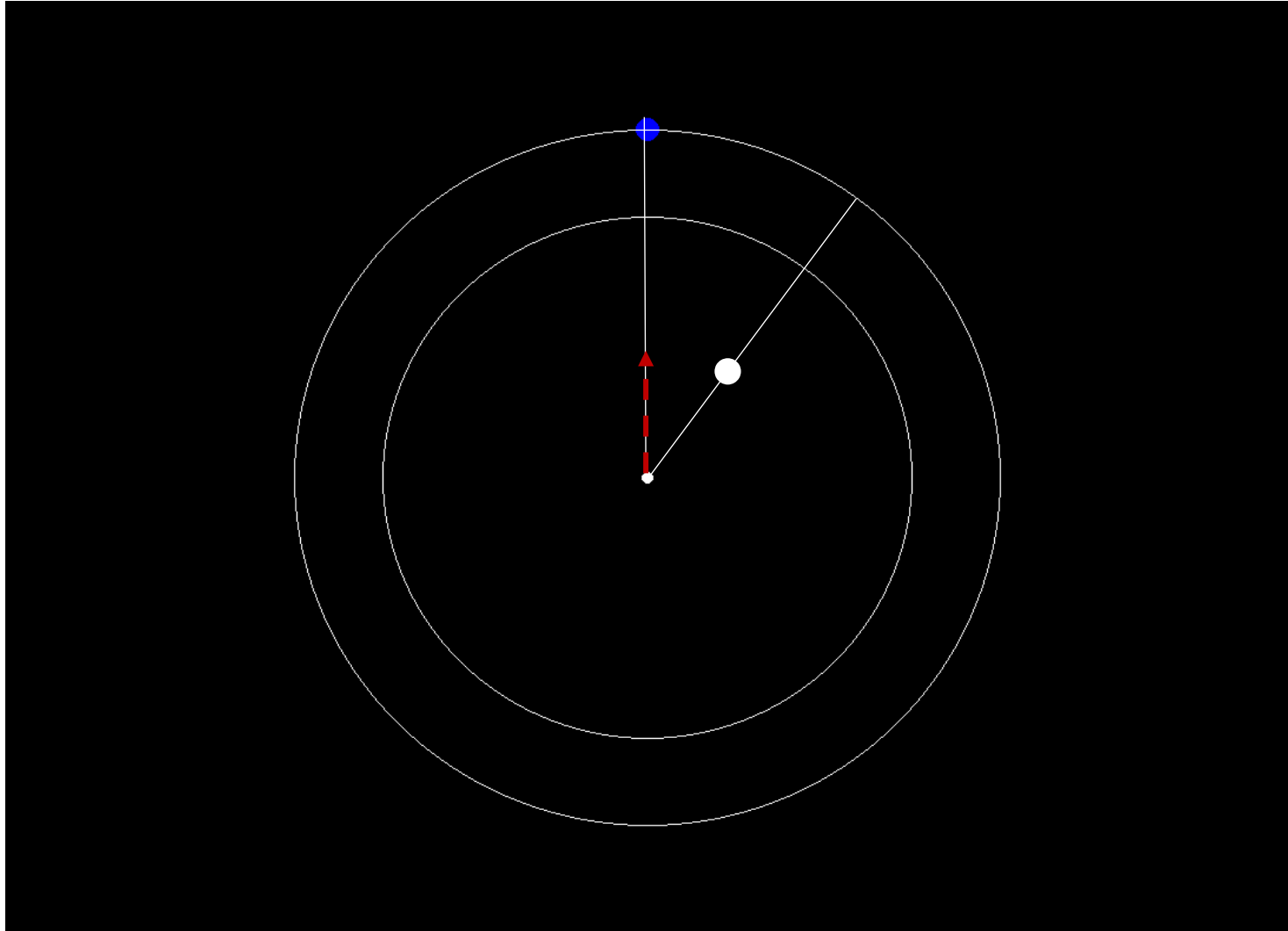
Playing field



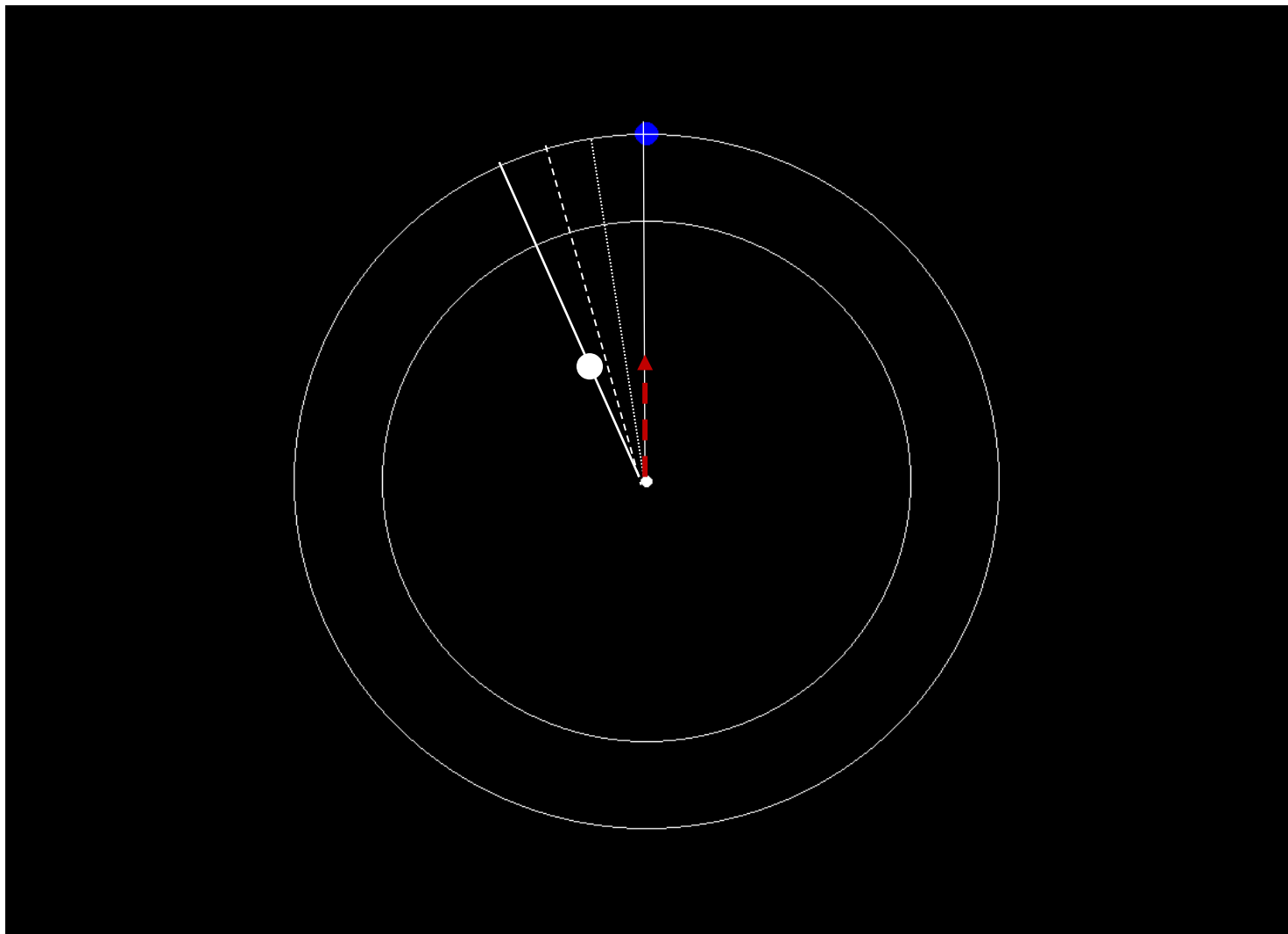
Exercise 1

- TASK 1: Implementation of perturbation
 - Implement a **sudden** clockwise perturbation of 30°
 - Implement a **gradual** counterclockwise perturbation of 3° (10 steps, 3 attempts each)

Sudden perturbation



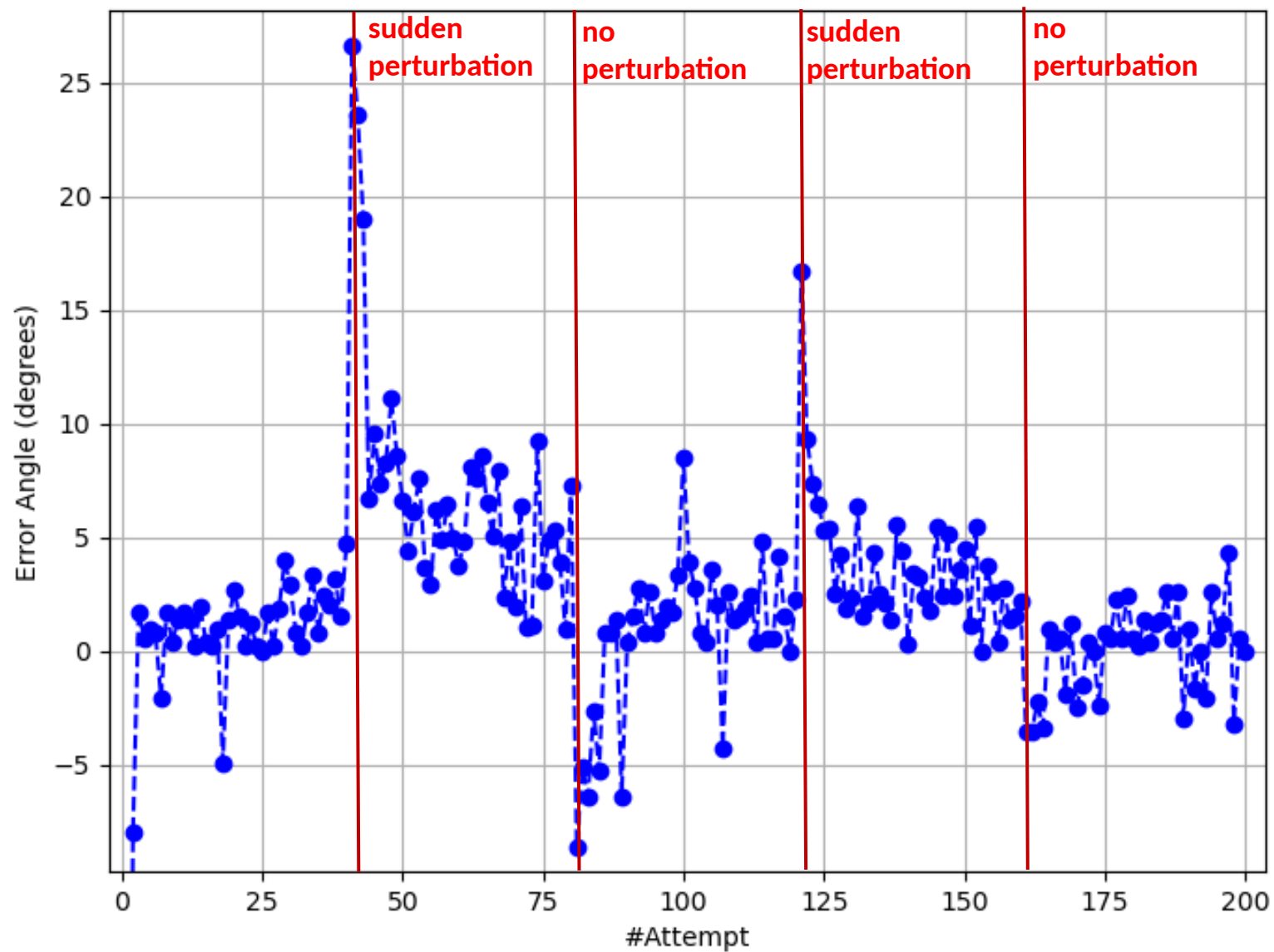
Gradual perturbation



Exercise 1

- TASK 1: Implementation of perturbation
 - Implement a **sudden** clockwise perturbation of 30°
 - Implement a **gradual** counterclockwise perturbation of 3° (10 steps, 3 attempts each)
- TASK 2: Analysis of experiment on unbiased subjects
 - Calculate the signed **error_angles** between target and circle cursor, **exclude** slow attempts where 'MOVE FASTER' appeared.
 - **Plot** the error angles over all attempts and **highlight** the experiment's segments
 - What's the motor variability (MV) in the unperturbed segments?
 - Run the experiment a second time with `mask_mode=false`. What do you **observe** in subject's movements in the now unmasked part?

Analysis



Exercise 1

- TASK 1: Implementation of perturbation (3 points)
 - Implement a **sudden** clockwise perturbation of 30°
 - Implement a **gradual** counterclockwise perturbation of 3° (10 steps, 3 attempts each)
- TASK 2: Analysis of experiment on unbiased subjects (3 points)
 - Calculate the signed **error_angles** between target and circle cursor, **exclude** slow attempts where 'MOVE FASTER' appeared.
 - **Plot** the error angles over all attempts and **highlight** the experiment's segments
 - What's the motor variability (MV) in the unperturbed segments?
 - Run the experiment a second time with `mask_mode=false`. What do you **observe** in subject's movements in the now unmasked part?
- TASK 3: Discussion of your results (3 points)
 - What do you see when perturbation is introduced? Is there an after-effect? What is the difference between gradual and sudden perturbation? Why is it important to mask the last part of the trajectory?
- Bonus TASK 4: Try out your ideas, just state what you did and why it was interesting to you (1 point [y/n])