MOBILE ROBOTS
Introduction to the Projects

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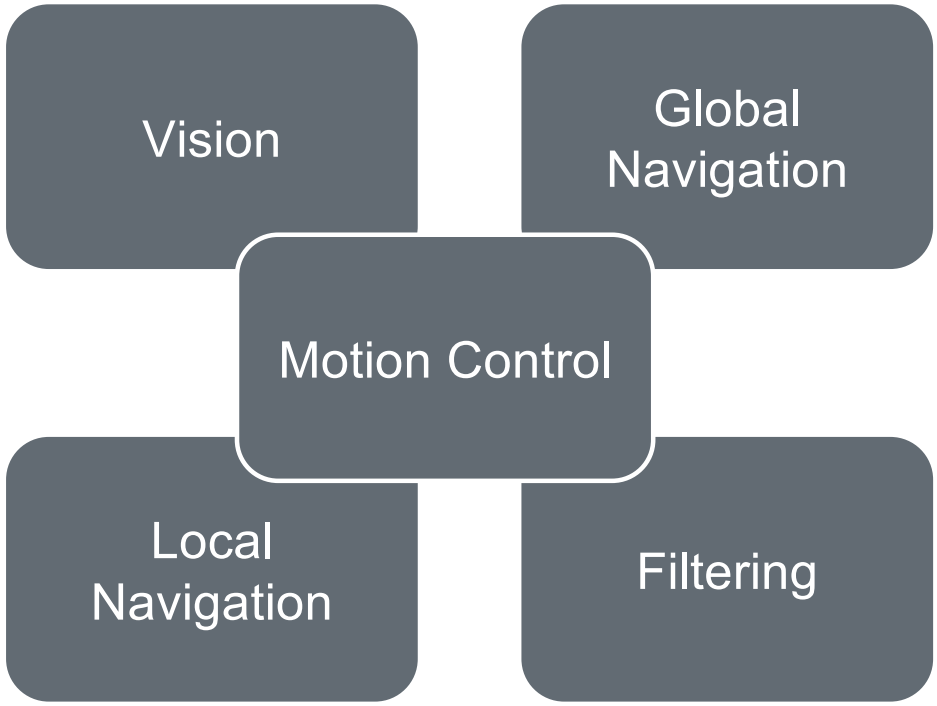
Course Topics (with project)

Week 1	Components of a mobile robot	**Week 8**	Uncertainties
Week 2	Vision	**Week 9**	Localisation 2 + Project week 1 (+ team building)
Week 3	Vision & ANN & ML	**Week 10**	Project week 2
Week 4	Navigation	**Week 11**	Project week 3 + group work check
Week 5	Navigation	**Week 12**	Project week 4 + Project presentations
Week 6	Localisation 1	**Week 13**	Project presentations + group debriefing
Week 7	Uncertainties	**Week 14**	Pr. presentations + Conclusion + Dry Exam

Project Information

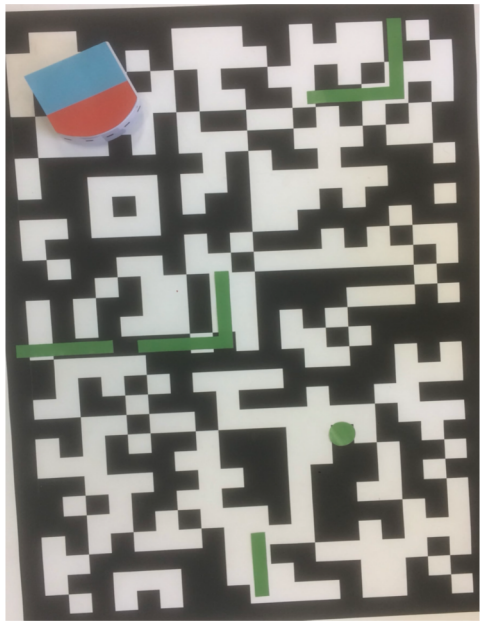
- Groups of 4 students
- Presentations week 13
- 4 weeks without exercise sessions (weeks 9-12) to work on it, note that there is a full lecture week 9 (today) and a case study week 10.
- TAs available from 17:15 to 19 on Tuesdays during the project, in the exercice room / online.
- Please use the forum, to allow everybody to benefit from the response.
- Training / development of group working skills (+ evaluation of impact)

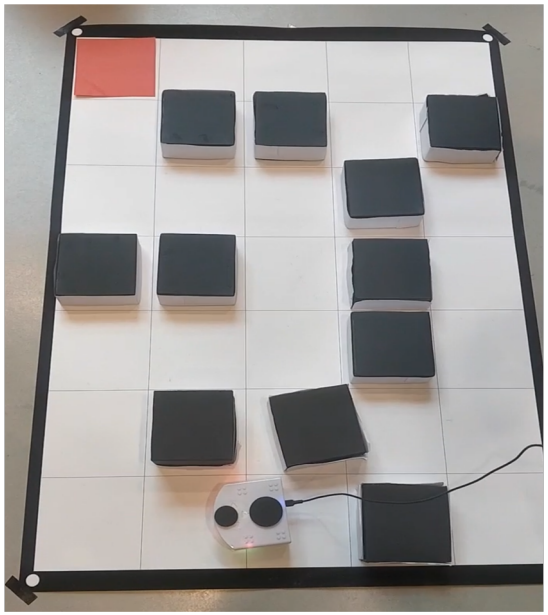


Components that are required for the project

Project Description - 1. Create an Environment

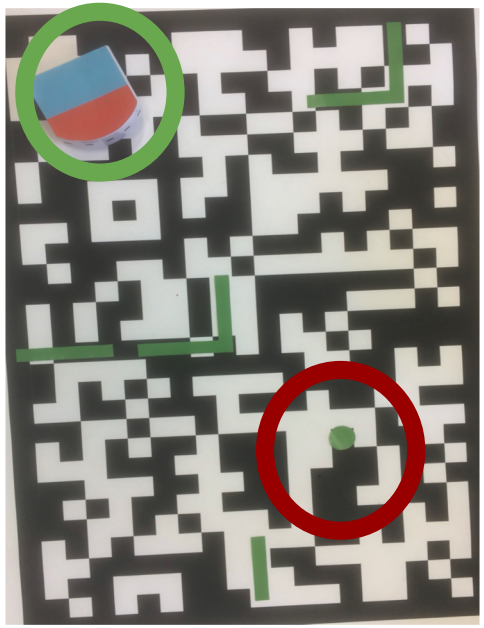
Your environment has to contain a set of obstacles that the Thymio avoids through **global navigation**. That is to say, the Thymio should avoid these obstacles without using the sensors to detect them.

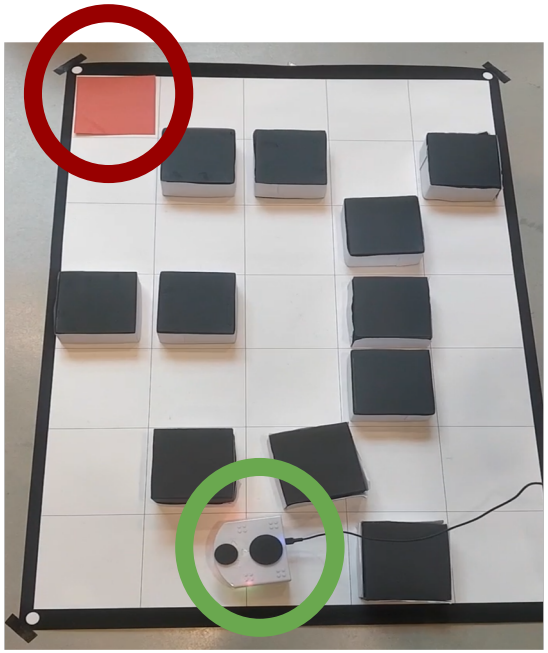




Project Description - 2. Find the best path

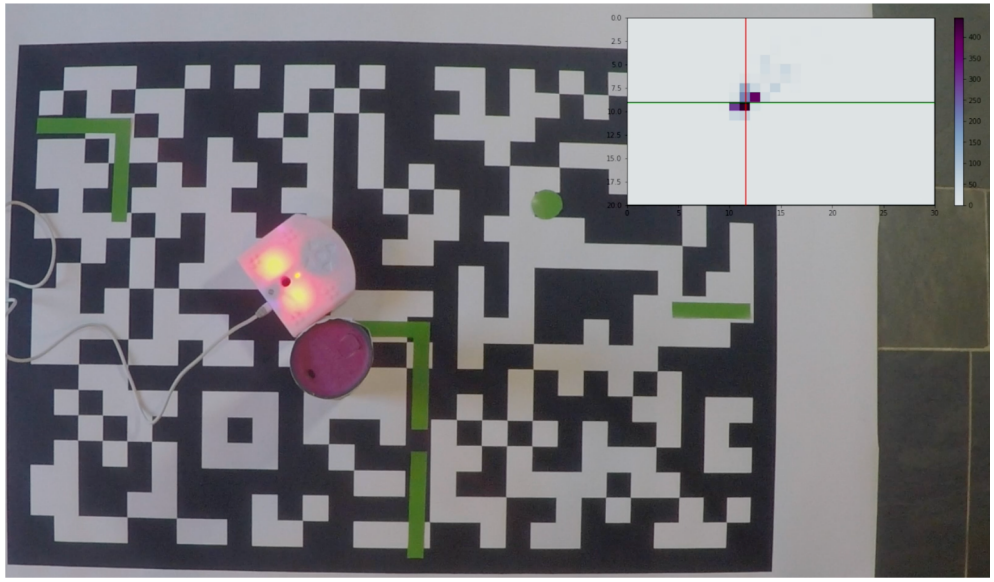
The objective is that the Thymio goes from **an arbitrary position** in the map **to a target that can be placed anywhere in the environment**. These will be changed during the demo to see how your system performs.

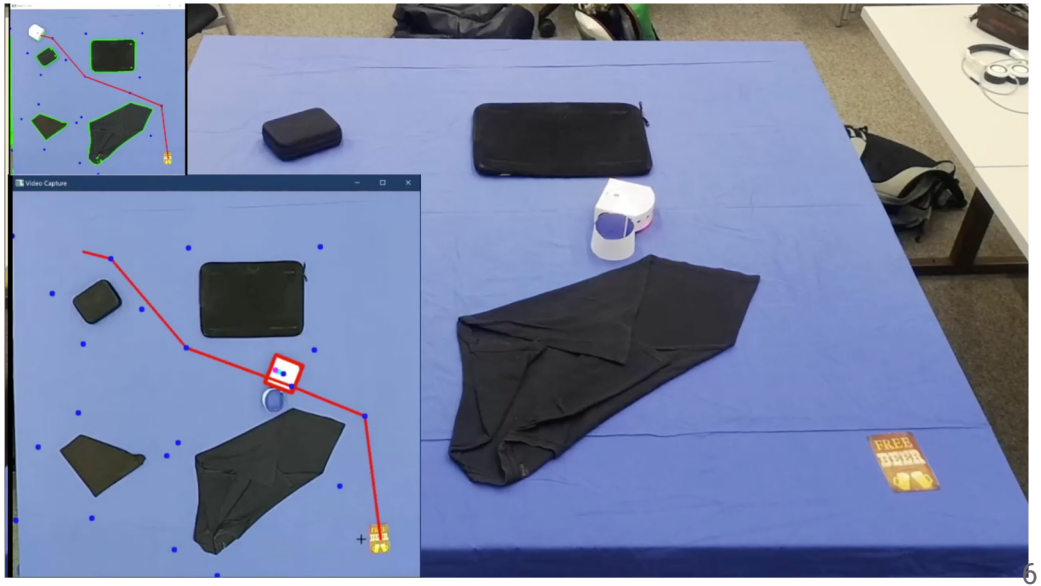




Project Description - 3. Motion Control & Pose est.

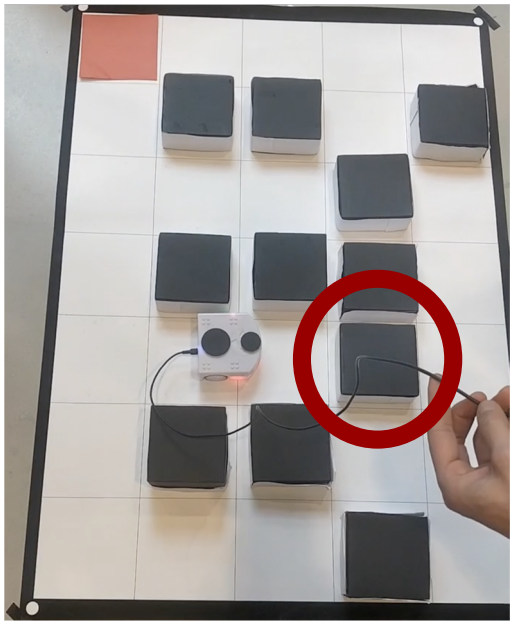
You will have to **control** the robot to help it move along the path. This requires an accurate estimate of the position of the robot which you will have to obtain through **bayesian filtering**.

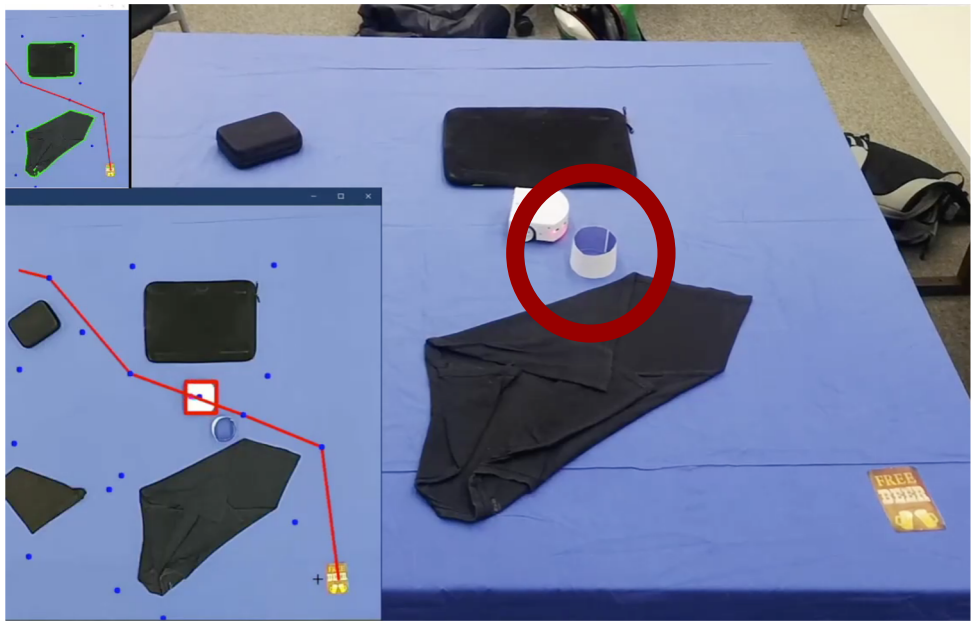




Project Description - 4. Avoid Obstacles

While navigating, the Thymio will have to use **local navigation** to avoid **physical obstacles that can be put in its path at any point in time**. You are free to choose what these physical objects are.





Examples from Autumn 2019-2020

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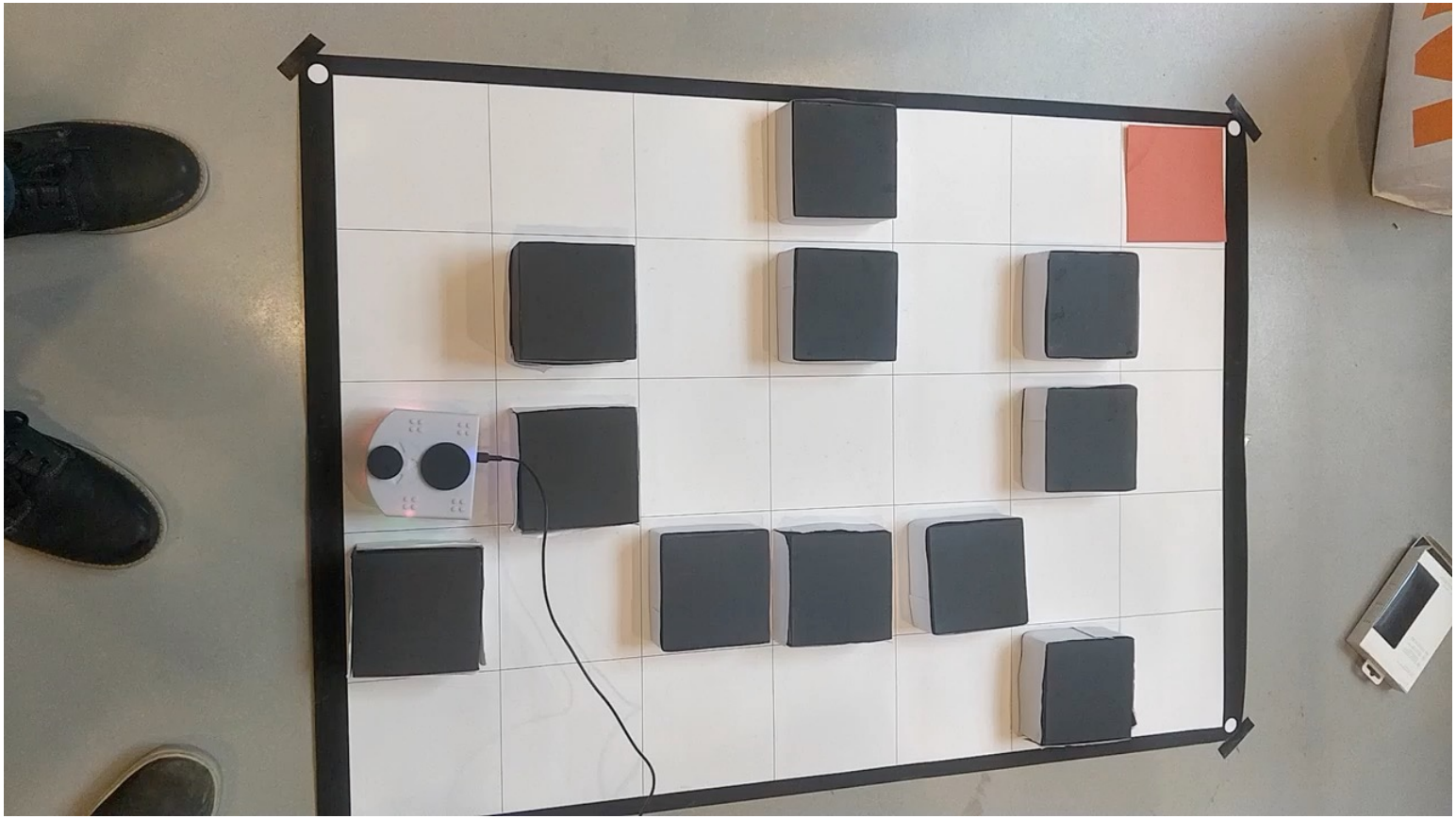
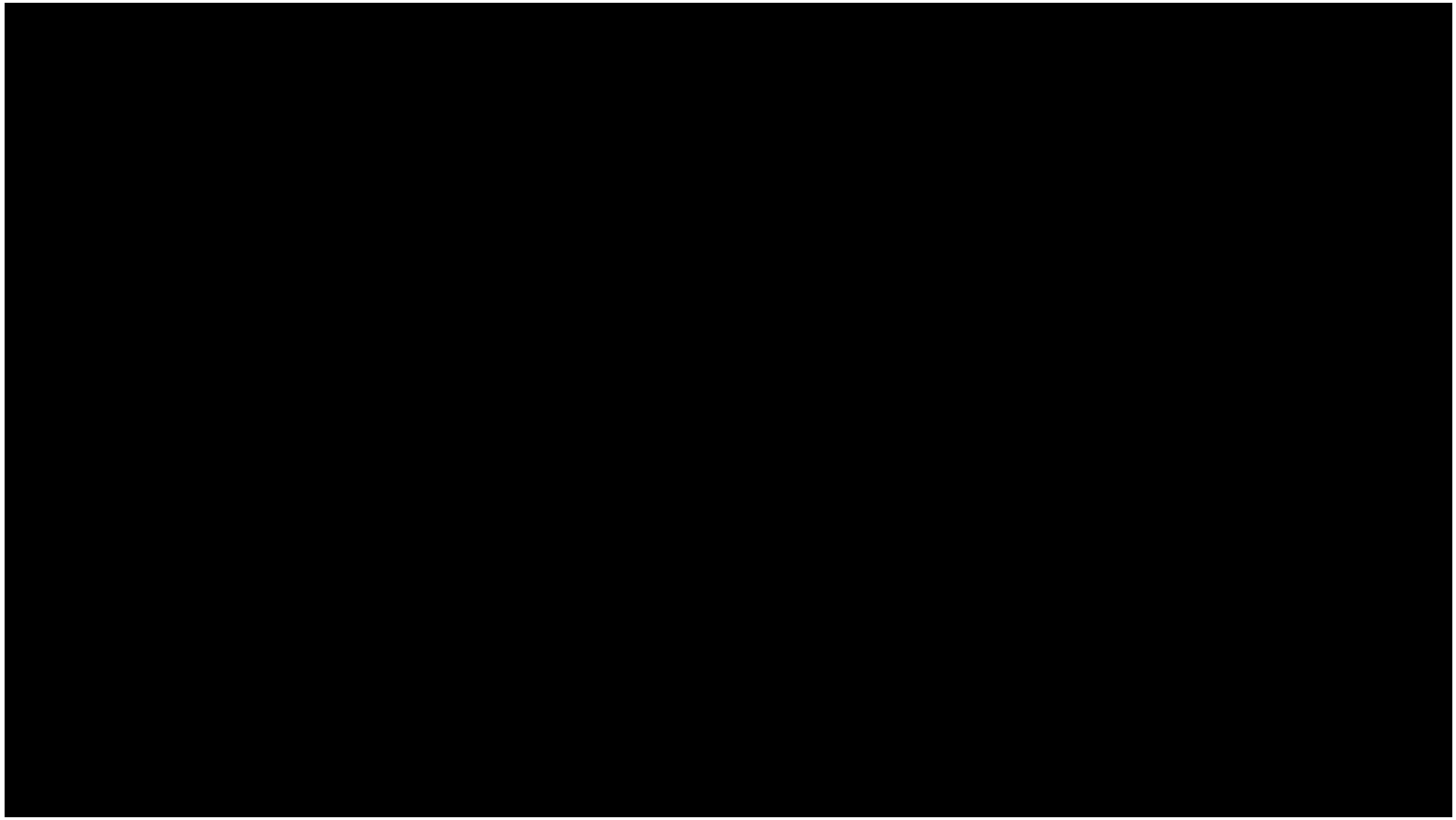


Examples from Autumn 2019-2020

Examples from Autumn 2010-2021



Deliverables

A Jupyter notebook which serves as a **report**. This must contain the information regarding :

- The members of the group, it's helpful to know who you are when we go over the report.
- An introduction to your environment and to the choices you made.
- Sections that go into a bit more detail regarding the implementation and are **accompanied by the code** required to execute the different modules independently. What is important is not to **simply describe the code**, which should be readable, but describe what is **not** in the code: the theory behind, the choices made, the measurements, the choice of parameters etc. Do not forget to cite your sources ! You can of course show how certain modules work in simulation here, or with pre-recorded data.
- A section which is used to run the overall project and where we can see the path chosen, where the system believes the robot is along the path before and after filtering etc… This can also be done in a .py file if you prefer. Just make sure to reference it in the report so we can easily have a look at it.
- Conclusion

The **code** used to execute the overall project. Do not hesitate to make use of .py files that you import in the notebook. The whole body of code does not have to be in the Jupyter notebook, on the contrary! Make sure the code **clean and well documented**. Somebody who starts to browse through it should easily understand what you are doing.

Deliverables

- A live (ZOOM!) **demonstration** preceded by a **short presentation** to explain what you did and why. Groups that had prepared slides for the demonstration last year were able to explain in a much clearer and more organised way what they had done and why.

- A backup video of your project at a stage where the modules were working is always a good idea. You never know what may go wrong during the presentation. We of course do prefer a live demo that works.

Tips

- **Before next week take the time to think through the choice of environment, obstacles, algorithms**
- We will ask you to do some team buiding next week to explore the skills you have in the team and use them well
- Next week we will ask you to defin the project and then organize your work.
- Do a schedule and stick to it. Take note of the amount of time you think you will need and how much time you actually took. This will help you in future projects.
- Do not underestimate the time it will take to put the different modules together. Many groups waited until the last weekend to do so and struggled with the submission.
- Do not hesitate to use libraries for certain portions of the project. Just make sure you understand how the libraries and the underlying algorithms work. You will be asked questions in the presentation regarding the different modules.

Practical Information

- by **tomorrow evening, Wednesday November 8, 23:00, please fill in** the survey on skills
- Presentation: 3 minutes of introduction, 3 minutes of demo, remaining 20 minutes of questions/answers
- Registration for the presentations slots (no worries, many available) will be open once you have the list of team members.