

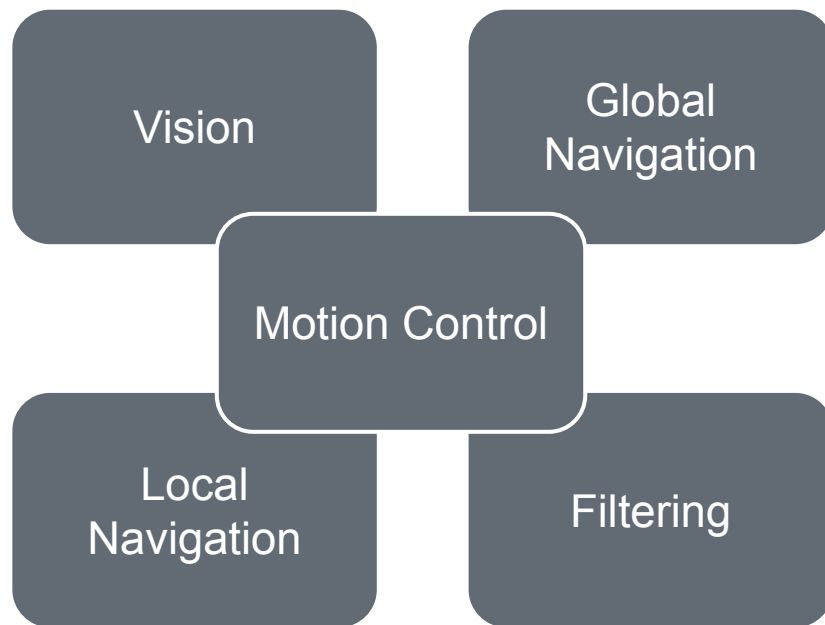
MOBILE ROBOTS

Intro to Projects

Prof. Francesco Mondada

Project Information

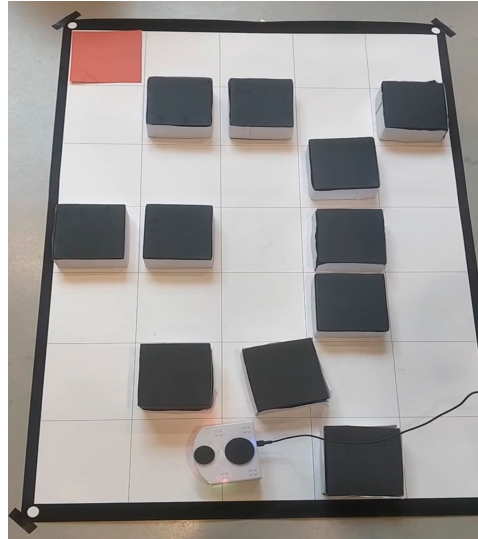
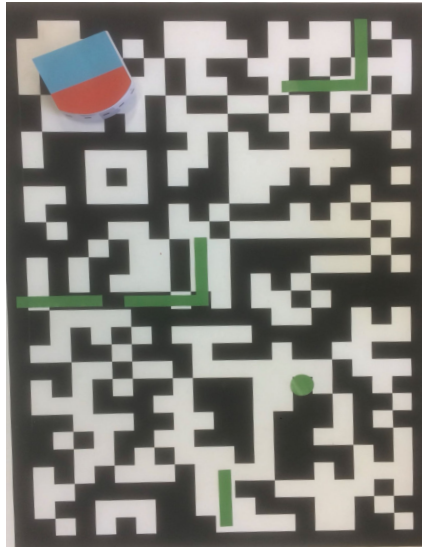
- Groups of 4 students
- Presentations weeks 13 & 14
- 4 weeks without exercise sessions (weeks 9-12) to work on it, note that there will be a full lecture week 9 and a case study week 10.
- TAs available from 15h - 19h on Tuesdays during the project
- Please use the forum, to allow everybody to benefit from the response.



Components that are required for the project

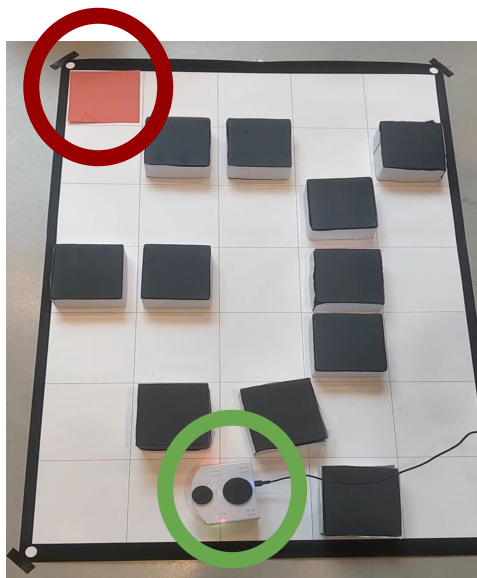
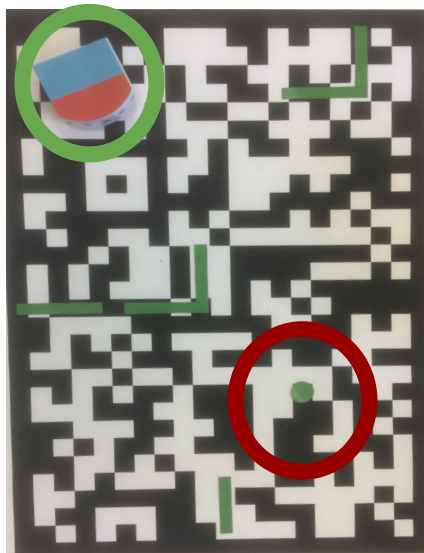
Project Description – 1. Create an Environment

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.



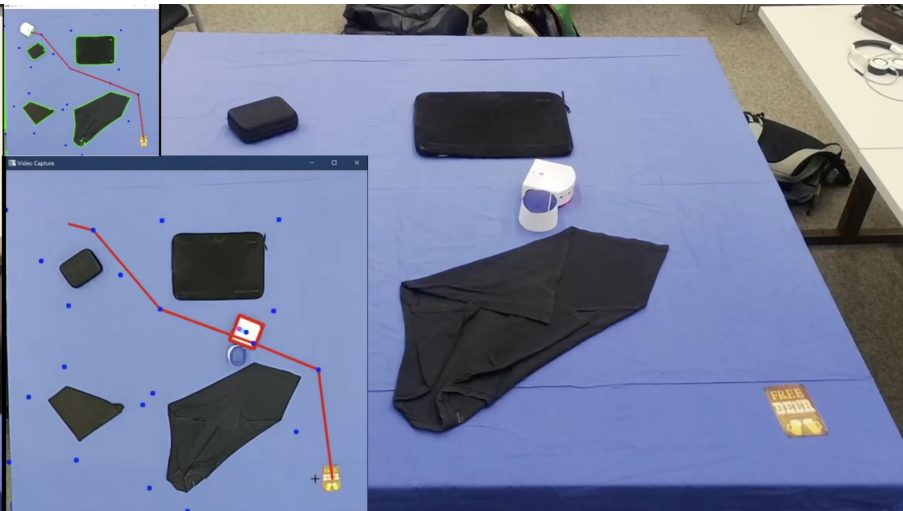
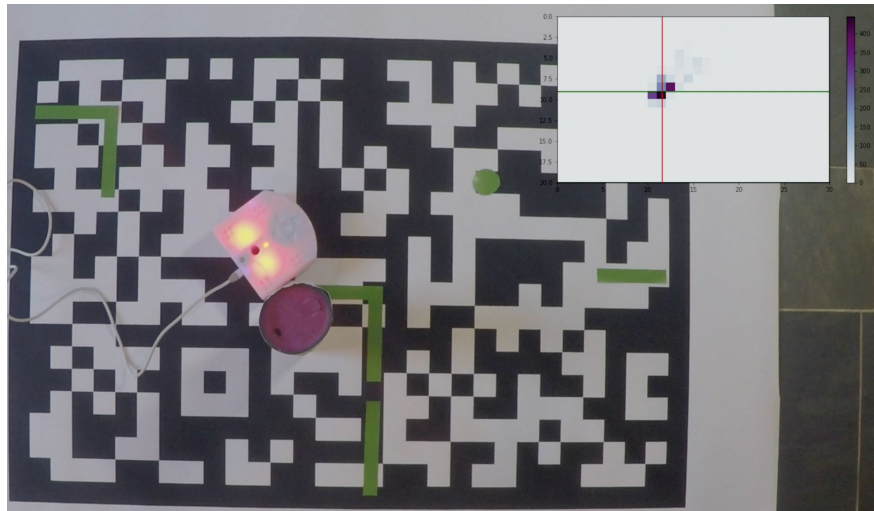
Project Description – 2. Find the best path

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.



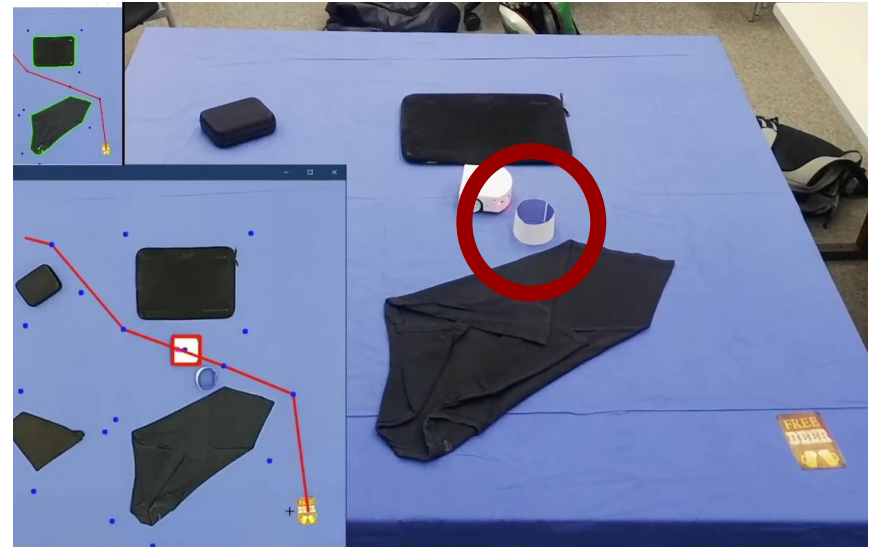
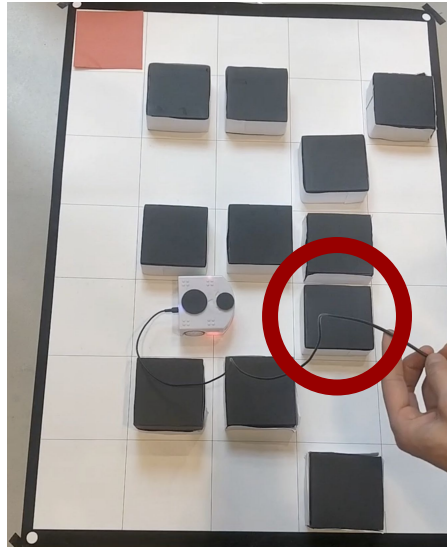
Project Description – 3. Motion Control & Filtering

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 **filtering** to compensate for noisy or lossy data.

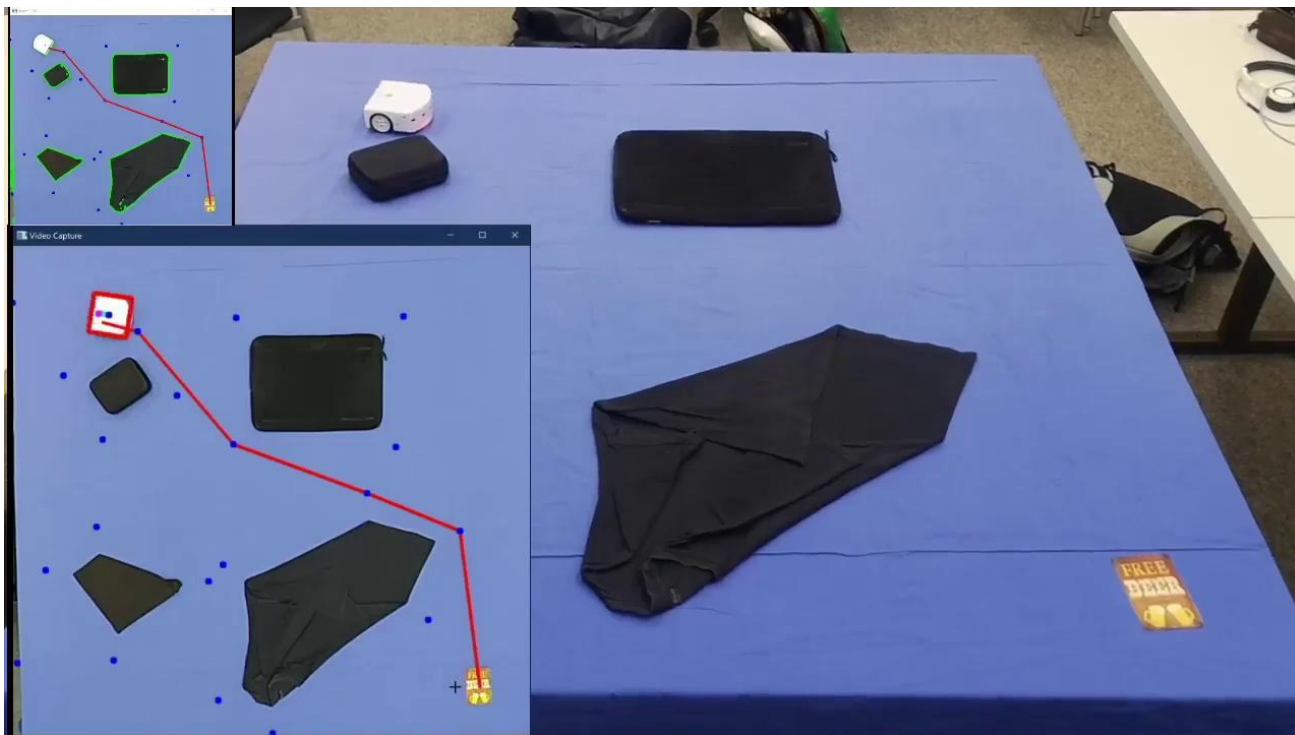


Project Description – 4. Avoid Obstacles

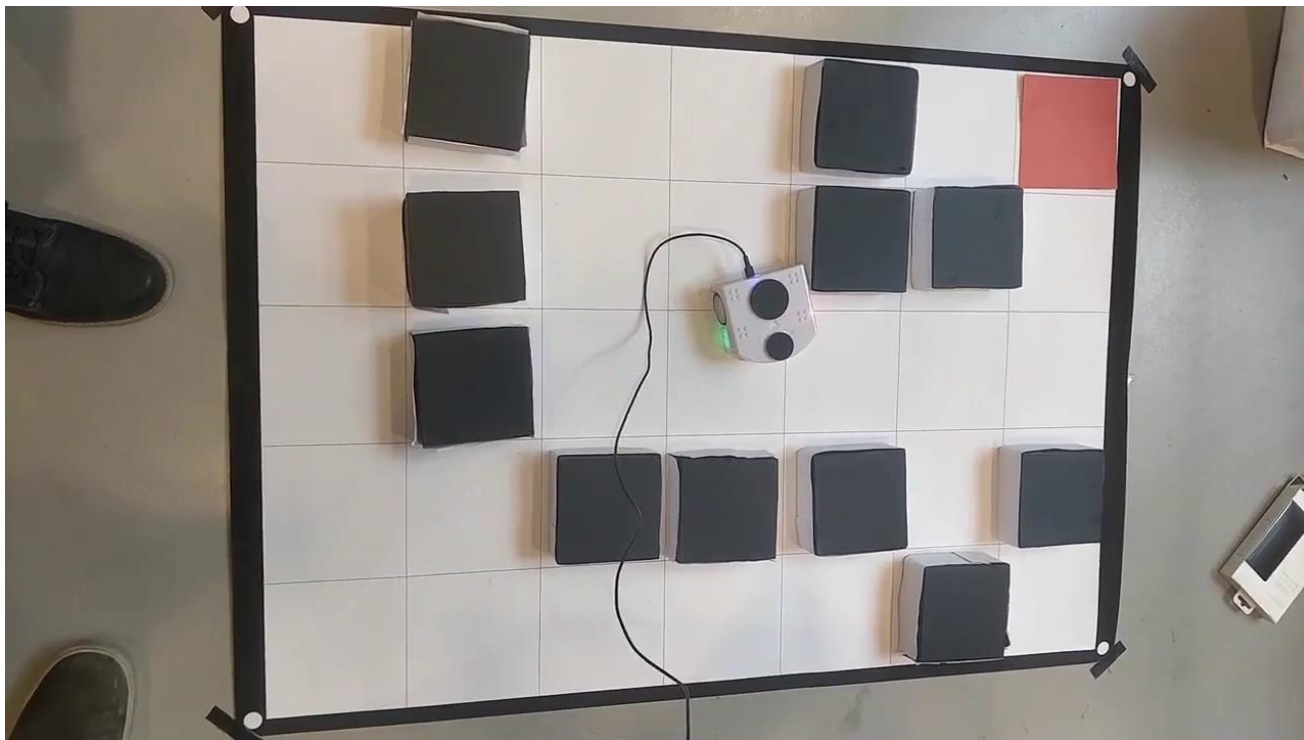
While navigating, the Thymio will have to use **local navigation** to avoid **physical obstacles that can be put in its path at any point in time**. You are free to choose what these physical objects are.



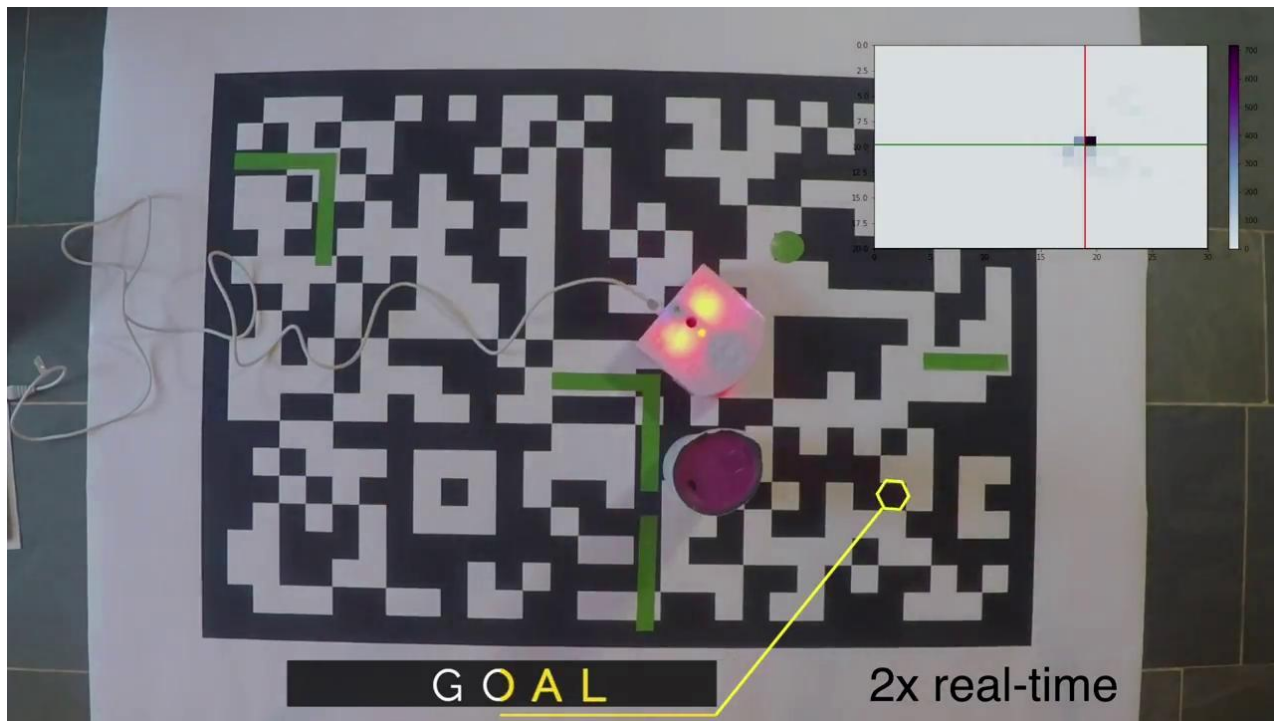
Examples from Autumn 2019–2020



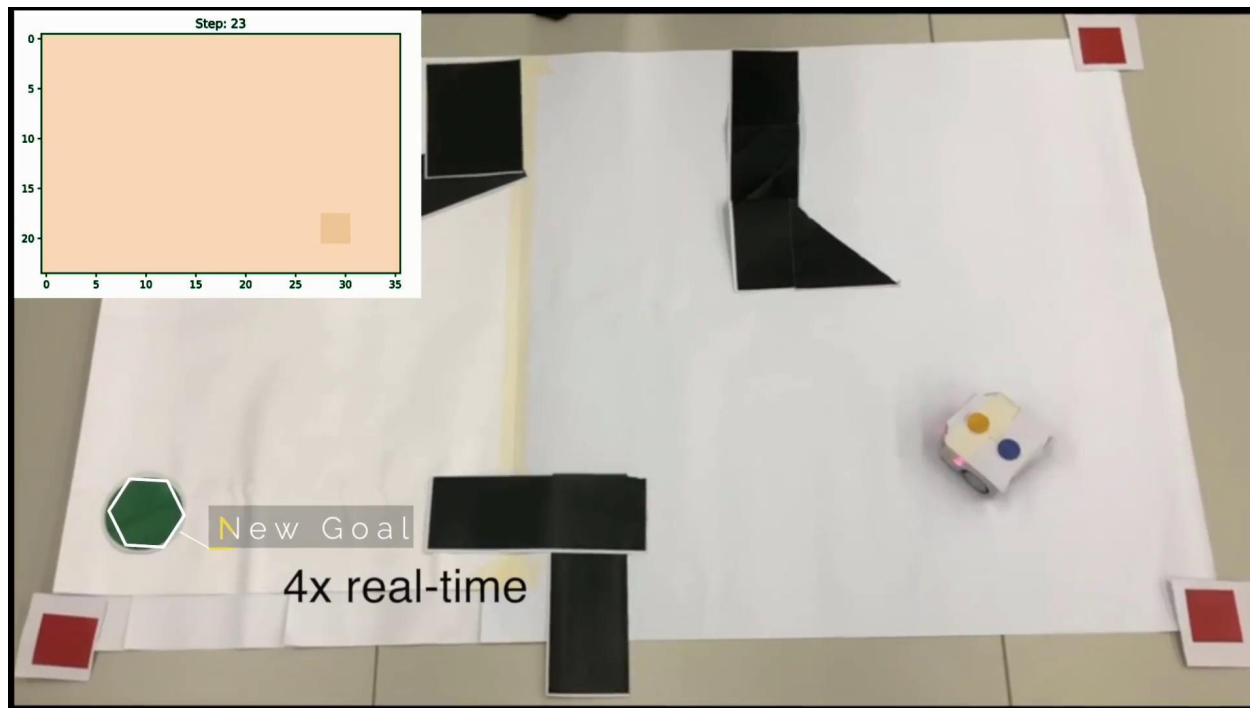
Examples from Autumn 2019–2020



Examples from Autumn 2019–2020



Examples from Autumn 2019–2020



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. You can of course show how certain modules work in simulation here, or with pre-recorded data. Do not forget to cite your sources !
 - 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 **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

- At the start of the project take the time to think through the choice of environment, obstacles, algorithms and **how the modules interconnect**. Groups that took more time to plan in the beginning made better choices which helped them save time in the long run.
- 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

- Deadline for submitting the project on Moodle: **Monday December 7th, 1:00 AM**
 - We had originally put 6am but found that too many students spent the night working on the project. Many said they preferred an earlier deadline.
- Presentation: 5 minutes of introduction, 3 minutes of demo, remaining 20 minutes of questions/answers
- Registration for the presentation slots will open on Moodle on November 17th at 15:15