

RoboGen Introduction

Evolutionary Robotics Course

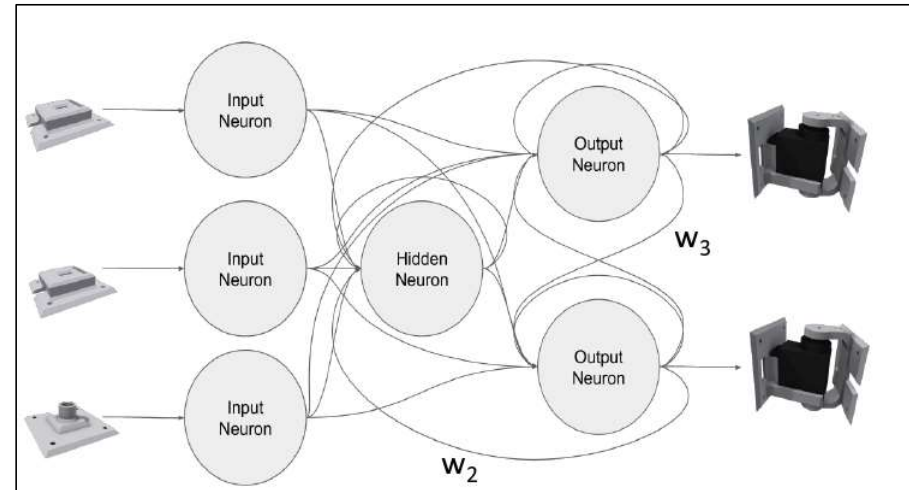
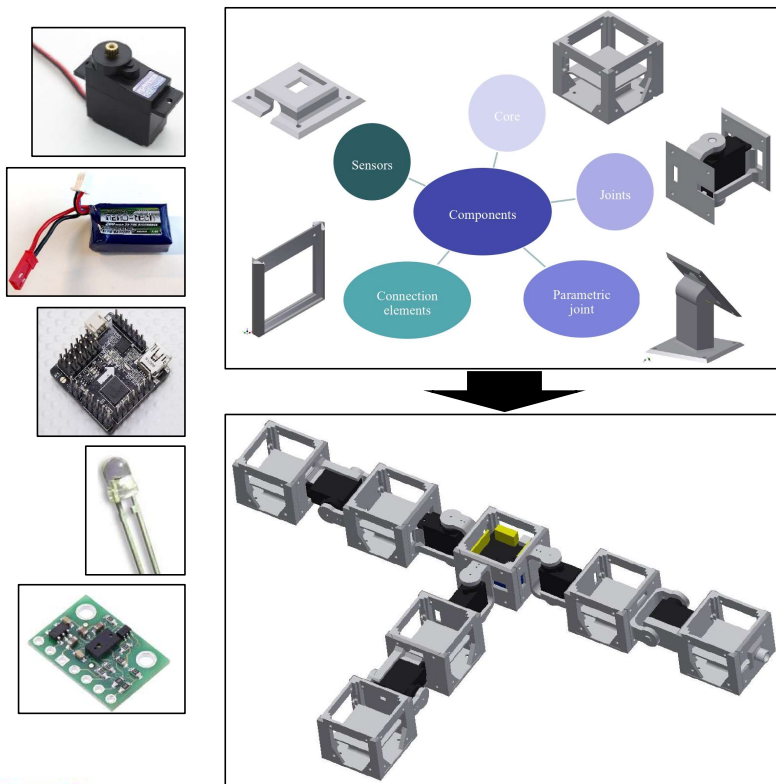
Professor Dario Floreano

Assistants:

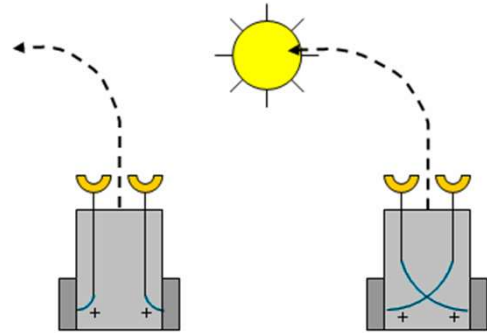
Euan Judd

Krishna Manaswi Digumarti

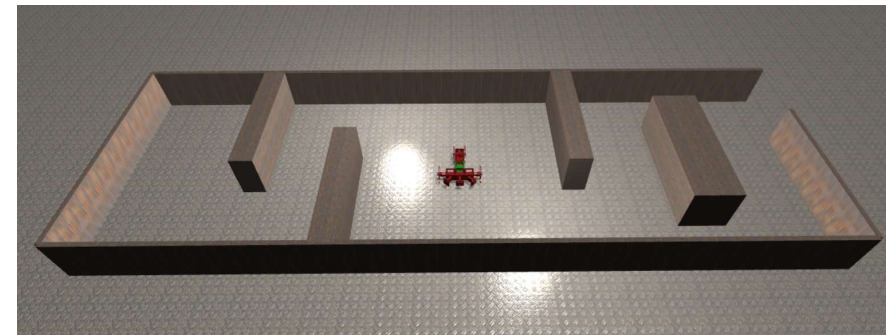
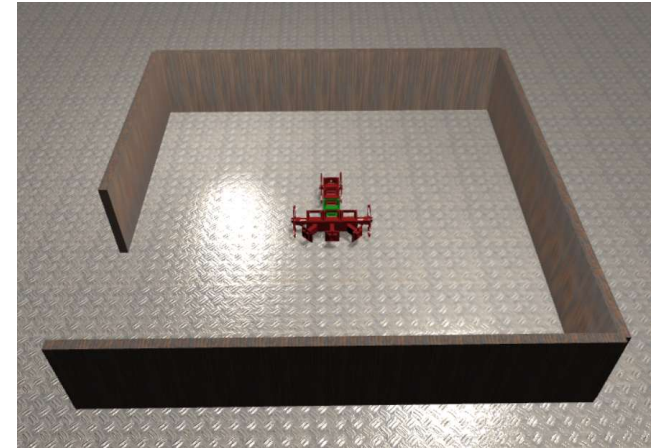
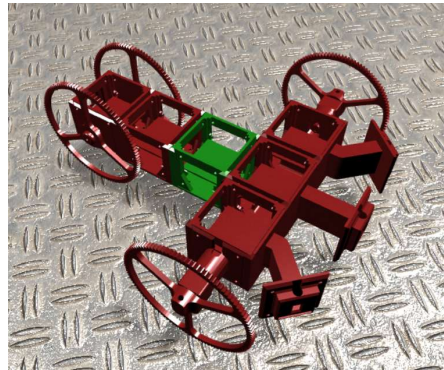
RoboGen allows co-evolving a robot's morphology and controller using 3D printed parts and off the shelf components.



The simplest neural connections can result in interesting behaviour.



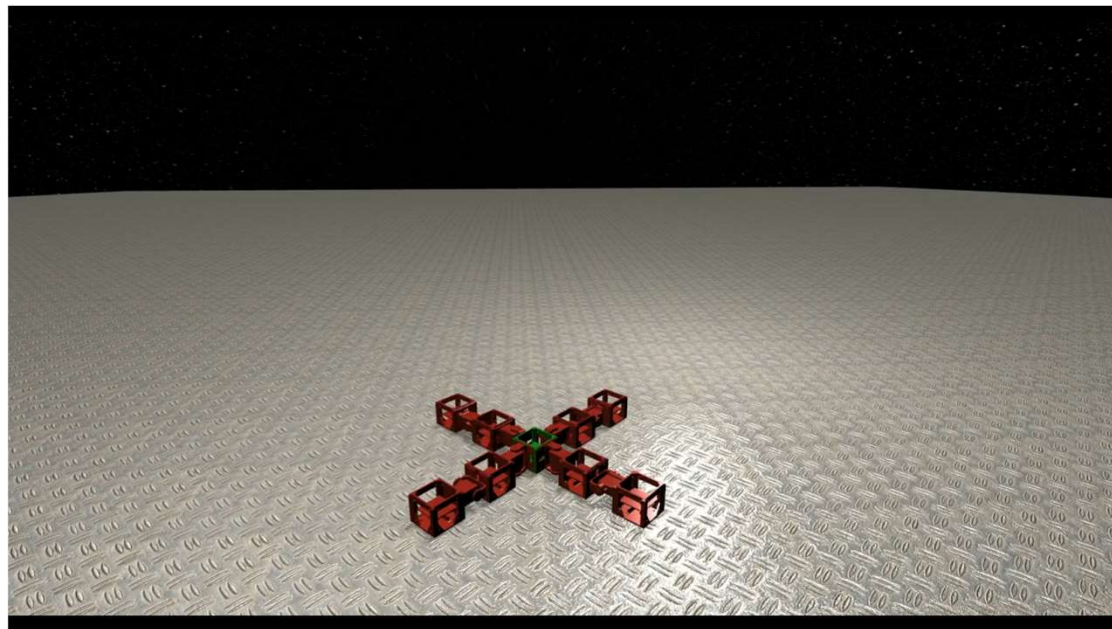
Braitenberg vehicles



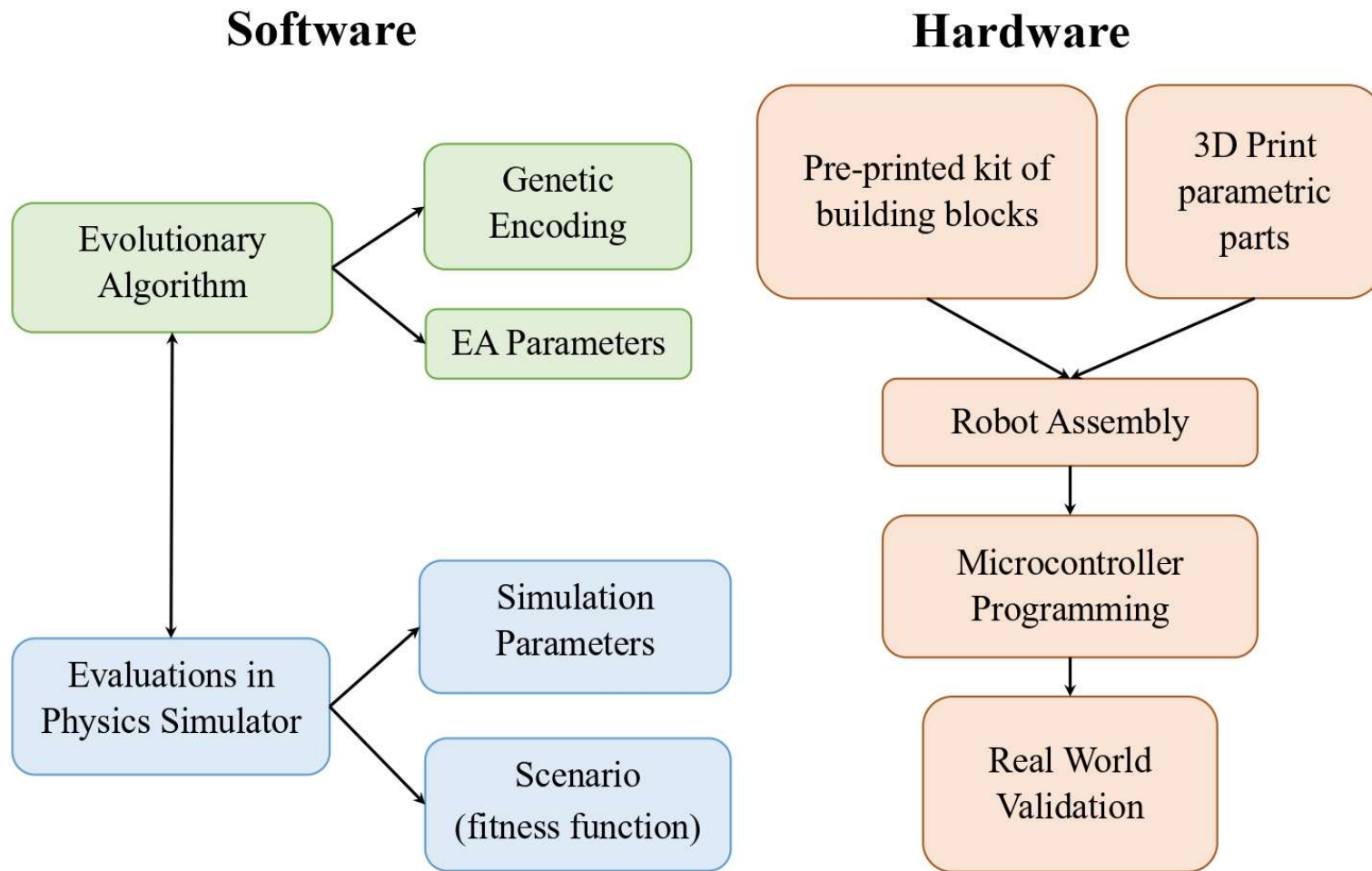
RoboGen is open source and has an evolution engine, simulation engine and WebGL based visualisation.

RoboGen™

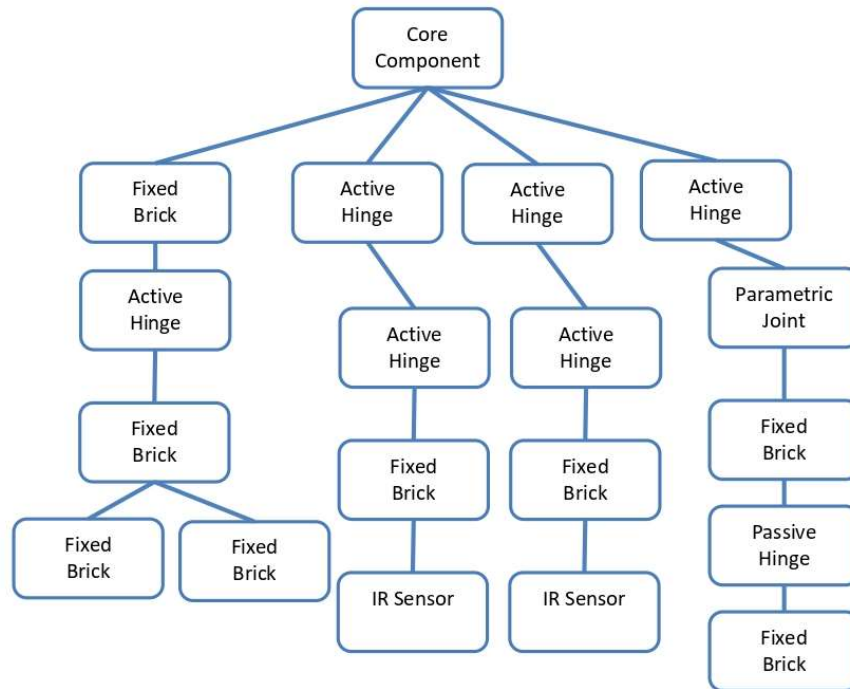
- <https://github.com/lis-epfl/robogen>
- <http://robogen.org/app/>



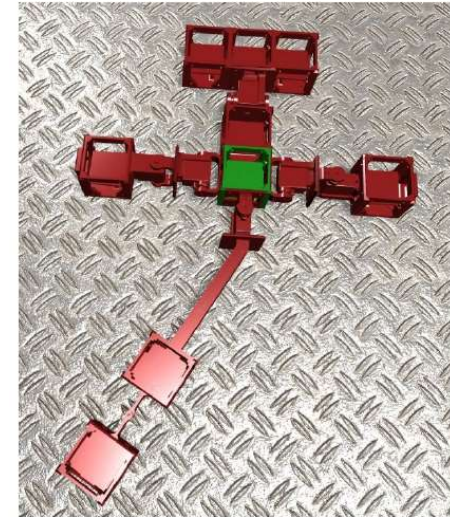
Co-evolution of Robot Bodies and Brains



Software: Genetic Encoding

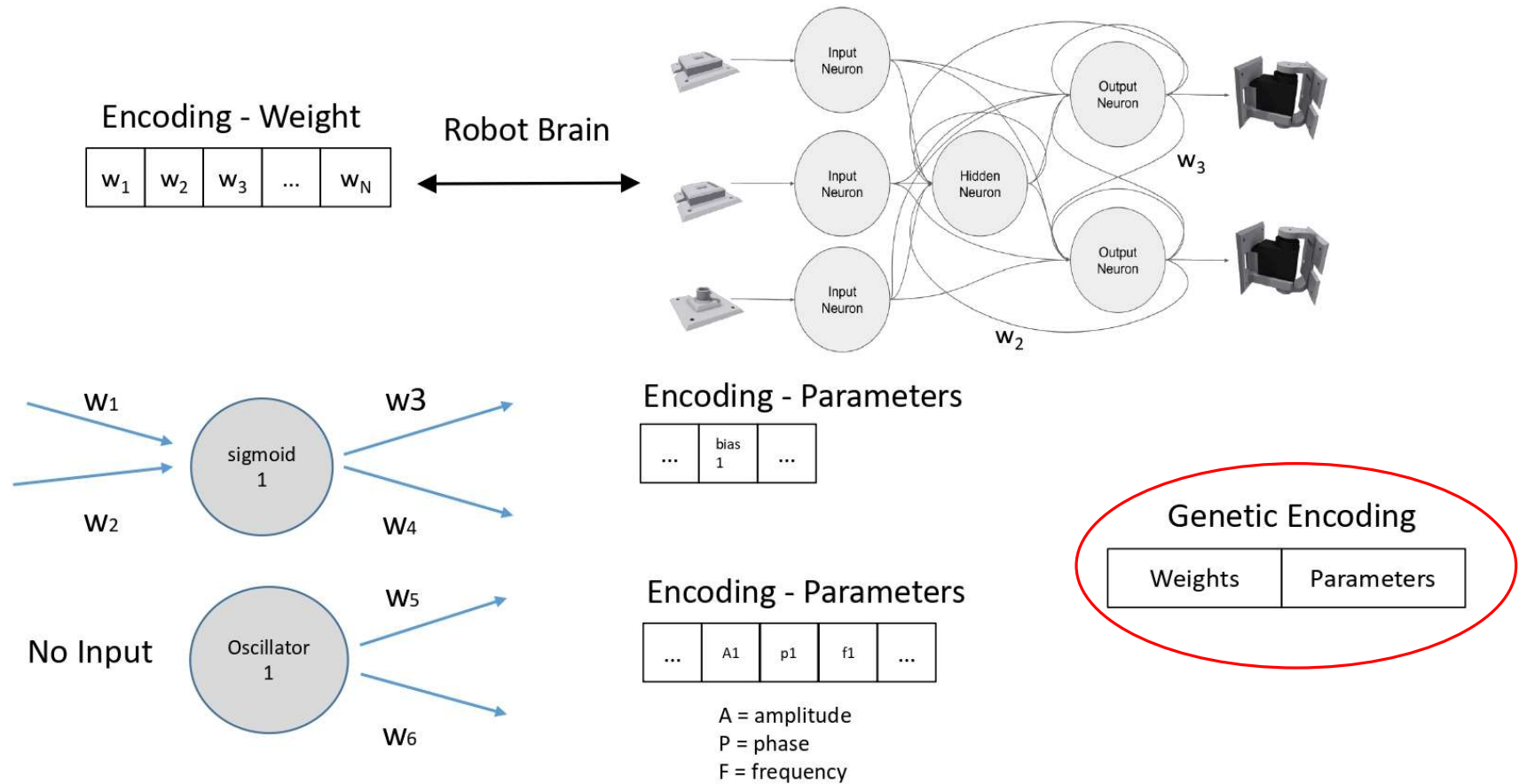


Robot Body
↔



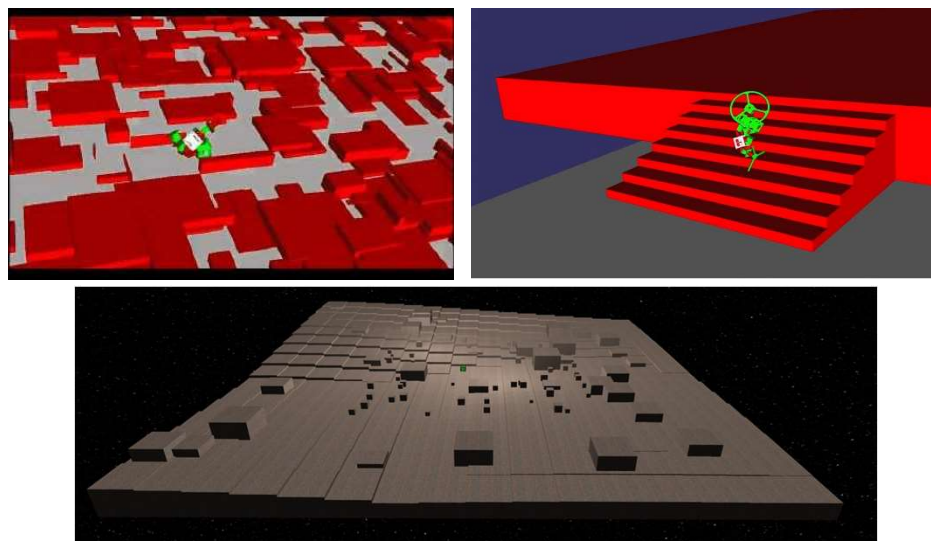
<https://robogen.org/docs/guidelines-for-writing-a-robot-text-file/>

Software: Genetic Encoding

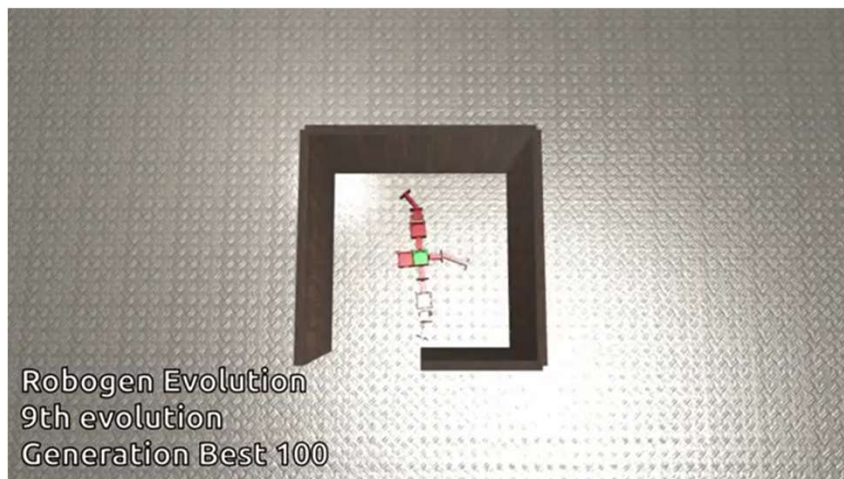


When using RoboGen, you provide the fitness function as well as the simulation and evolution parameters.

- Environment:
 - friction, etc. (https://robogen.org/docs/evolution-configuration/#Simulator_settings) and
 - obstacles (https://robogen.org/docs/evolution-configuration/#Obstacles_configuration_file)
- Scenario (fitness function): e.g. racing, chasing, or write a custom one in JavaScript (<https://robogen.org/docs/custom-scenarios/>).
- Evolutionary algorithm parameters: e.g. mutation rate, number of generations, etc. (https://robogen.org/docs/evolution-configuration/#Evolution_client_settings)



Previous examples



What's next?



3-4 students/group



This should not be the case.

Final presentation should state the contribution of each team member

Schedule

- 24 March: Basics of RoboGen
 - Evolve the brain of cart robot
 - Project & Group Formation
- 14 April: Evolving morphologies using RoboGen
 - Learn to evolve body + brain
 - Project group should be finalized
- 5 May: Information on robot fabrication
- 12 May: RoboGen project coaching
 - Projects discussion with course assistants
 - Continue working on projects out of class



Evaluation



2 June: Final presentations

A live demo of your evolved robot with 3D printed robot.

The results you obtain + creativity + task difficulty + demonstration of a rigorous scientific approach + clarity and completeness of presentations will all influence your final grade.

Grade

Project Requirements

- You will be evolving a robot to perform a task of your choosing.
- You will need to create your own scenario and define the parameters of the evolutionary process:
 - Environment (obstacles, light source, terrain, etc.)
 - Fitness function (important to design a good one!)
 - Evaluation procedure (length of evaluation, number of trials, presence of noise, etc.)
 - Evolutionary algorithm parameters
 - Neural network structure
- You should perform a systematic study of one or more of the above aspects in order to achieve good results.

Evaluation

The final presentation will be on 2nd June. You will summarize your project and present a live demo of your evolved, 3D printed robot. The presentation will be based on a template we will provide. The presentation will document your work, your methods, your results and your analysis. Hint: performing repetitions of your experiments in order to conduct a statistical analysis is strongly encouraged!

The results you obtain + creativity + task difficulty + demonstration of a rigorous scientific approach + clarity and completeness of your presentations will all influence your final grade.

Learn more about robogen ...



[RoboGen Website](#)



[YouTube Channel](#)



[RoboGen App](#)