Autonomous exploration, active learning and human guidance with open-source Poppy humanoid robot platform and Explauto library

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The Demonstration

The Torso robot **learns how to move its arm** to control the **ball**, **light** and **sounds**!

Interact to **help him**:

- On the Tablet, **click** an element to focus on (*sound*, *light*, *ball pose*...)

OR

- Push the Demo Button and then **demonstrate** a motion:
  - Move Torso's left arm to show him how to control the joystick

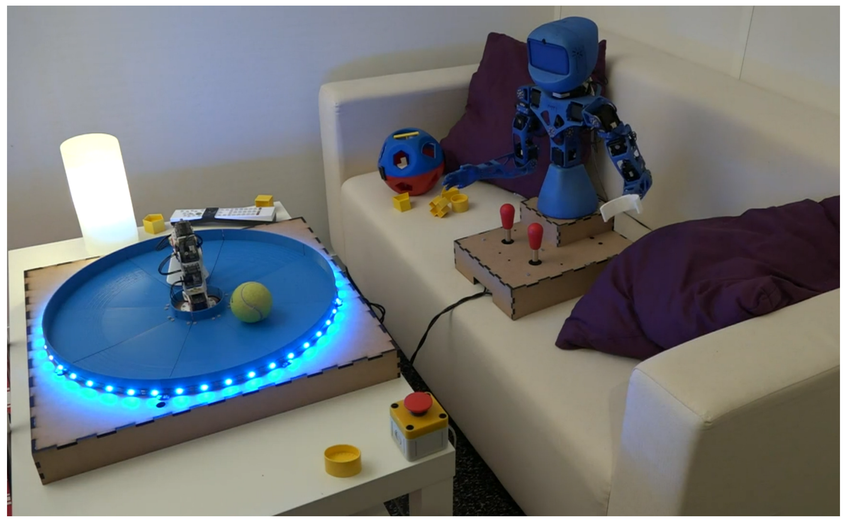
OR

  - Move the left joystick to show him how to teleoperate the Ergo robot

An open platform *Poppy robots + Explauto library*, to:

- Allow **non-roboticists** researchers to conduct **learning experiments** with robots
- Benchmark algorithms for active multi-tasks policy learning with robots

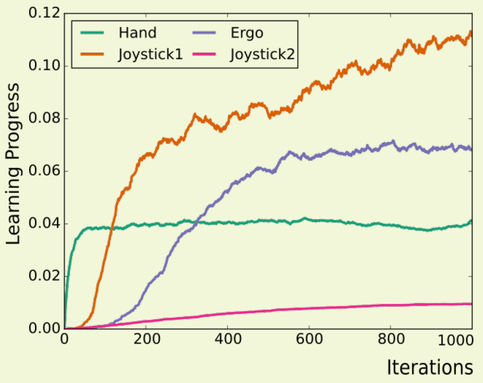
github.com/sebastien-forestier/NIPS2016



Intrinsically Motivated Multi-Task Reinforcement Learning

Intrinsically motivated RL allows:

- To learn **parameterized policies**
- To solve families of **parameterized problems**
- Problems structured in spaces that can be
- organized in a **hierarchy of reusable skills**



github.com/sebastien-forestier/ExplorationAlgorithms

Forestier, S. and Oudeyer, P.-Y. (2016). Modular active curiosity-driven discovery of tool use. In 2016 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Daejeon, Korea.

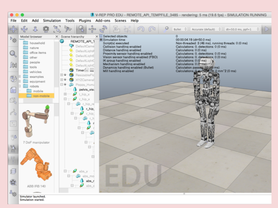
Poppy: an experimental platform for science

*"Make **scientific** outputs openly **accessible**, **reproducible** and **cumulative**"*

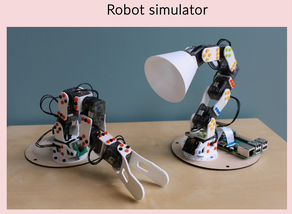
Poppy robots are accessible in terms of **cost** and **complexity**, allowing researchers to share hardware and experimental details

Fast design, building and experimentation of alternative morphologies: **3D printing** and **rapid prototyping** techniques now make it possible!

poppy-project.org


Robot simulator


Poppy Humanoid


Poppy Ergo Junior

Make your Ergo Jr jump in 3 lines of code

```
In [ ]: from poppy.creatures import PoppyErgoJr
        jr = PoppyErgoJr()
In [ ]: jr.jump.start()
```

Explauto: a library to study learning in robotics agents

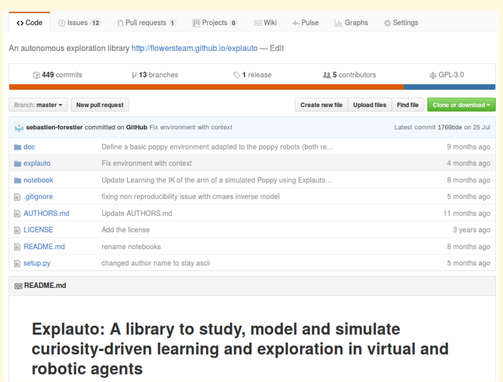
Explauto provides a high-level Python API for an easy definition of:

- Real and simulated **robotics setups**
- **Incremental learning** of parametrized policies
- **Active selection** of parametrized RL problems

```
from explauto.experiment import Experiment, make_settings

s = make_settings(environment='simple_arm',
                  babbling_mode='motor',
                  interest_model='random',
                  sensorimotor_model='nearest_neighbor')

expe = Experiment.from_settings(s)
```



github.com/flowersteam/explauto