TECHNICKÁ UNIVERZITA V LIBERCI
Fakulta strojní

Air spring controlled by reinforcement learning algorithm

Jiří Rágulík, Michal Sivčák

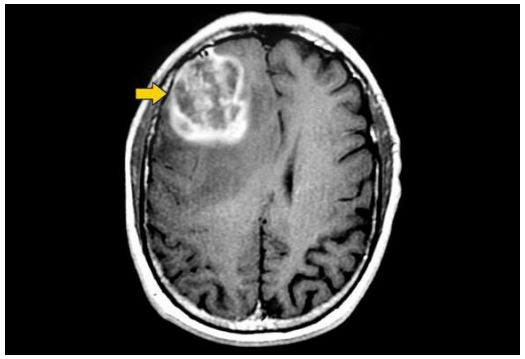
Replacing PID regulator

- **PID control**
- SDC (Skyhook Damper Control)
- LQG (Linear Quadratic Gaussian)
- Fuzzy logic
- Neural network control
- Adaptive control
- Predictive control
- Compound control
- **Deep reinforcement learning**

Why artificial inteligence algorithms?

TESLA

comma.ai



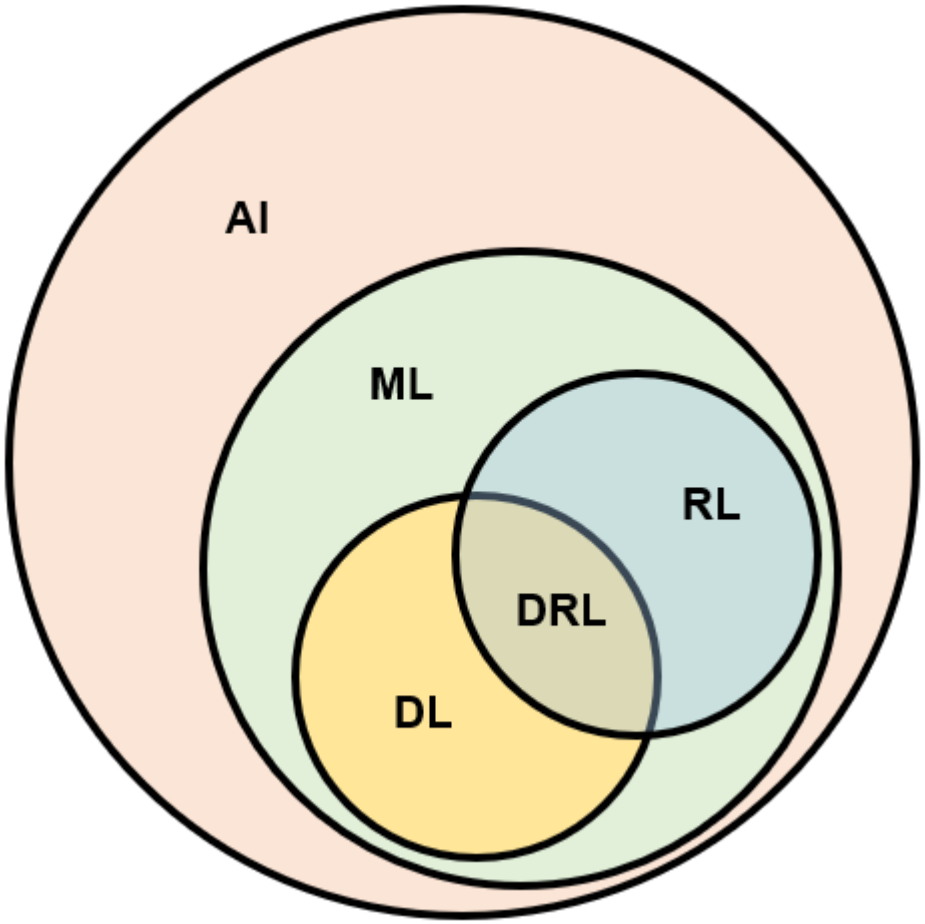
ARTERYS

Behold.ai

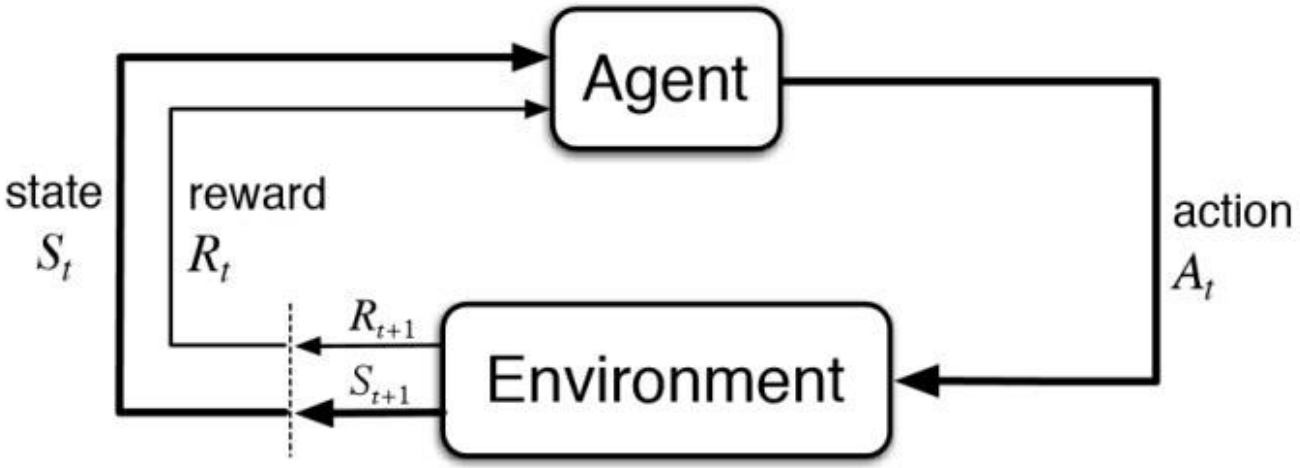
BostonDynamics

DisneyRESEARCH STUDIOS

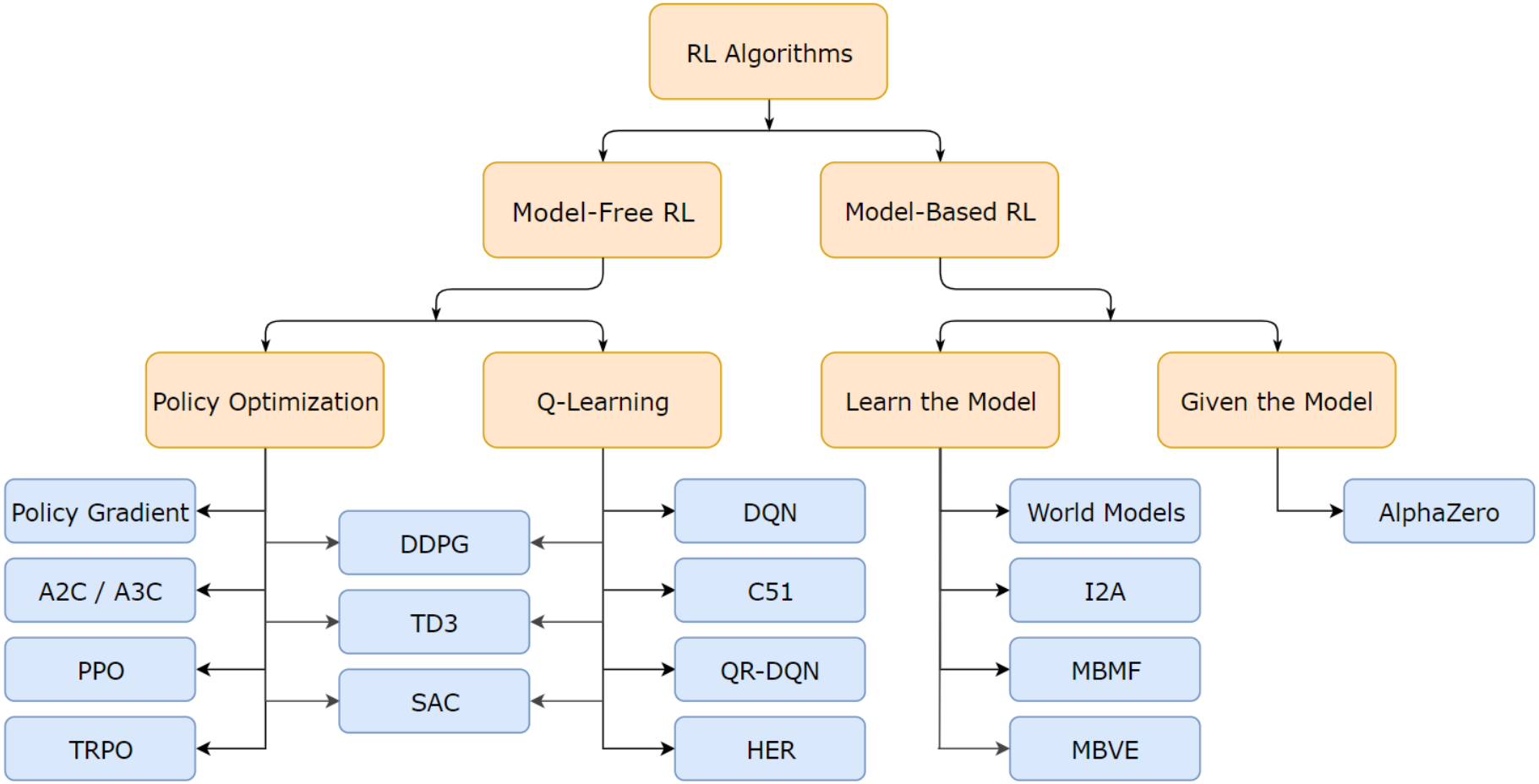
What is deep reinforcement learning?



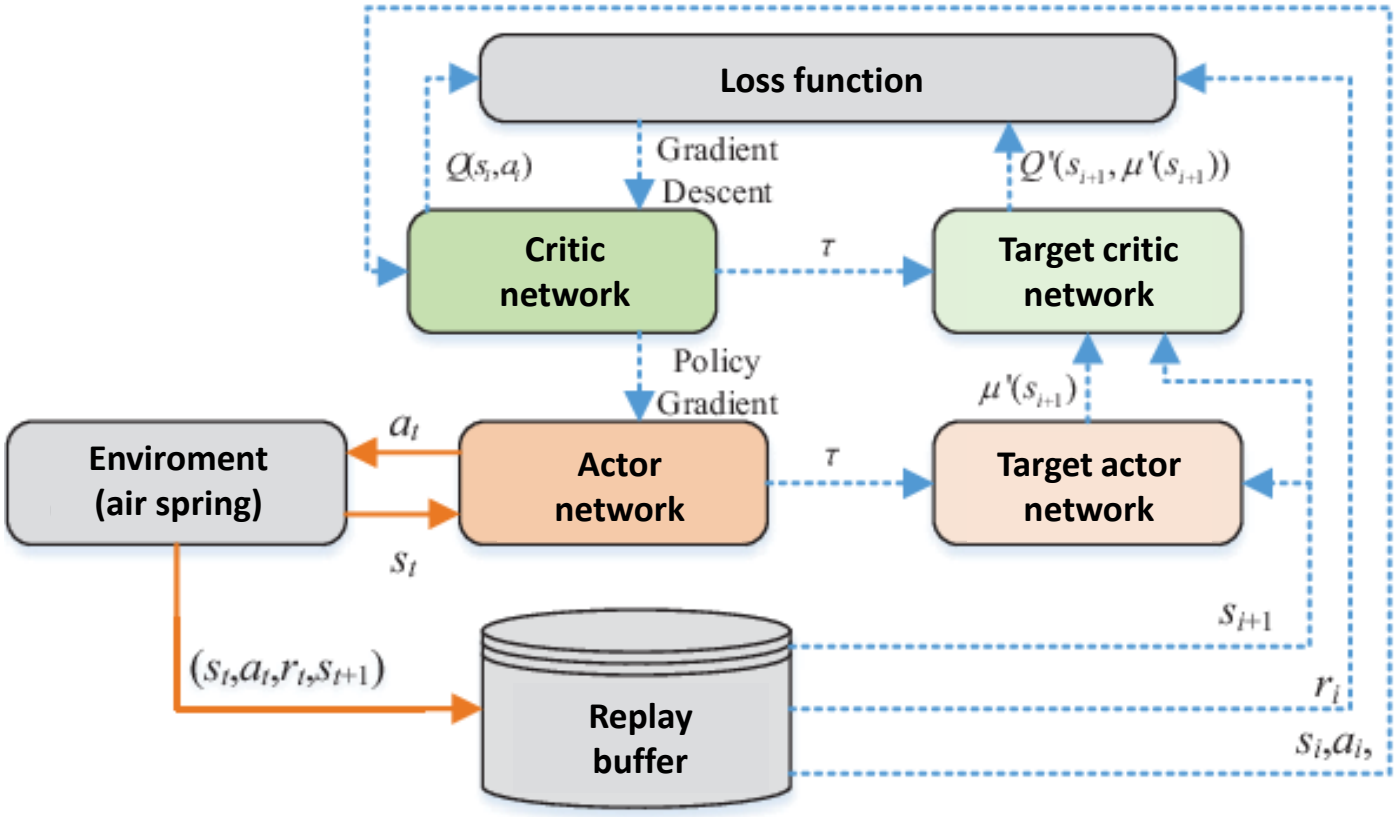
How does it work?



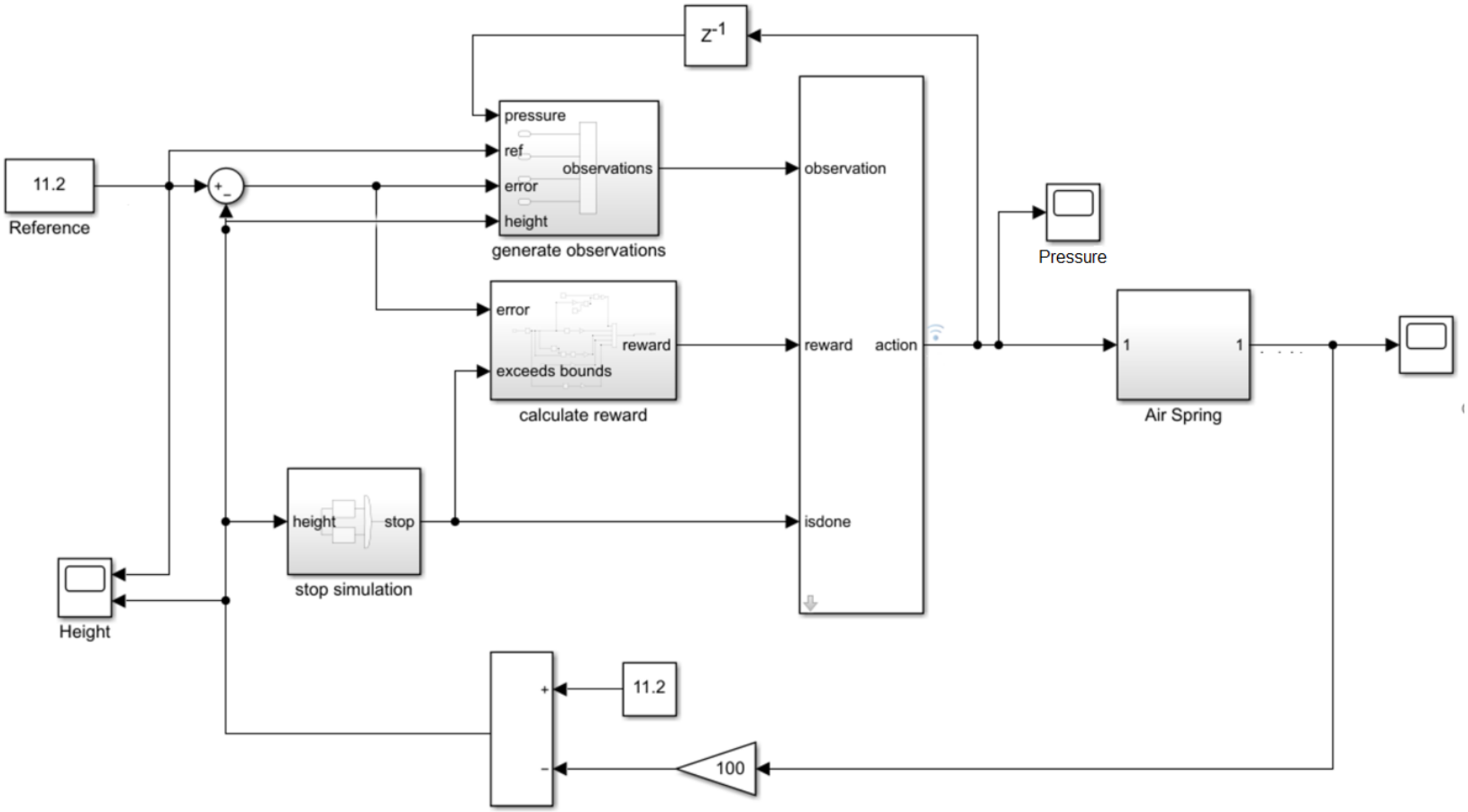
Reinforcement learning algorithms



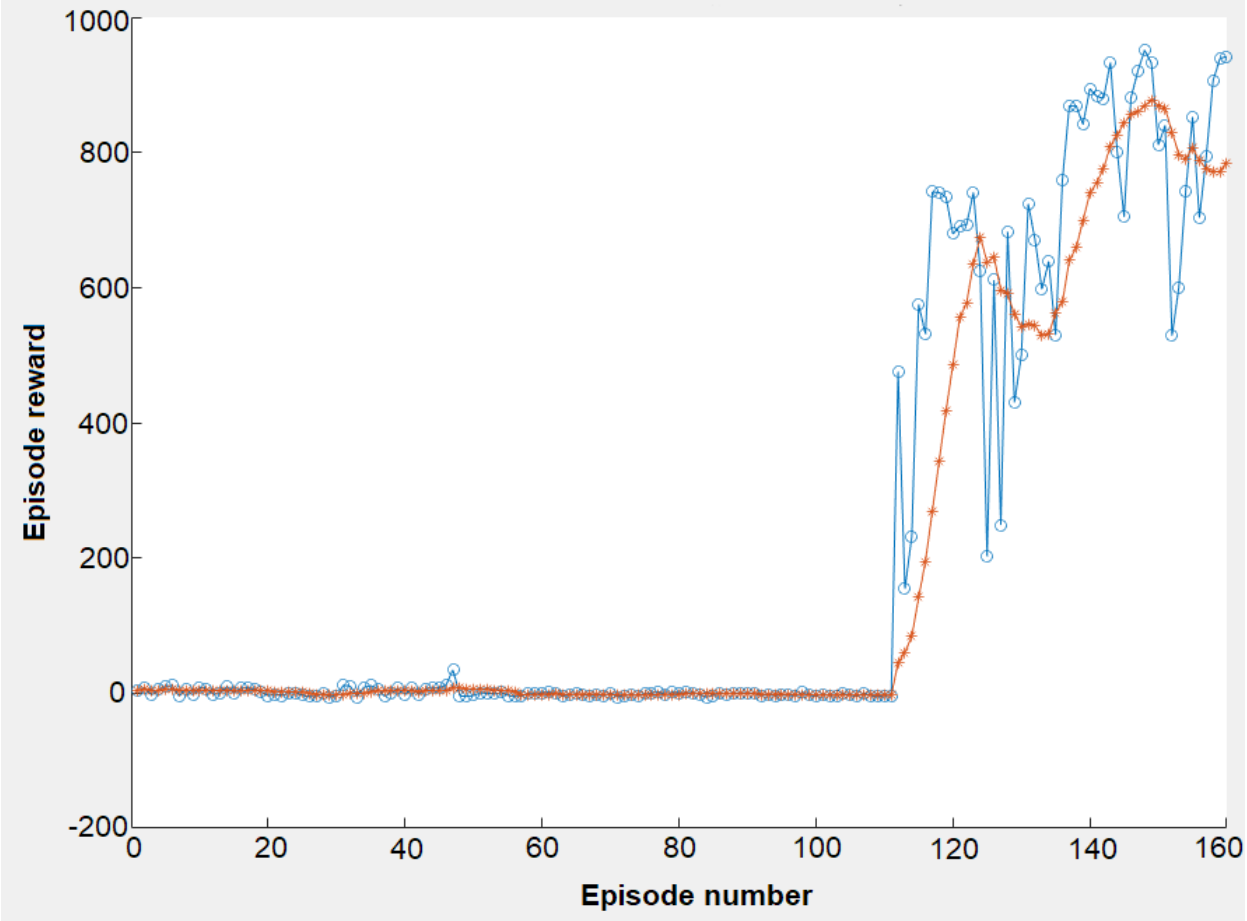
Deep Deterministic Policy Gradient



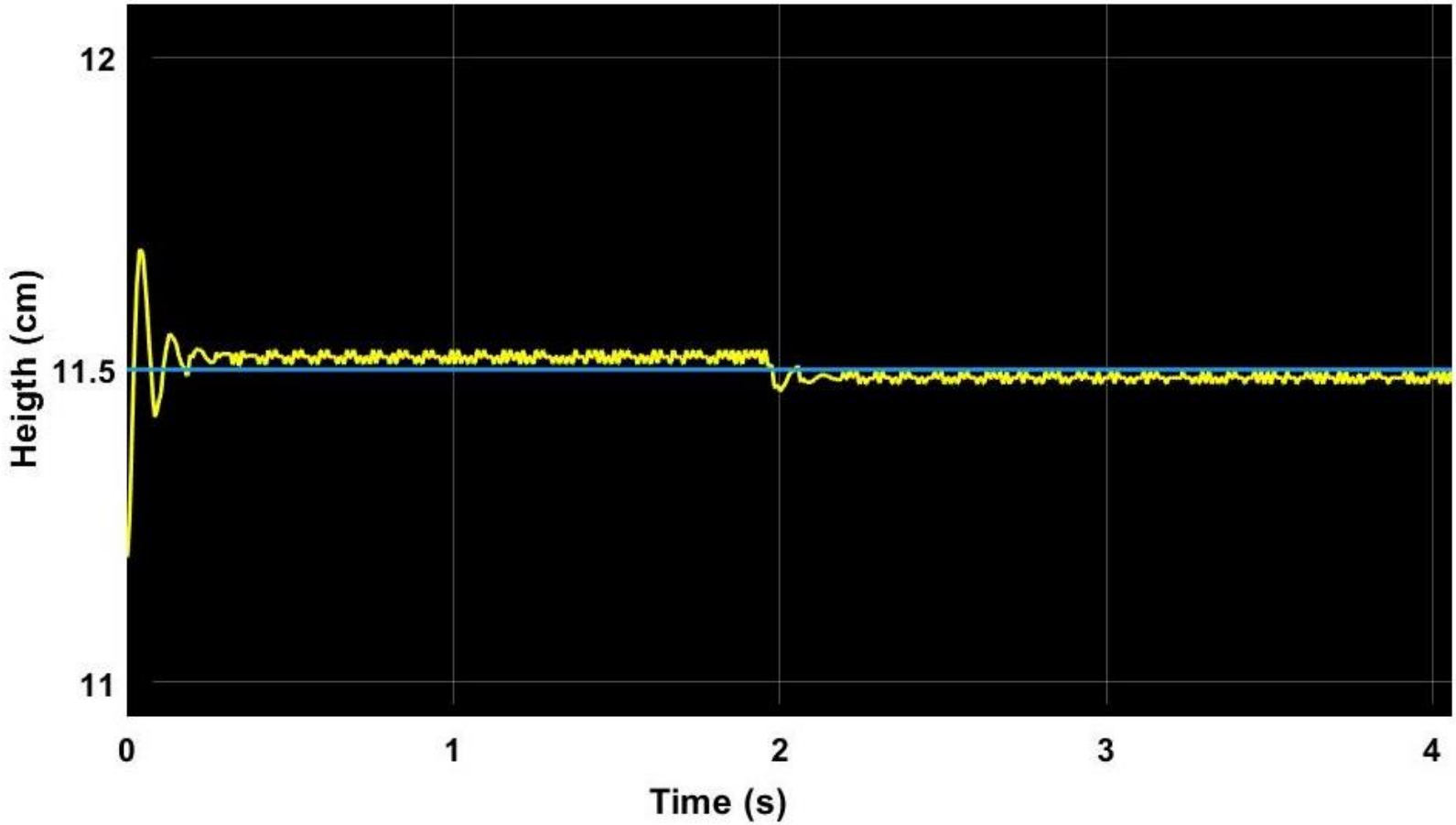
Application of algorithm



Learning process



Results (step change of weigth by 6 kg)



Cause of oscillations

$$r_t = \frac{3 \cdot \left(1 - \left(\frac{|e_t|}{3}\right)^{0.4}\right)}{2} + (|e_t| < 0.2) + \frac{\left((|e_{t-1}| - |e_t|) \geq 0\right)}{2} + (|e_t| = 0) - 5 \cdot (EB)$$

Thanks for your attention.