robotics

Swiss National Centre of Competence in Research

EPFL ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

ETH zürich

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USI/SUPSI IDSIA

NCCR Robot Capabilities

Aerial Scenario

→ Autonomous, vision-based navigation in GPS'denied environments

Live, dense 3D reconstruction of the environment

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→ Navigate autonomously without any external infrastructure

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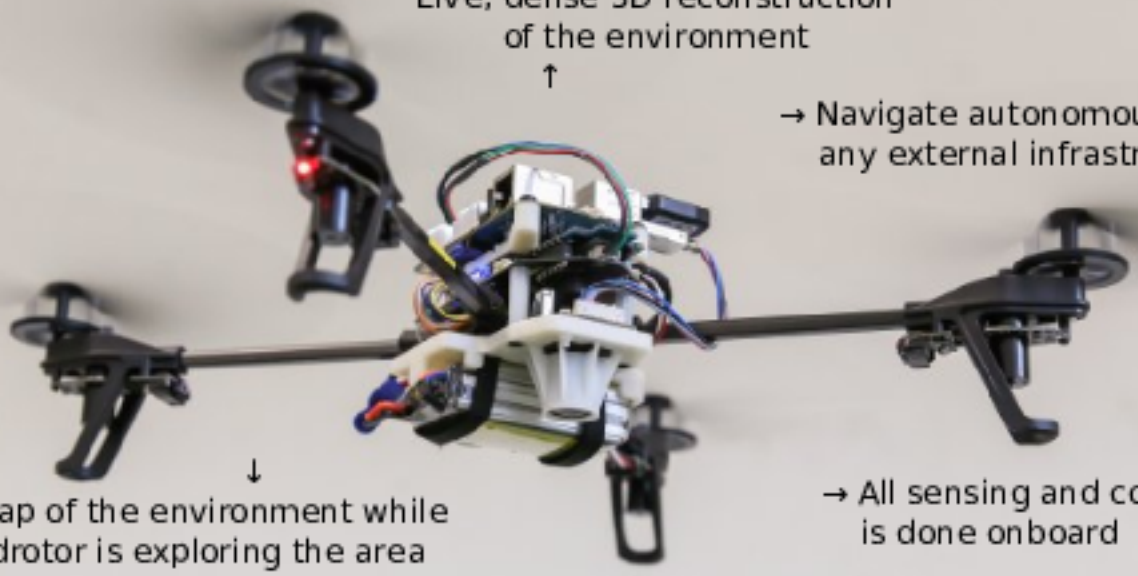
http://rpg.ifi.uzh.ch/



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Build a map of the environment while the quadrotor is exploring the area

→ All sensing and computation is done onboard

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No human intervention

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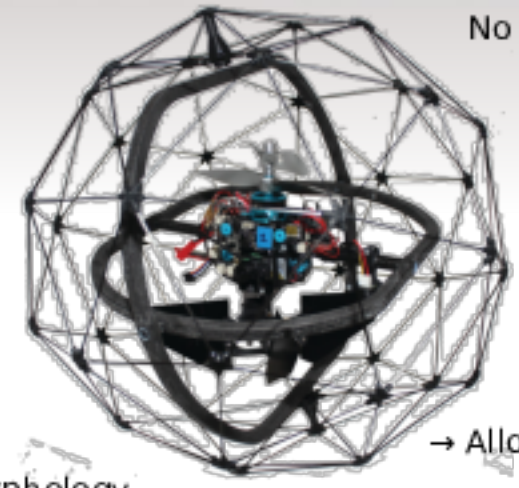
http://lis.epfl.ch/airburr



Resilient ←

→ Exploring very cluttered environments

→ Roll on walls and ceiling

→ Providing video signal to rescuers

→ Allows collisions with obstacles while remaining stable

Adaptive morphology for optimized performances

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Forward flight for covering long distances and ground locomotion for local exploration

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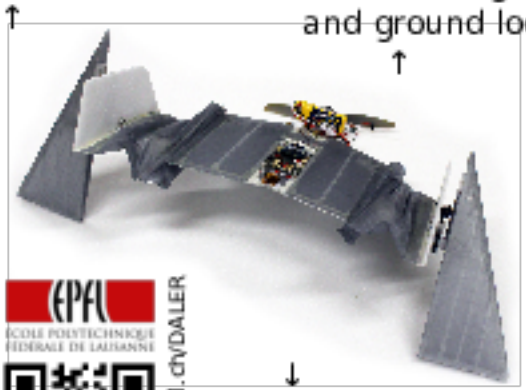

→ Integrated design approach for weight minimization

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http://lis.epfl.ch/DALER

Aerial and terrestrial capabilities powered by a single locomotor apparatus

Easy storage and transportation

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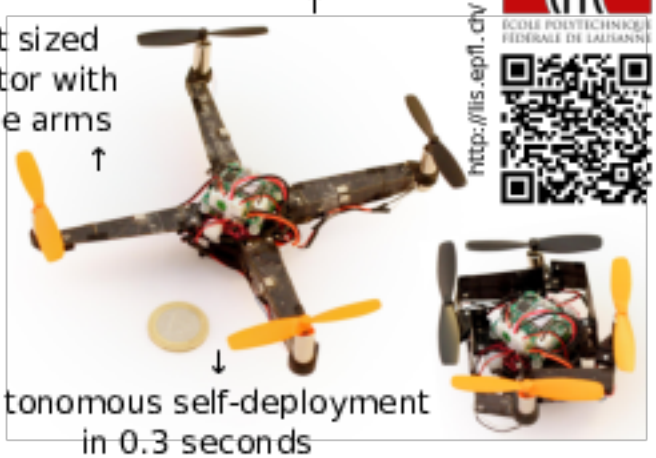
Pocket sized quadrotor with foldable arms

↑



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http://lis.epfl.ch/

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Autonomous self-deployment in 0.3 seconds

Ground Scenario

→ Torque and position controlled joints

→ outdoor operation

→ Animal-like step reflex

Autonomous, laser and camera based navigation in rough terrain

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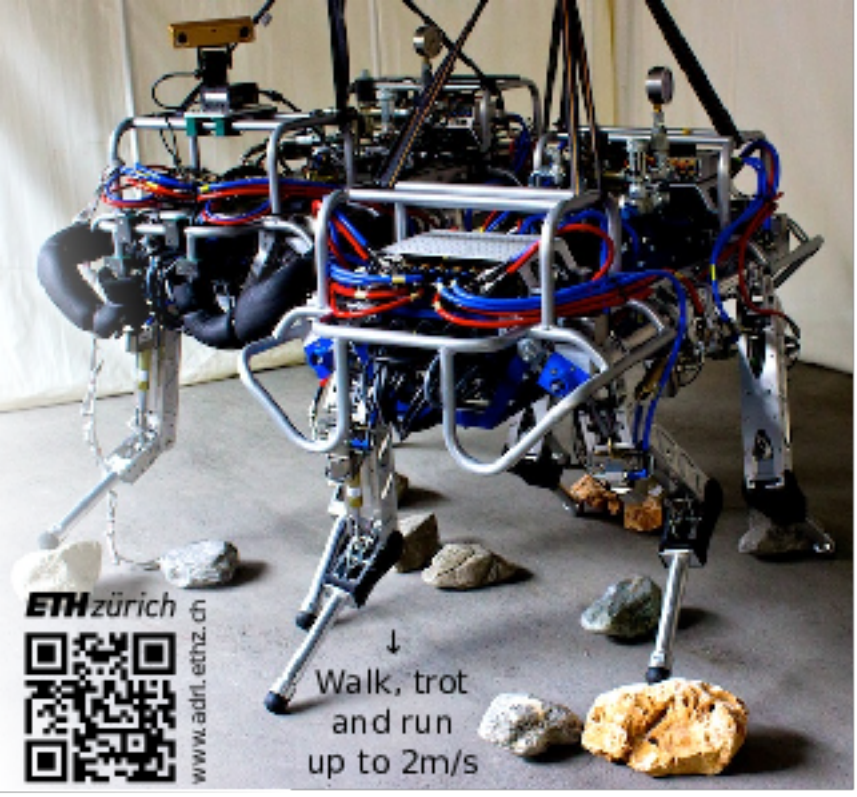
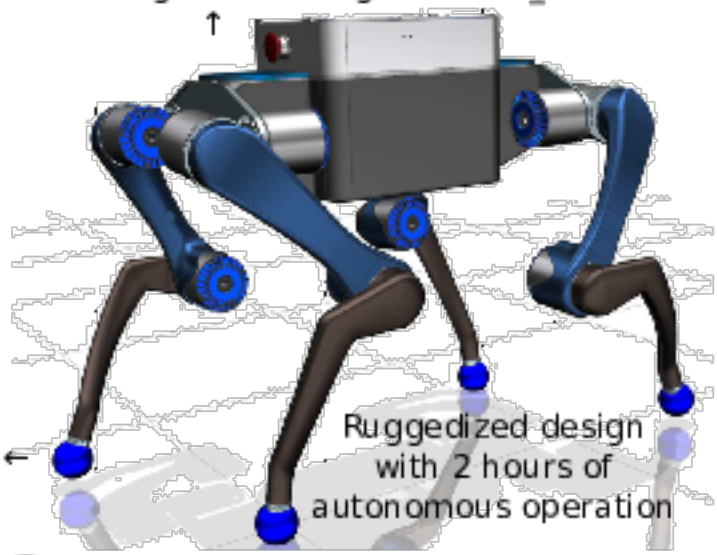
leggedrobotics.ethz.ch





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Rear and jump up to 0.5m from squat

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Real-time control systems ←

Amphibious Scenario

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Multi-modal (walking/swimming) locomotion ←

→ 15 min of swimming autonomy
or
tether operation for reliability

↑

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http://biorob.epfl.ch

Equipped ← with sensors and GPS)

↓
Waterproofed

↓
Motor skills for obstacle avoidance/overpass (leg reflexes, posture control)

Multi-Robot Coordination

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http://rpg.ifi.uzh.ch/

→ Flying robot guides ground robot step by step

Flying robot explores area and detects obstacles for ground robot

Fastest mission includes removal of obstacles by ground robot

http://robotics.idsia.ch/

More info: http://www.nccr-robotics.ch/

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