ETH zürich

Roboter verlassen die Produktionshallen

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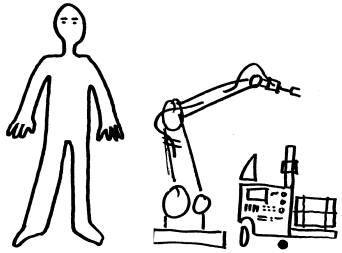
www.wysszurich.ch

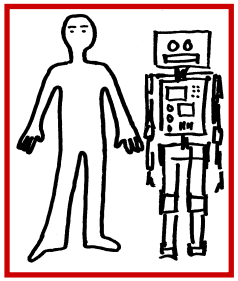
18. Thurgauer Technologietage
UNIMA AG, MATZINGEN, 23.03.2018

Nächste Generation von Robotern

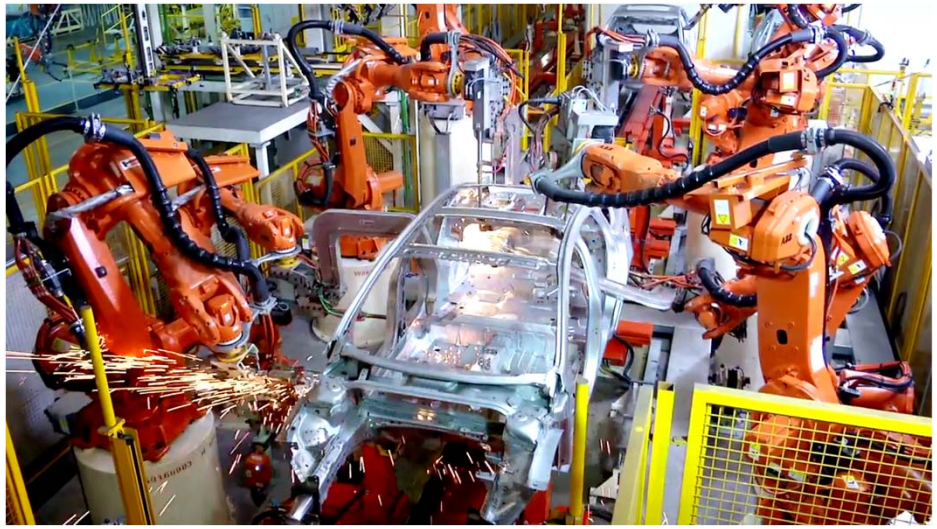
| mobil, verbunden, intelligent, adaptiv und unter uns



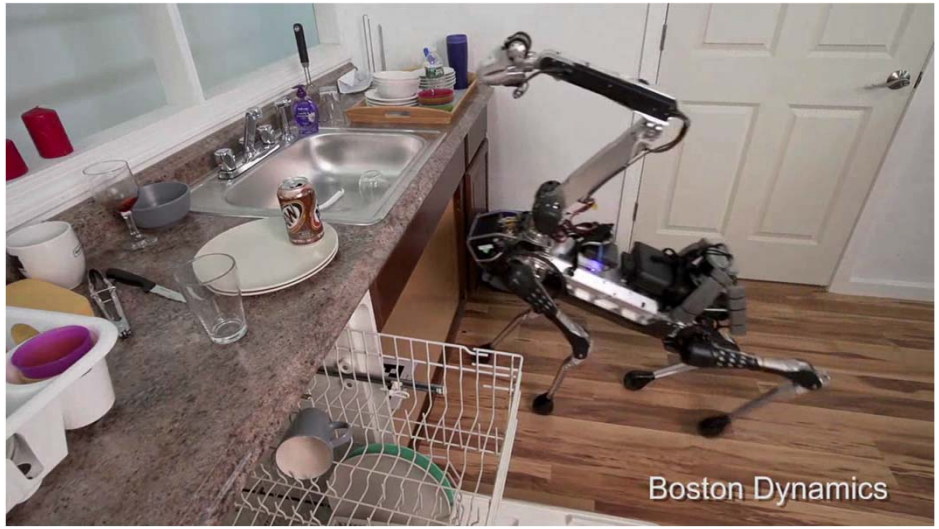
Industrial Robots



Service Robots



https://www.youtube.com/watch?v=SeloQy0oXjI



https://www.youtube.com/watch?v=tf7IEVTDjng

Serviceroboter | die Herausforderungen

50x speed
https://www.youtube.com/watch?v=gy5g33S0Gzo

- Roboter müssen mit ***unsicherer*** und nur ***teilweise verfügbarer multimodaler Information*** umgehen können.
- Roboter müssen ***sehen***, ***spüren*** und ***verstehen*** können.
- Roboter müssen ***taktil*** mit der Umgebung interagieren können
  → («soft robots» mit Kraftreglung)
- Roboter müssen ***intuitiv programmierbar*** sein
- Roboter müssen ***lern-*** und ***anpassungsfähig*** sein

→ **Um das zu erfüllen, braucht es Künstliche Intelligenz, aber auch neue Sensoren, Aktoren und Roboterkonzepte**

Service Robots

– wheeled and walking robots for challenging tasks

BeachBot (with Disney) – developed by students

| the beach artist

https://www.youtube.com/watch?v=eBRrQBPtdak

Vertigo – developed by students

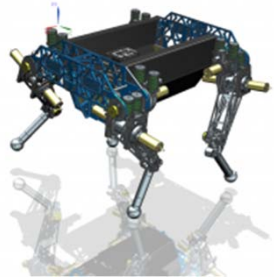
| the ultimate wall climber

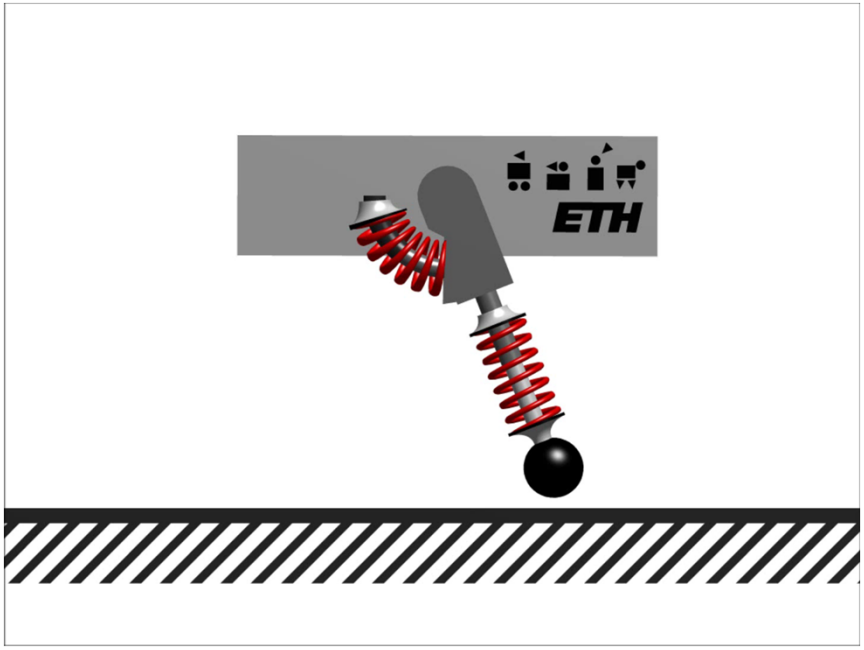
https://www.youtube.com/watch?v=KRYT2kYbgo4

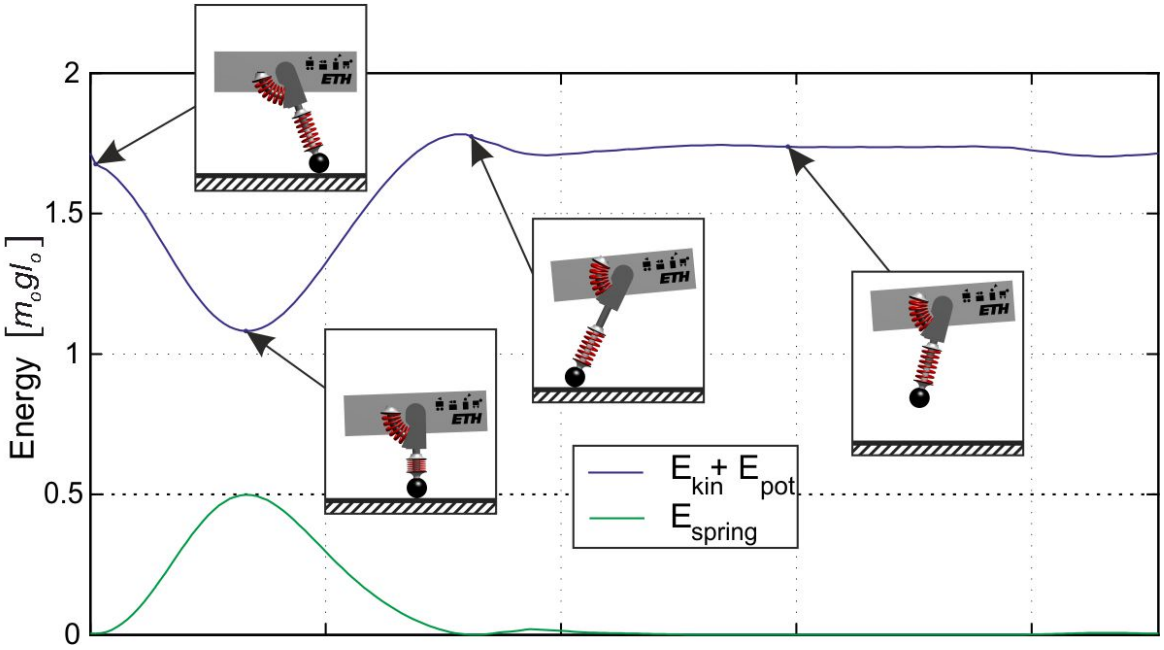
Efficient Walking and Running | what nature evolved (Extreme Jumpy Dog)

- http://www.youtube.com/watch?v=Jql6TSyudFE

Efficient Walking and Running | serial elastic actuation





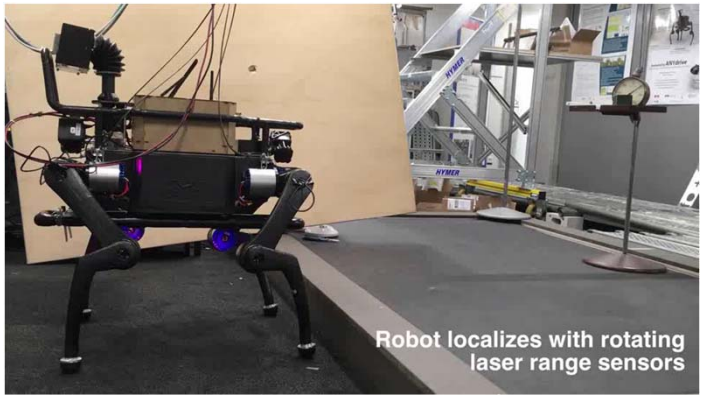


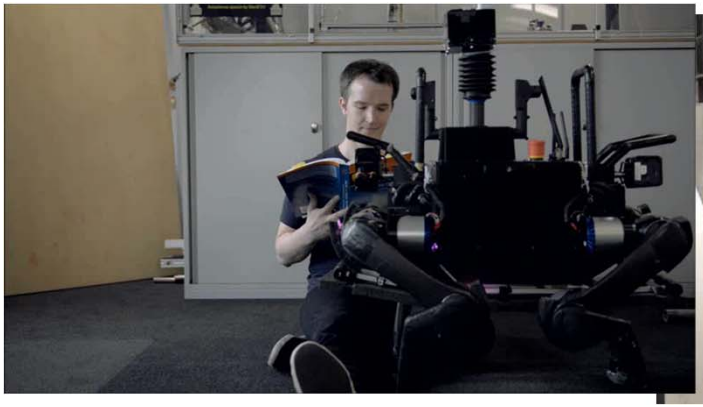
https://www.youtube.com/watch?v=6igNZiVtbxU

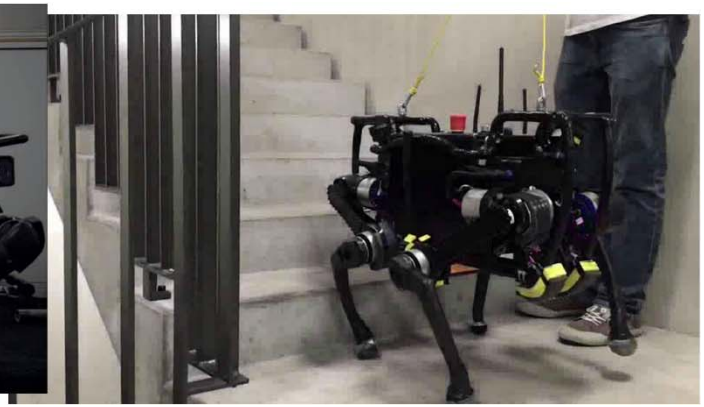
ANYmal
Combining dynamic motion skills with large mobility

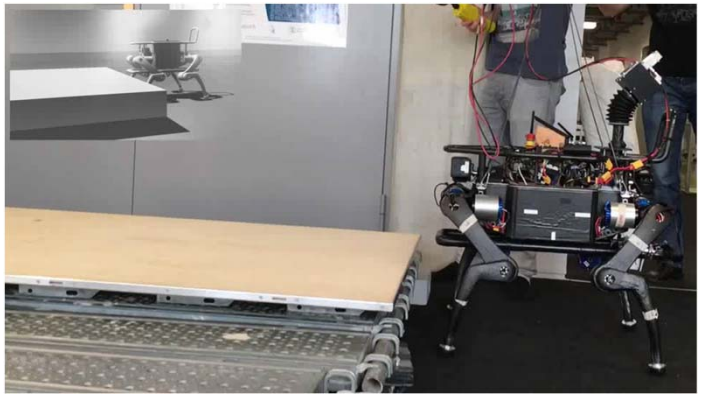
RSL Robotic Systems Lab

Prof. Marco Hutter









Service Robots – flying robots for challenging tasks

wingtra – developed by students

| the VTOL UAV

https://www.youtube.com/watch?v=QADvPDWtgFU

Atlantik Solar

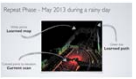
| 81 hours non-stop in summer 2015

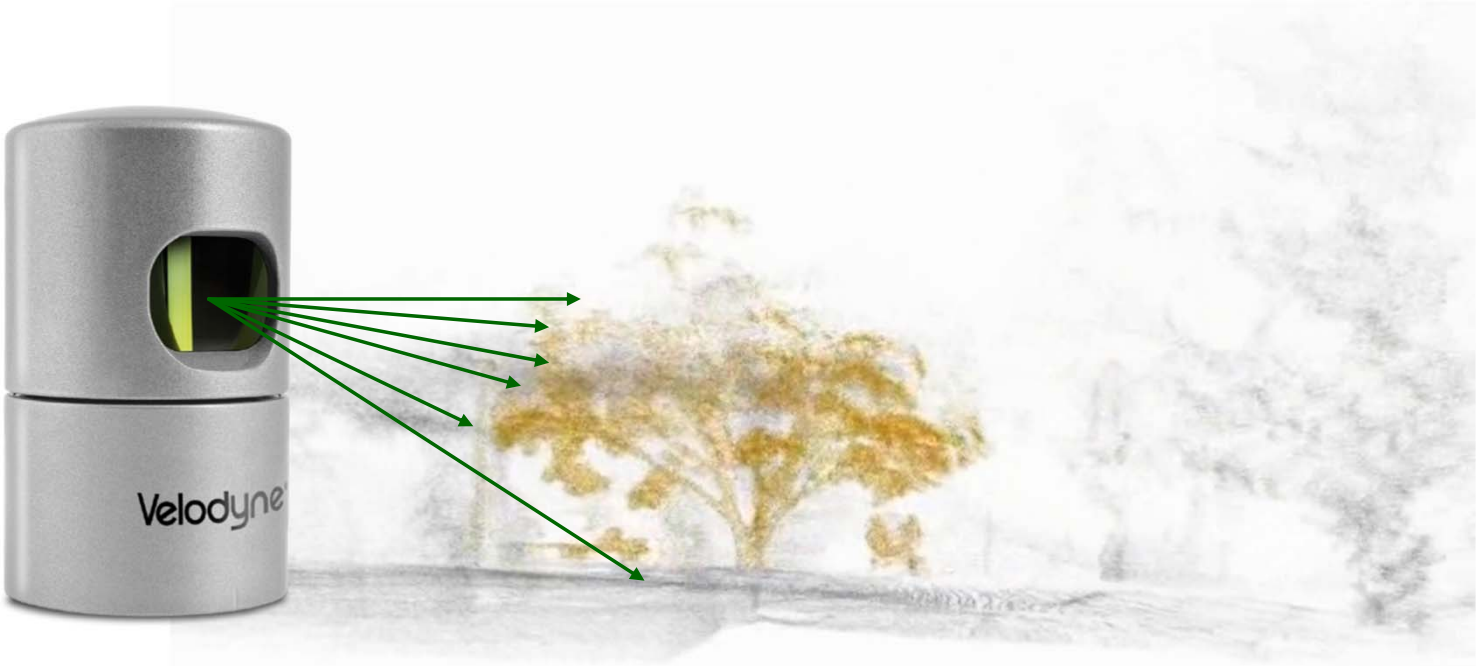
| 5.64 m, 6.2 kg

https://www.youtube.com/watch?v=8m4_NpTQn0E

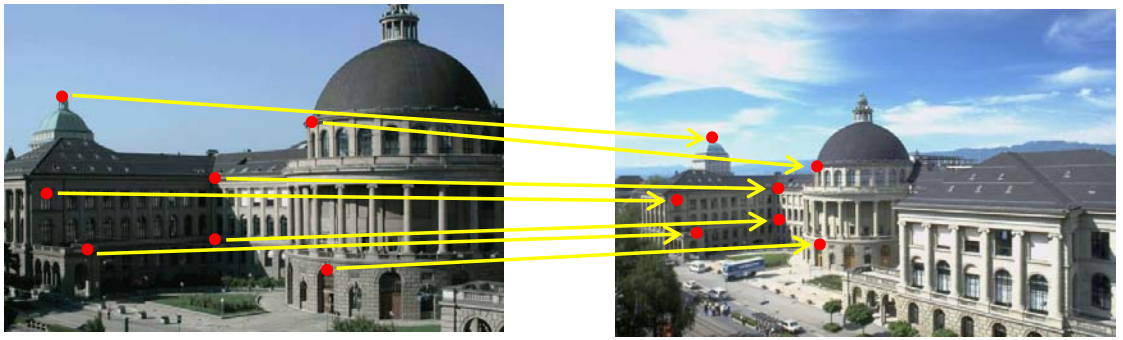
https://www.youtube.com/watch?v=wyS6W1t_ryQ

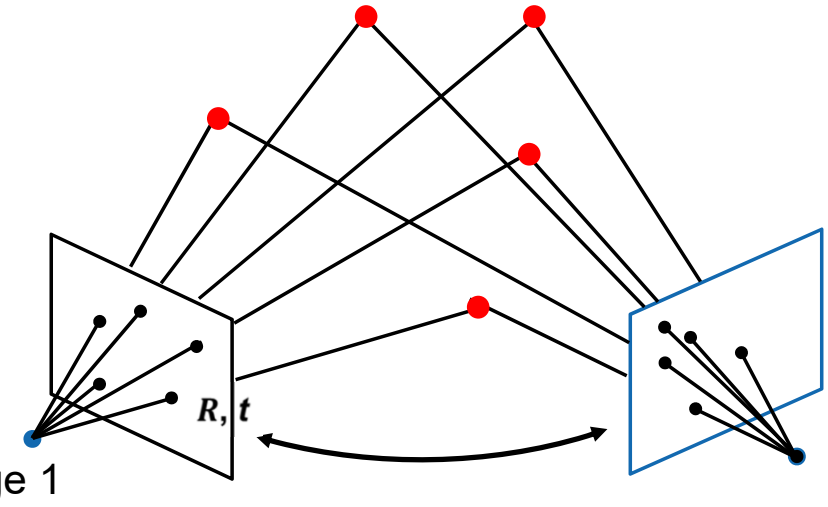
"Sehen" | Laser-basierte 3D Pläne



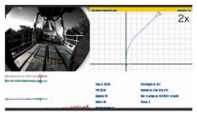


"Sehen" | Bewegungsschätzung mit Kamera und Inertialsensor (IMU)





Google Project Tango



https://www.youtube.com/watch?v=yvgPrZNp4So

Autonomous Cars Today | cameras (lane tracking, …) → no map

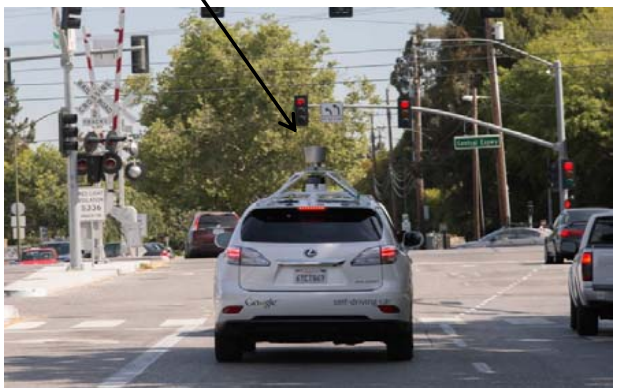
- Detection and tracking of …
  - Lanes,
  - street signs,
  - other cars,
  - …

https://www.youtube.com/watch?v=aGW4nRzx8Iw

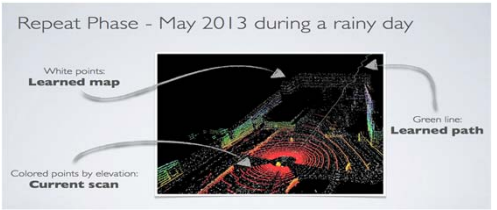
MOBILEYE

Today | 3D laser sensors → map based

Expensive, complex and cumbersome

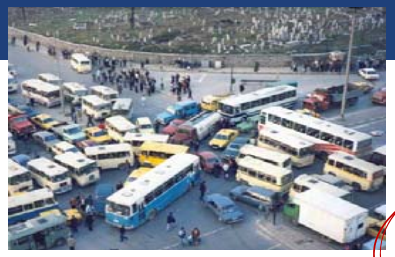


- Google Self-Driving Car Project (status summer 2015)
  - > 20 vehicles in use
  - > 2,7 mio km, 1.5 mio km in autonomous mode
  - > 11 accidents
    - No people insured
    - Non of them caused by car control algorithm



https://www.youtube.com/watch?v=eJCR2TaeSFc

Autonomous Cars | roadmap



Fully autonomous Car
(you can sleep)

Autonomous car freeway

Interaction / negotiation between traffic participants

increasing complexity /understanding

learning and adaptation

Autonomous car urban

V-CHARGE

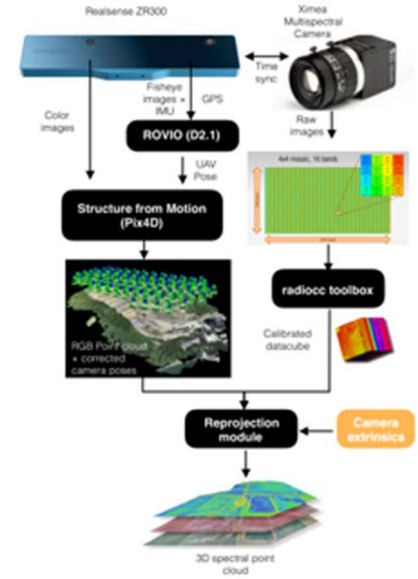
Driving Speed

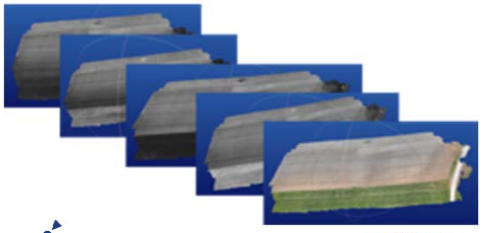
Complexity of Environment → Perception and Interaction

Autonomous Cars | a bright future without traffic jams

Flourish – Aerial Data Collection and Analysis, and Automated Ground Intervention for Precision Farming

Spatio-Temporal Spectral Environment Modeling

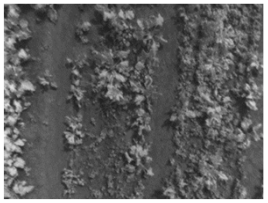


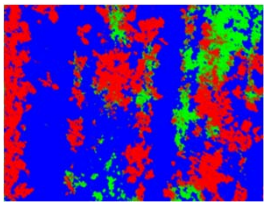


https://youtu.be/5f1EtfW76Qc

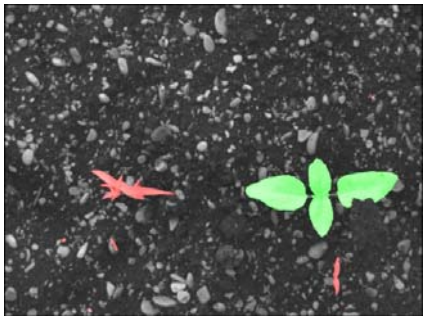
Autonomous UAV landing

UAV onboard weed detection



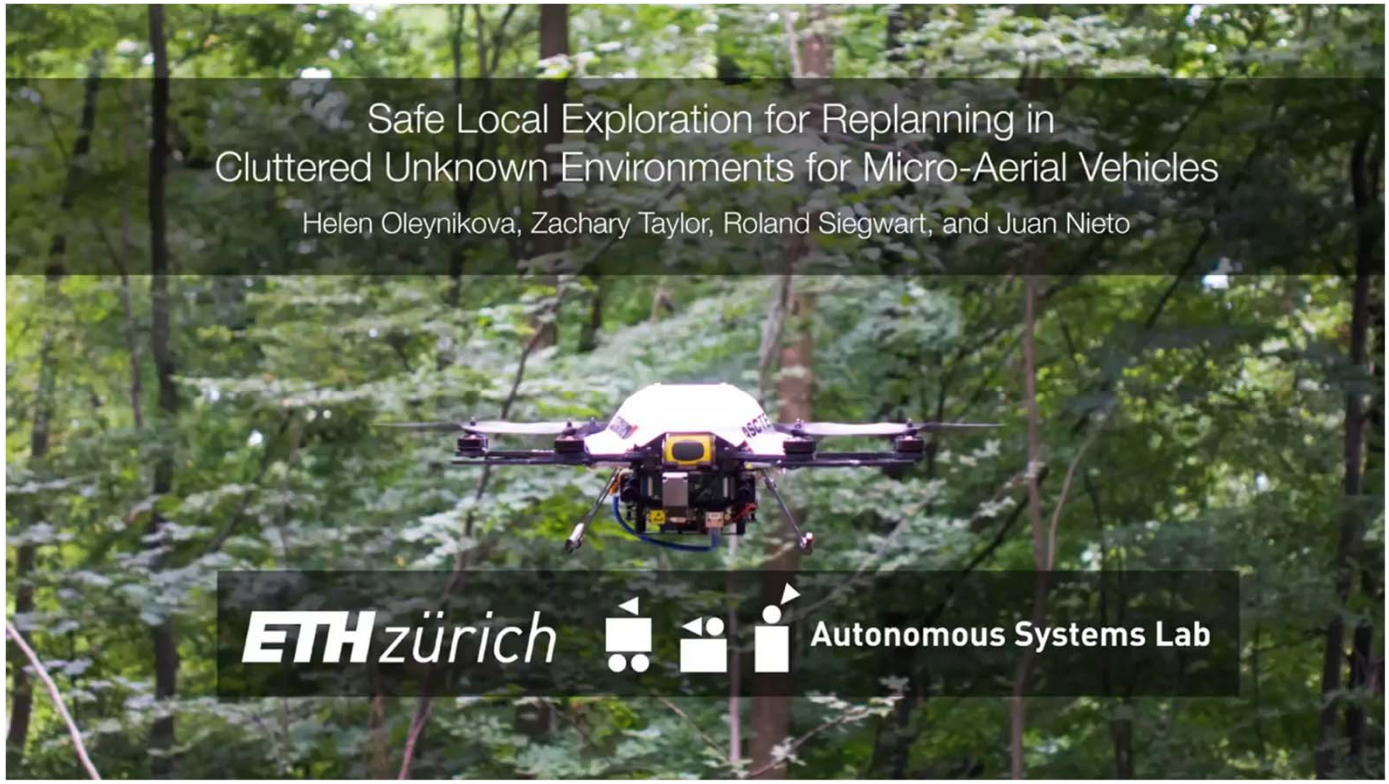


Weed classification on UGV (Sunflower ~95% acc.)



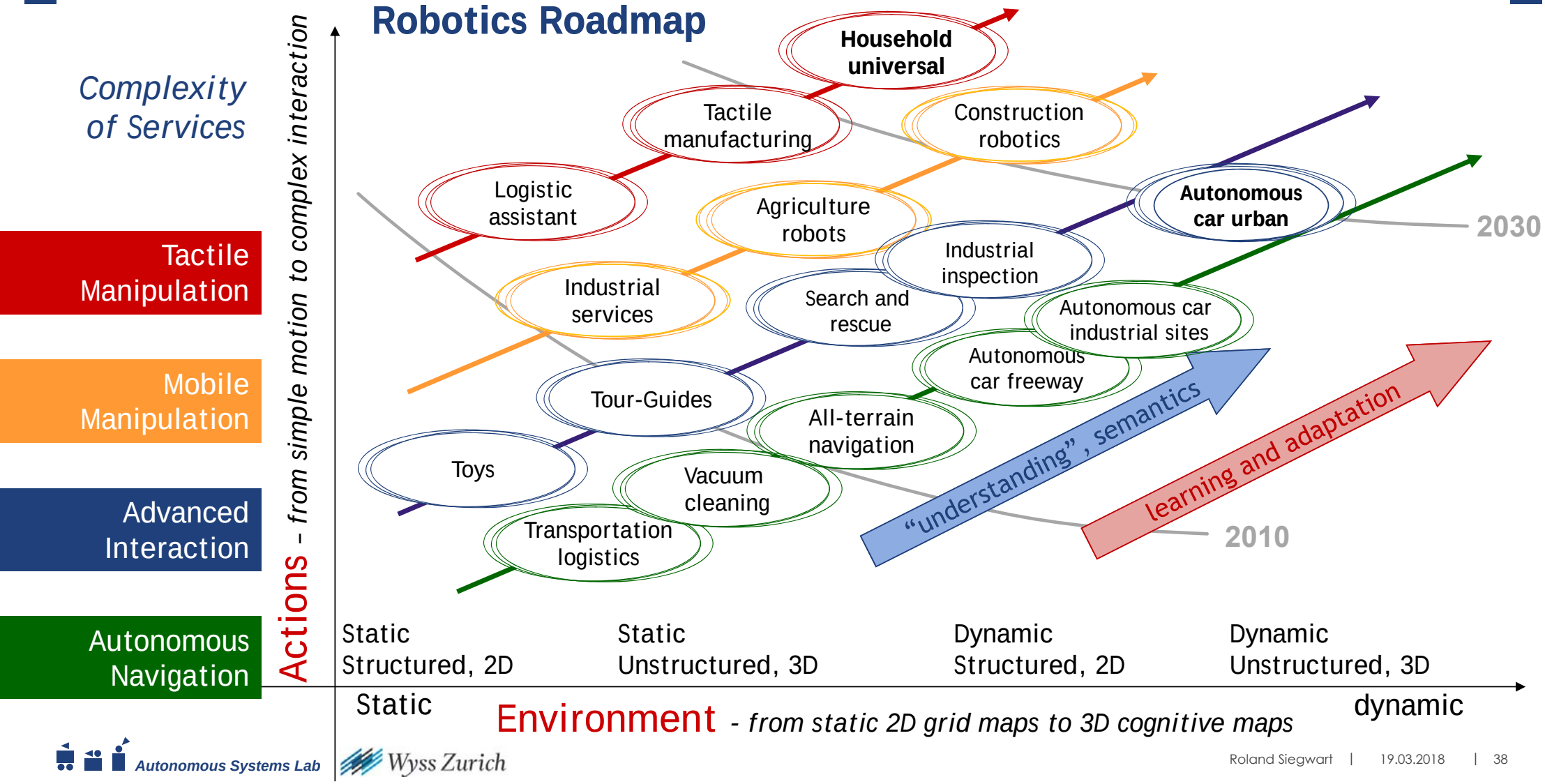
Automated spraying and stamping

Navigation & Planning in Cluttered Environments



https://www.youtube.com/watch?v=rAJwD2kr7c0

Robotics Roadmap



Switzerland | a melting pot for robotics technology

Initiatives

robotics — Swiss National Centre of Competence in Research

National Centre of Competence in Research Digital Fabrication

ETH zürich — Center for Learning Systems

Wyss Zurich TRANSLATIONAL CENTER

ieLab

Spin-offs (*ASL)

ANYbotics *

senseFly

VERITY studios

ONESKY SAFER SMARTER SKY FOR ALL

PIX4D simply powerful

Skybotix *

GoPro

wingtra *

force dimension

aeon scientific

YouRehab inspire motivate achieve

noonee because its wearable

FEMTO TOOLS

Dacuda Scanning redefined.

Ophthorobotics AG

MagnebotiX

Fotokite

DISTRAN SWITZERLAND *

FLYABILITY

AEROTAIN *

BLUEBOTICS * Mobile Robots at Your Service

Rapyuta Robotics

Hocoma

F&P Personal Robotics

Inspection Robotics *

Industrial Collaborations (ASL)

Google

Disney Research, Zurich

Project Tango

GoPro Be a HERO.

ABB

menzi muck

arma suisse

SIEMENS

TOTAL ARGOS CHALLENGE

HEXAGON

Leica Geosystems

BOSCH

esa

RUAG

MANOR

Schindler

ASCENDING TECHNOLOGIES

intel

Take Home Message

- Ja, Robotik boomte
  - … es braucht aber noch viel F&E um diese komplexen Systeme auf den Markt zu bringen.
- Ja, Europa und speziell die Schweiz hat das Potential diesen wichtigen Markt zu erobern und somit nachhaltig Arbeitsplätze zu schaffen. Es geht um:
  - Hervorragende Forschung und grossartige Talente
  - Präzisionsmechanik und Künstliche Intelligenz
  - Innovation und Unternehmertum
- Für die Skalierung von Robotik-Technologie und Startups brauchen wir Talente, mehr Risikobereitschaft und langfristig ausgerichtetes Risikokapital (> 10 Jahre)