DD2410

Lecture slides
Locomotion

Many means of locomotion

- Wheels
- Tracks
- Legs
- Flying
- ….

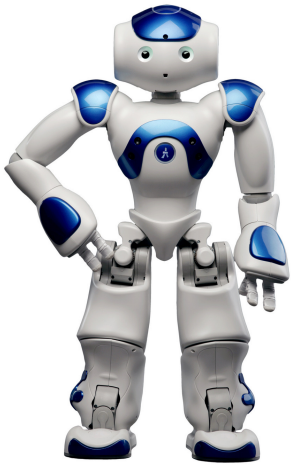
Legged locomotion

- Point contacts between robot and ground
- Pros
  - Potential for handling rough terrain well
  - Only contact points need to be OK, ground in between does not matter
- Cons
  - Mechanically complex
  - Power hungry

Two legged robots (Bipeds)

- Japan/Korea almost alone on the market before

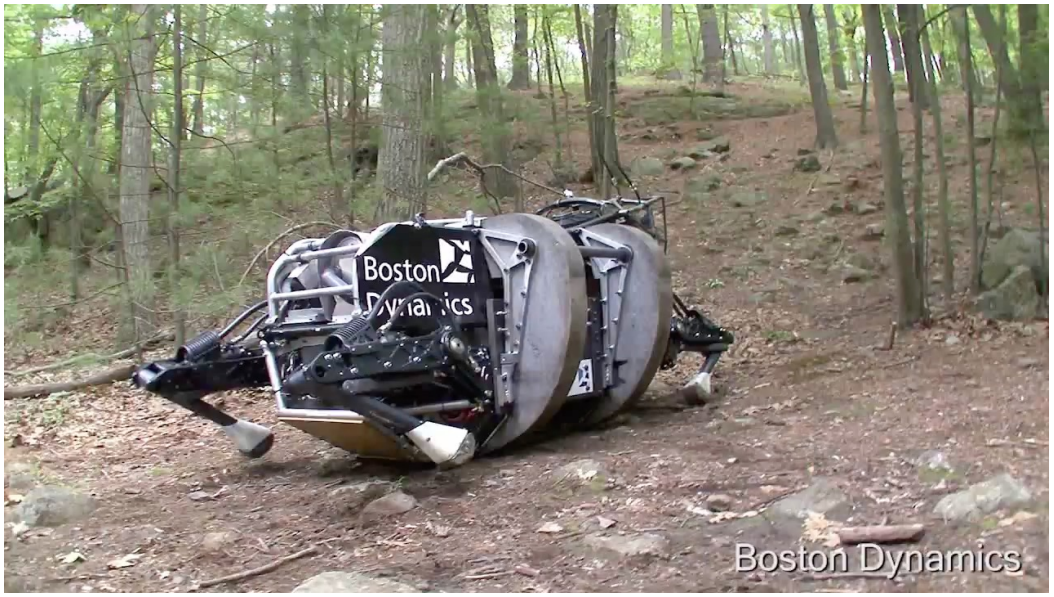
Two legged robots (Bipeds)



- Now also in Europe and USA

Quadrupeds

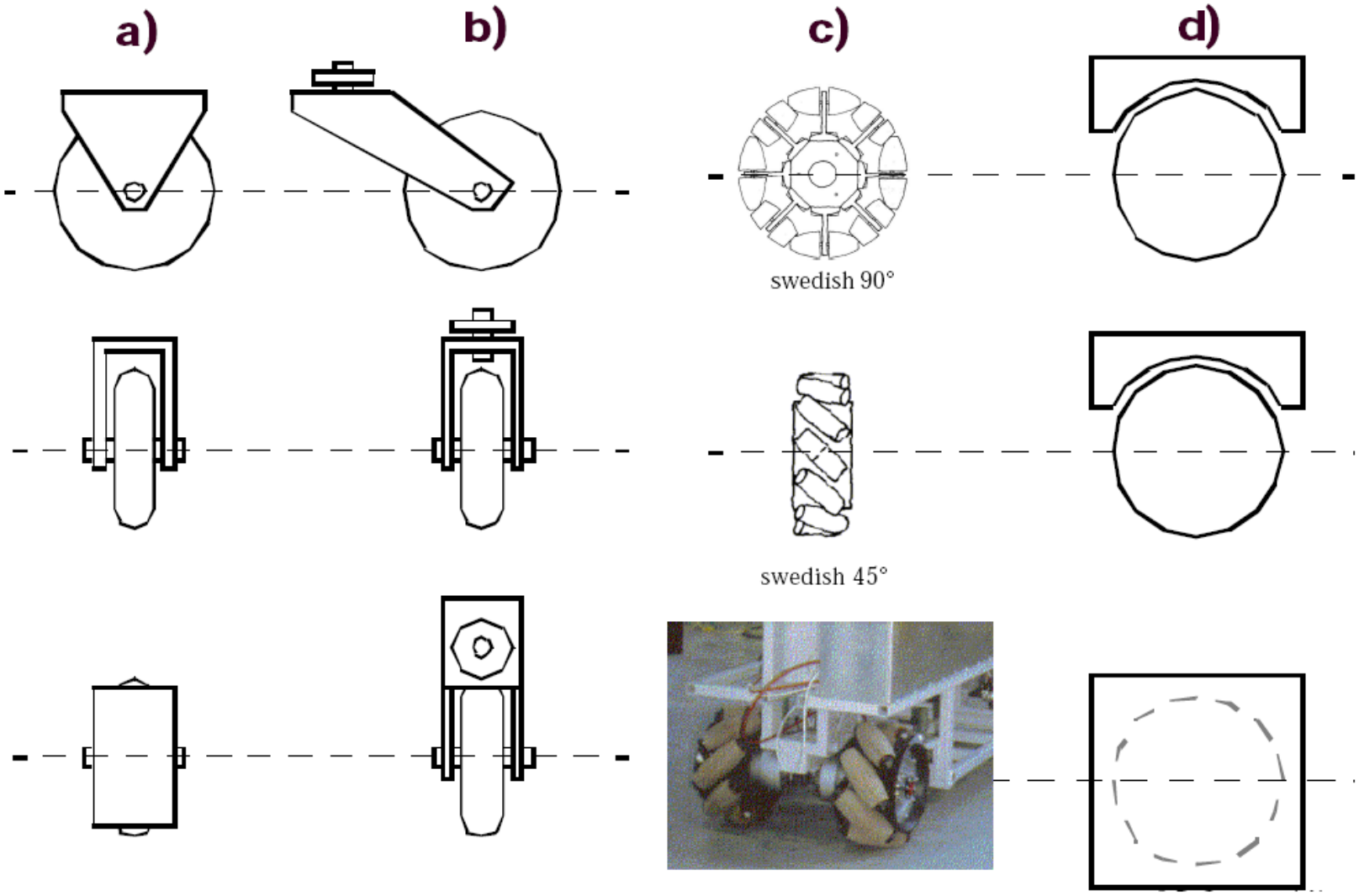
- Statically stable when still and for some gaits



Wheeled locomotion

- Most popular means of locomotion in robotics (and other vehicles)
- Simple to implement and highly efficient
- Bigger wheels gives better handling of rough terrain
- Wheeled robots typically designed so that balance is not an issue

Wheel design

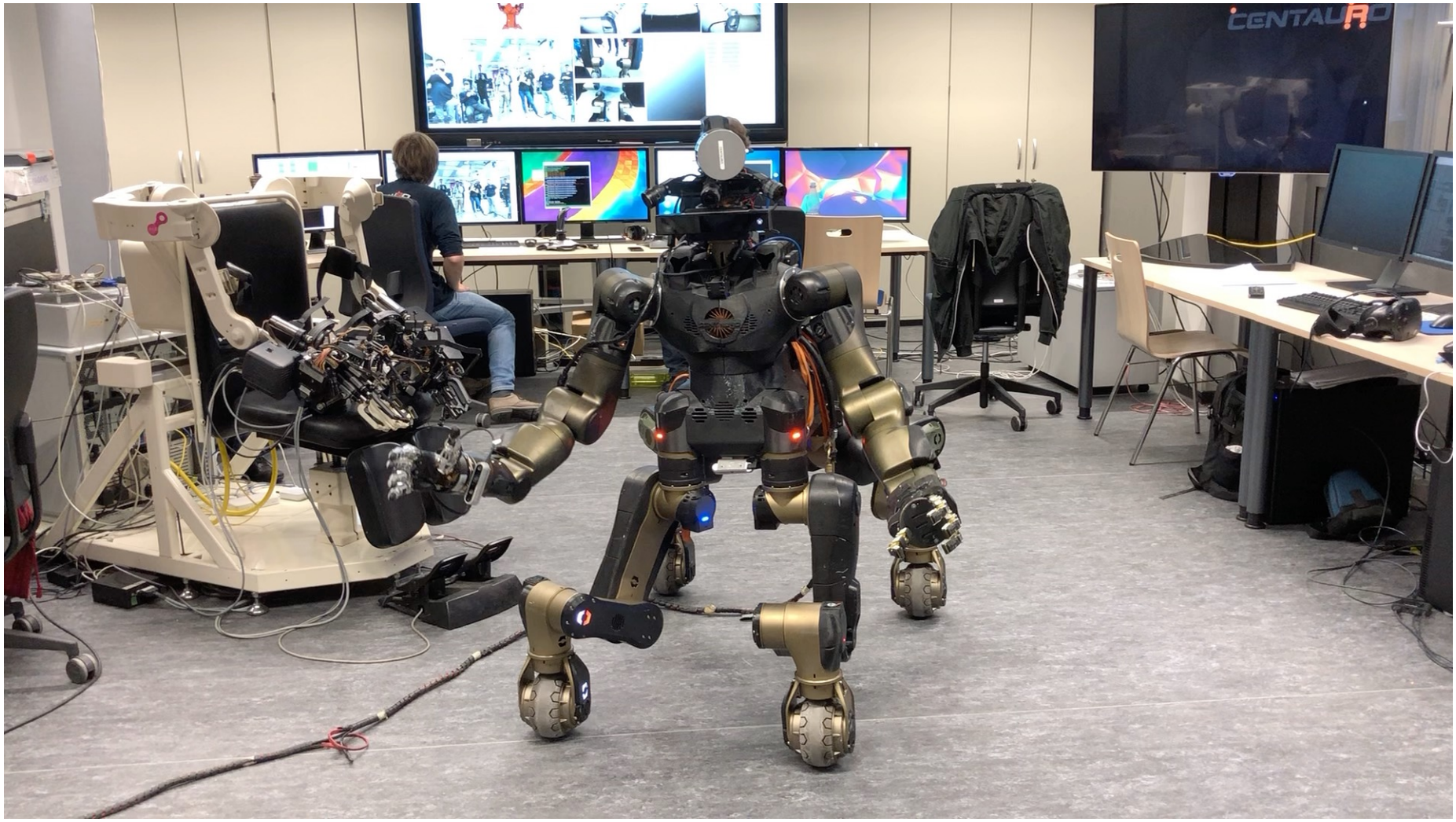


Slip/skid steering

- Mostly for outdoor platforms
- Wheels or tracks
- Turn by applying different speed to wheels
- Skidding/slipping makes it hard to predict motion
- Extremely energy inefficient when friction is high

Wheels and legs
H2020 Project “Centauro”

H2020 Project “Centauro”
The result



H2020 Project "Centauro"
The result

H2020 Project “Centauro”
The result

Flying robots
Unmanned Aerial Vehicles (UAV)

- Increased interest
- Two main types
  - Fixed wings
  - Multirotor (rotary-wing)

Pros and cons with fixed wings and multirotors?

- Fixed wing:
  -
  -
  -
  -
- Multirotor (rotary-wing):
  -
  -
  -
  -

Pros and cons with fixed wings and multirotors?

- Fixed wing:
  - Can glide. Moves fast
  - Longer range
  - Cannot stand still
  - Need larger area for start/stop

- Multirotor (rotary-wing):
  - Can stand still (“hover”). Easy to change height.
  - Can fly close to ground
  - Start/stop on small area
  - Limited range

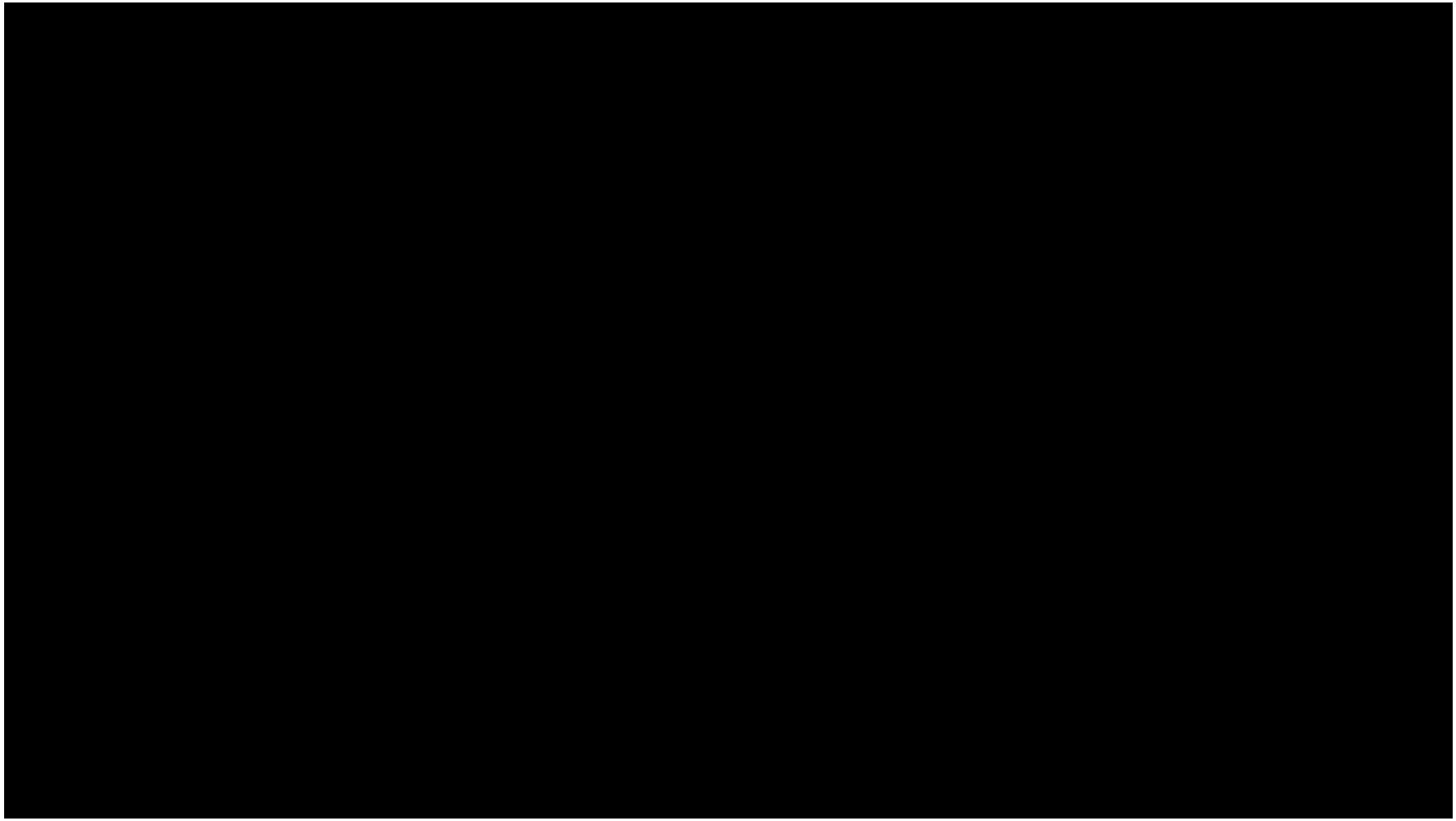
Videos: multi-rotor

The Flying Machine Arena
Quadrocopter Ball Juggling

IDSC

ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Video: Zipline in Rwanda with fixed-wing



Surface and underwater robots

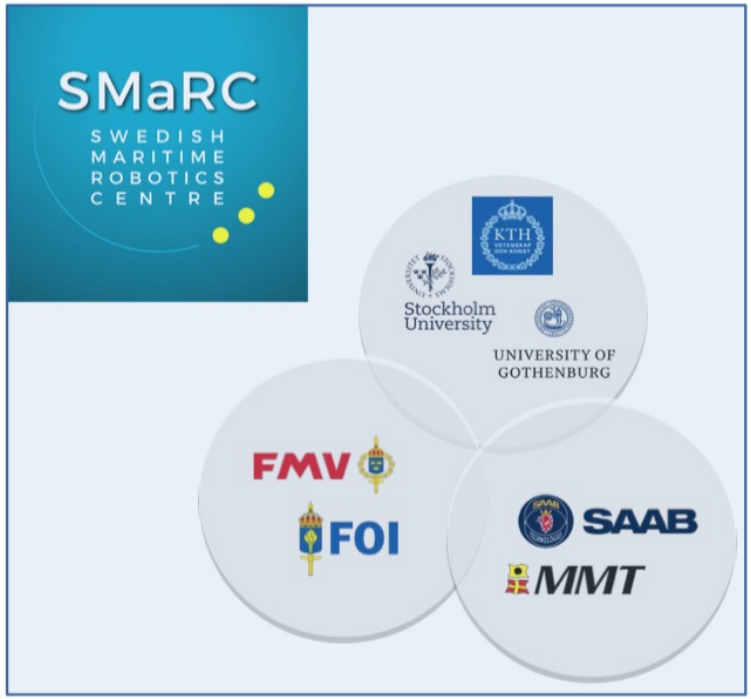
- Autonomy on the sea also investigated
- Both on the water and under the water
- Why automate?

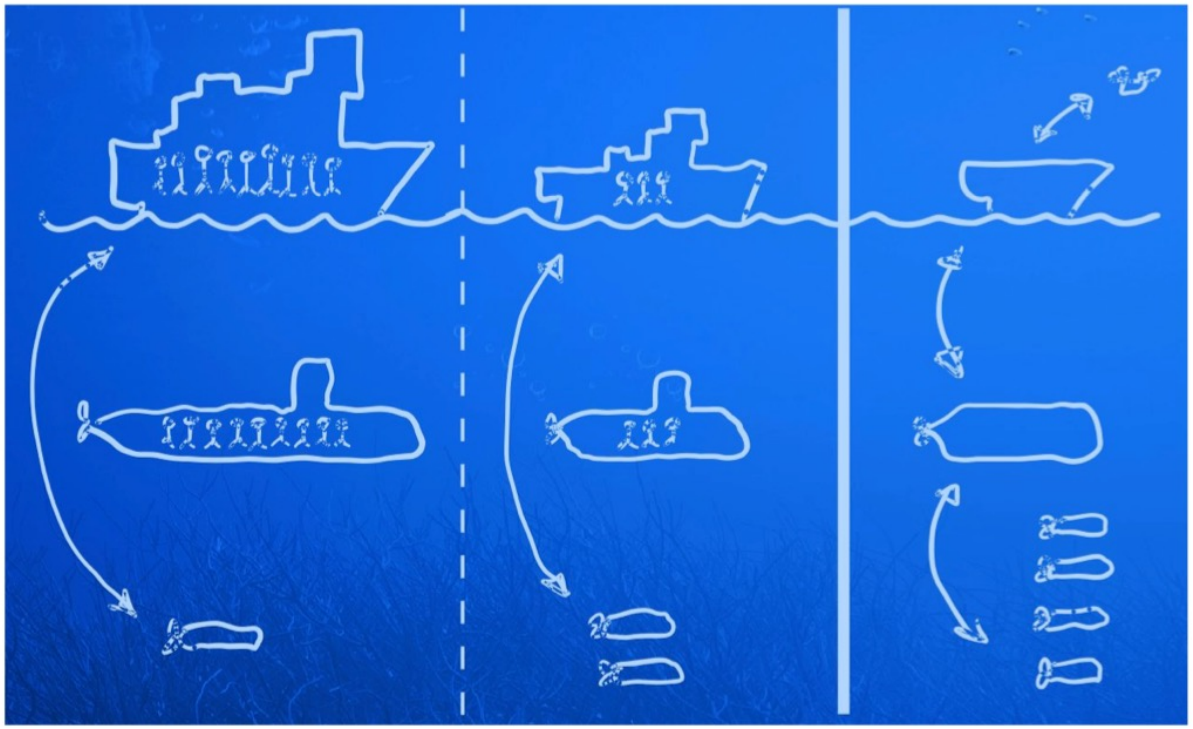
SMaRC - https://smarc.se

Swedish Maritime Robotics Centre

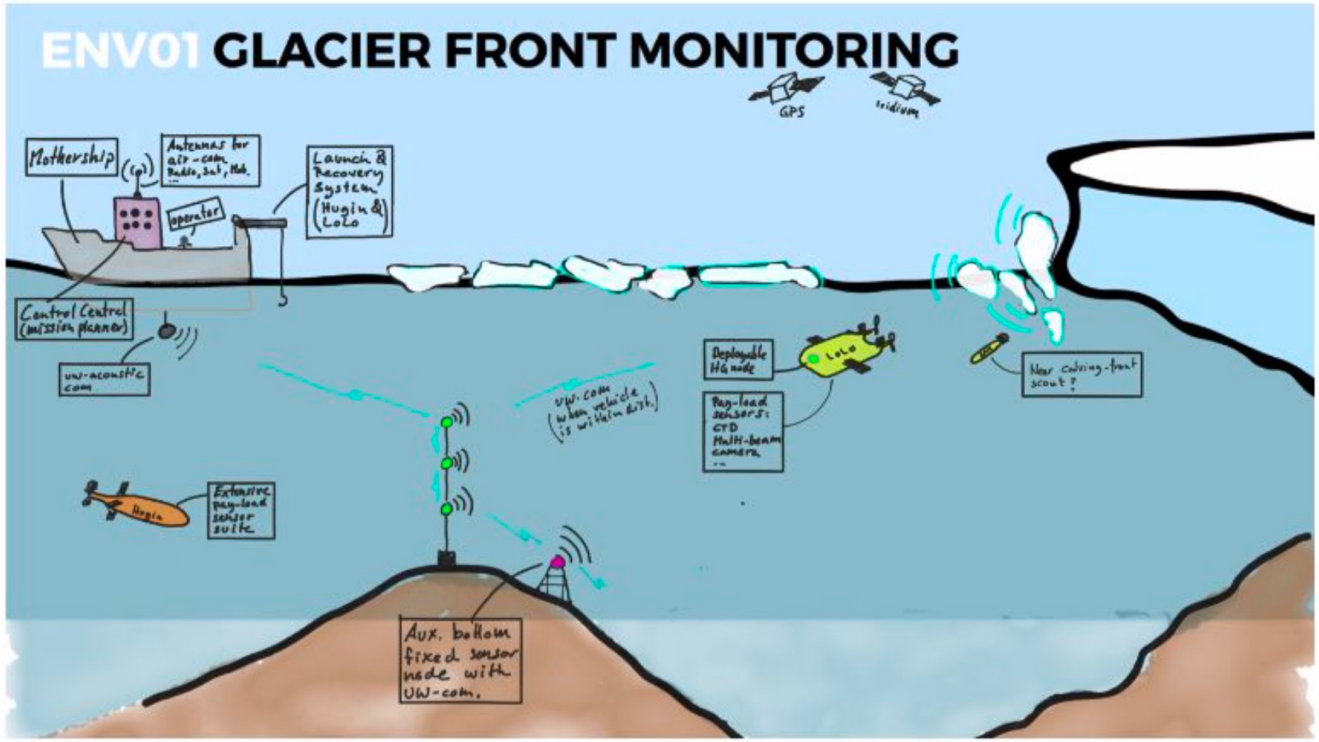
Mission: perform research on, and demonstrate, solutions that can contribute to the transition to autonomous intelligent underwater systems.

The project runs from Mars 2017 to December 2024.



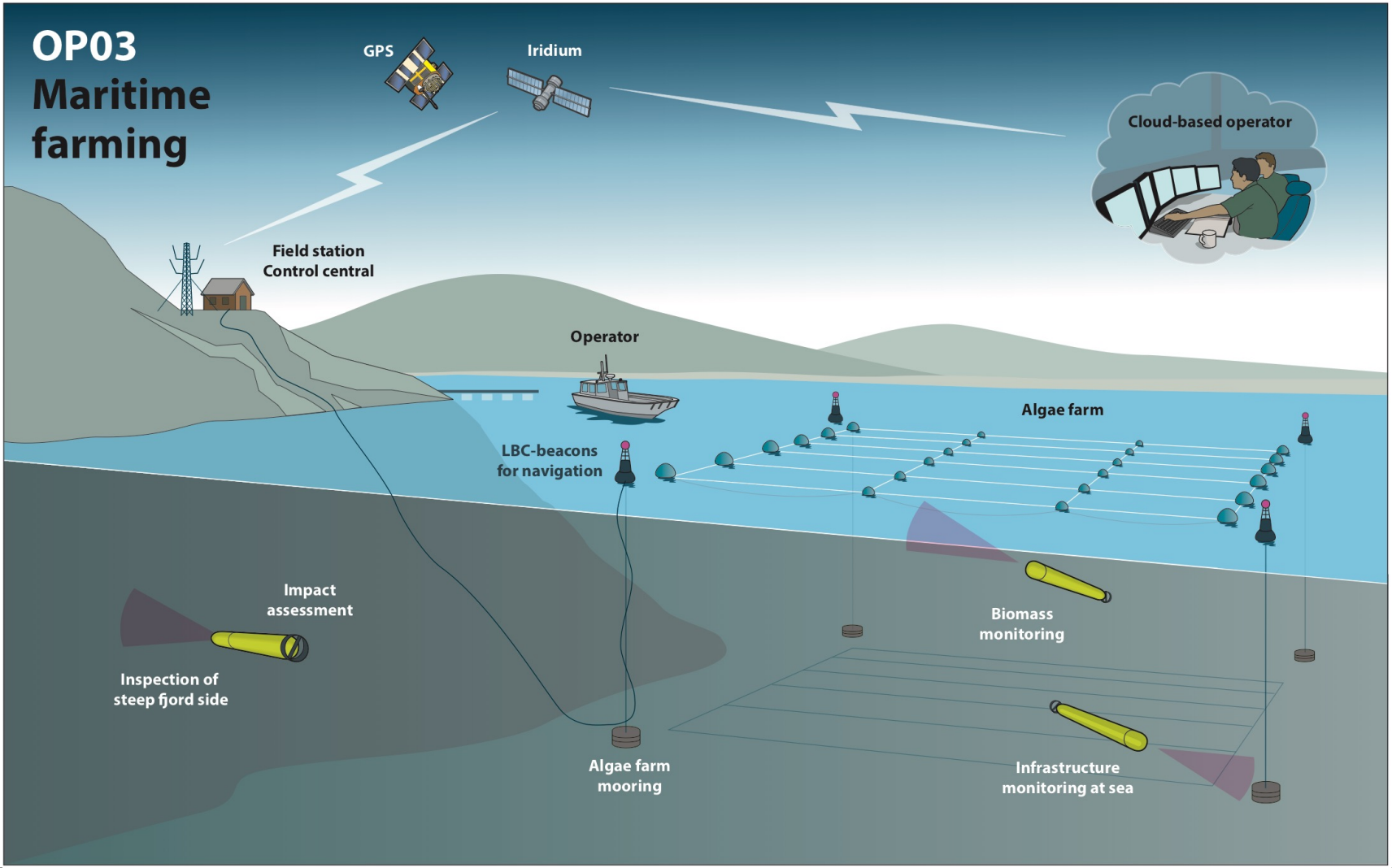


Ex: Investigating Antarctica



The robot Ran was under the glacier for 13 hours.

Ex: Farming


OP03
Maritime
farming
GPS
Iridium
Cloud-based operator
Field station
Control central
Operator
Algae farm
LBC-beacons
for navigation
Impact
assessment
Inspection of
steep fjord side
Biomass
monitoring
Algae farm
mooring
Infrastructure
monitoring at sea

Ex: Shipwreck

TA Chris

TA "Nacho"

https://www.nytimes.com/2019/07/22/science/shipwreck-archeology-shipwreck.html

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