Presentatie Cluster Inspectie Leidingen

Presentatie door Iwan de Waard (ExRobotics)
en Nicolò Botteghi (Universiteit Twente)

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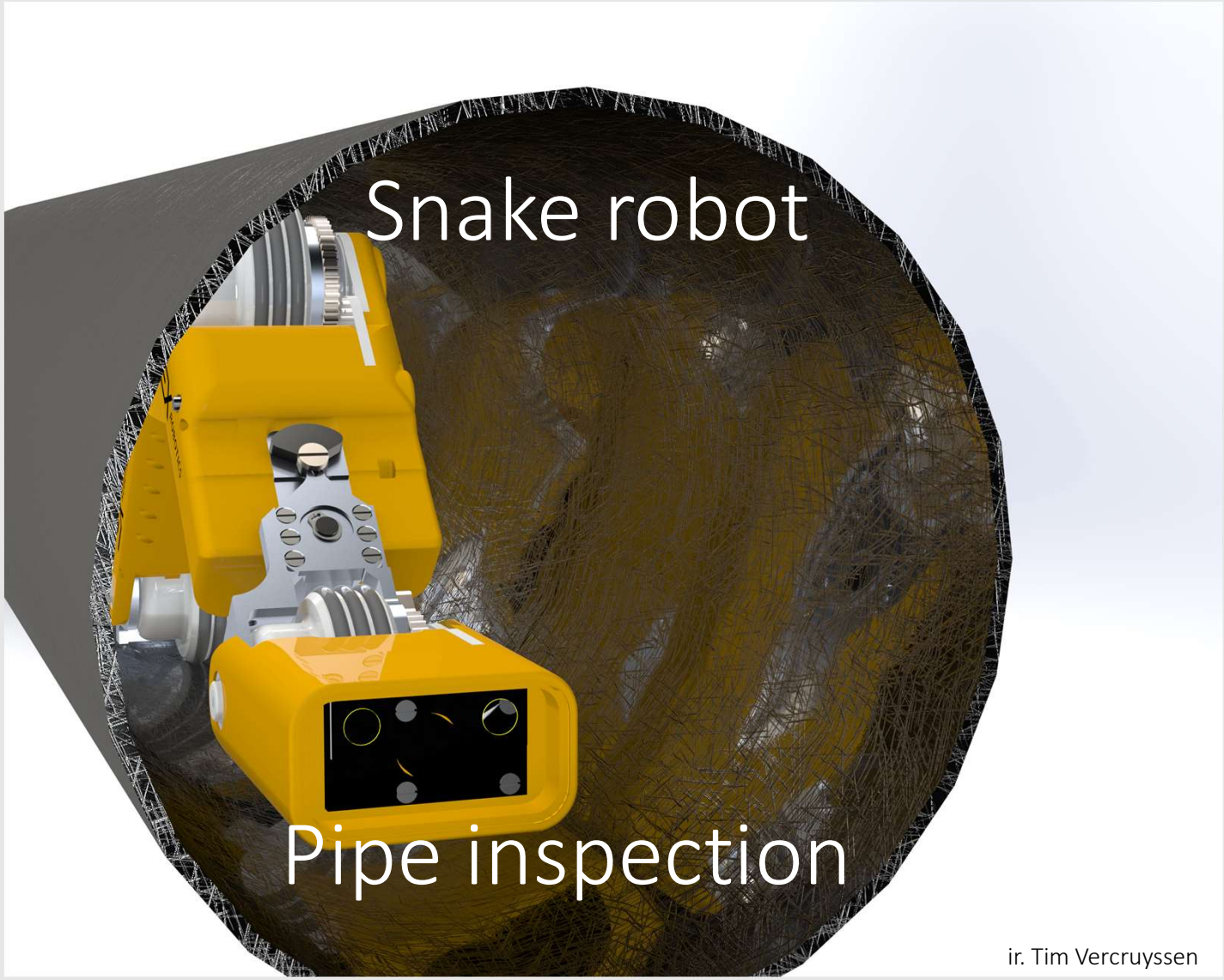
Vlaanderen-Nederland
Europees Fonds voor Regionale Ontwikkeling

Snake robot



Pipe inspection

ir. Tim Vercruyssen

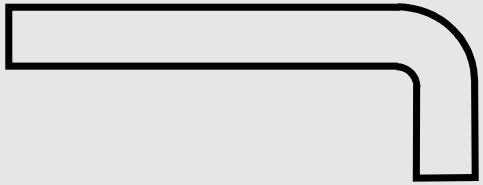
ROBOTICS

Doel -> Interne pijpleiding inspectie

EX ROBOTICS

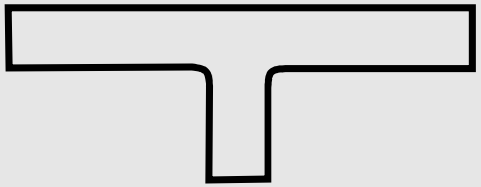
Challenges

Inspection of straight pipelines, with diameter between 4 – 8 inch.
Horizontal & Vertical, Up & Down!

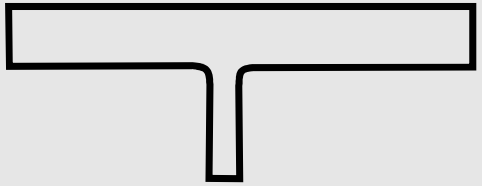


Inspection of straight pipelines with 90 degree (1D) turns in
every possible orientation

Inspection of straight pipelines with gate and ball valves full open.



Inspection of straight pipelines and T-joints v

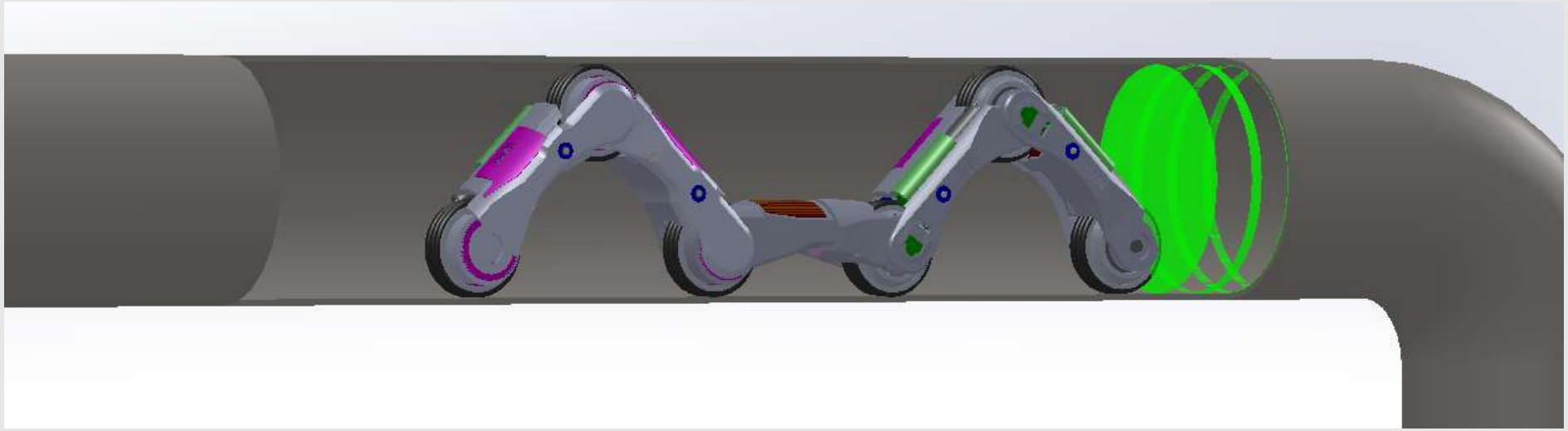


Inspection of straight pipelines and T-joints v
diameter (minimum diameter 4 inch)

EX ROBOTICS

Universiteit twente

- Gasleidingen
- Edwin Dertien



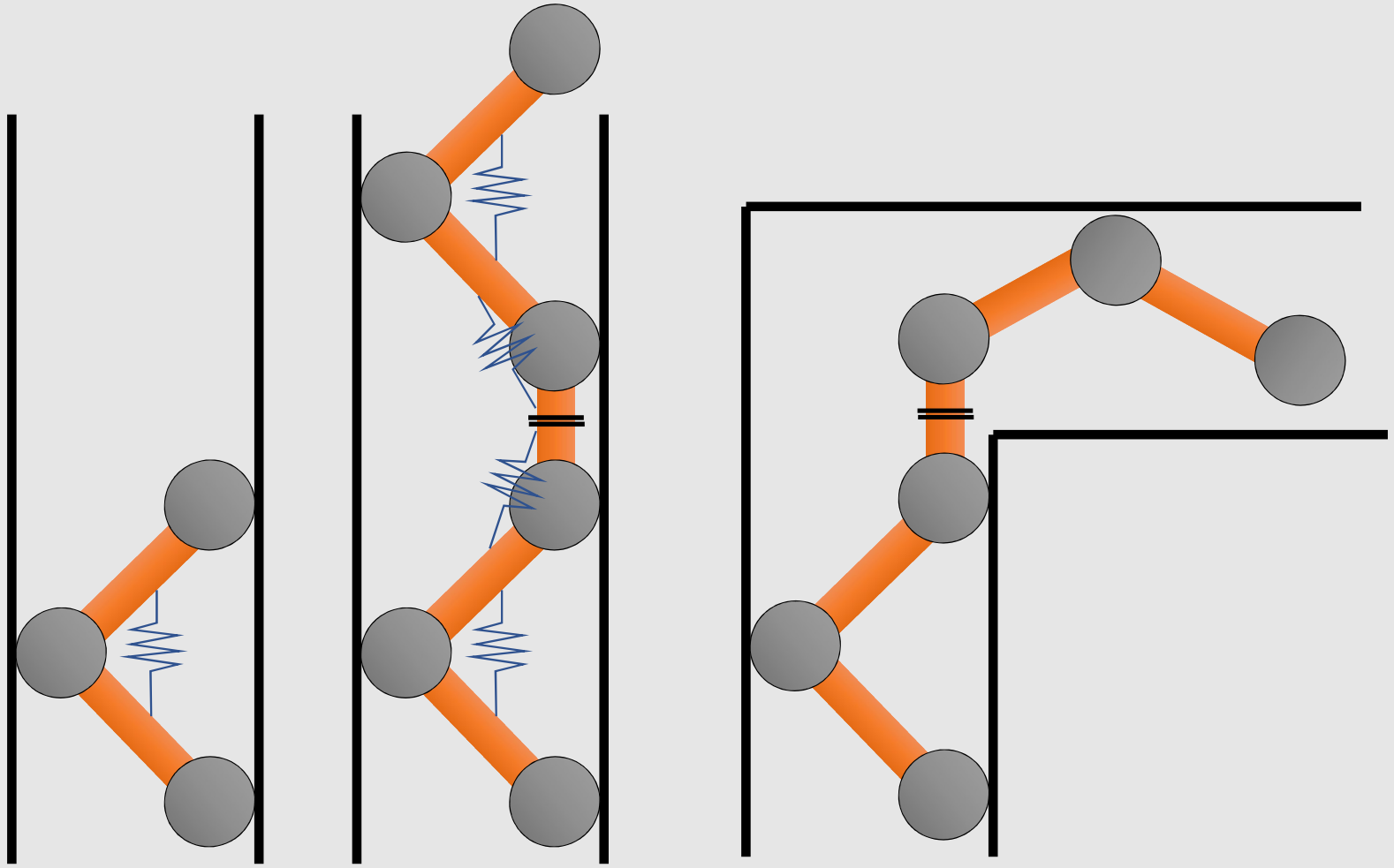
EX ROBOTICS

ExRobotics:

- Pijpleiding 4-6”
- 3.5kg
- Modules: 140mm
- Wiel: 54mm

EX ROBOTICS

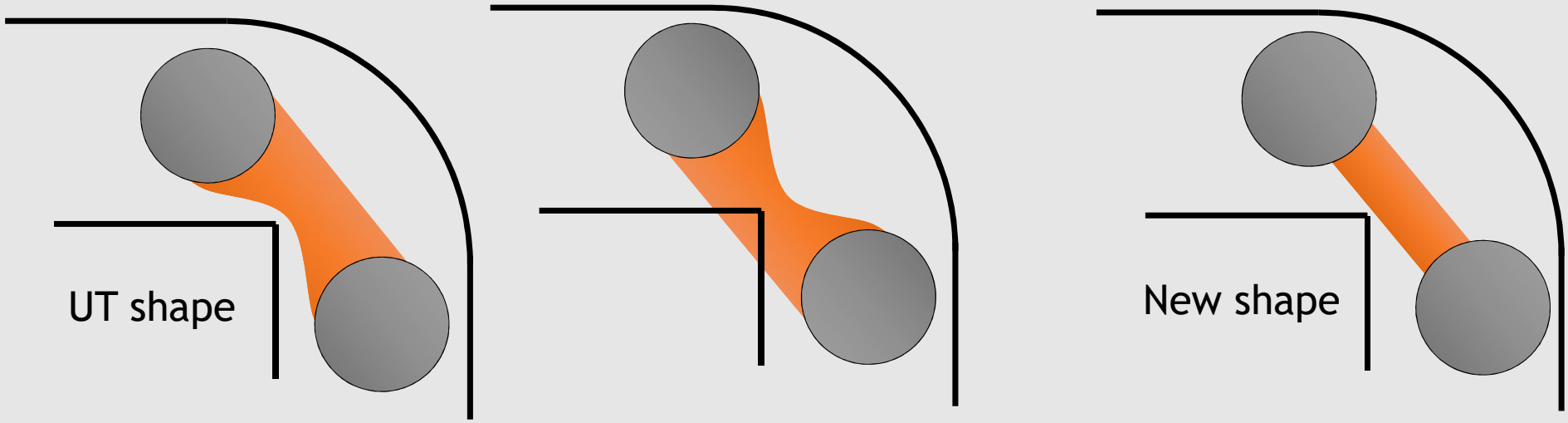
Principal



EX ROBOTICS

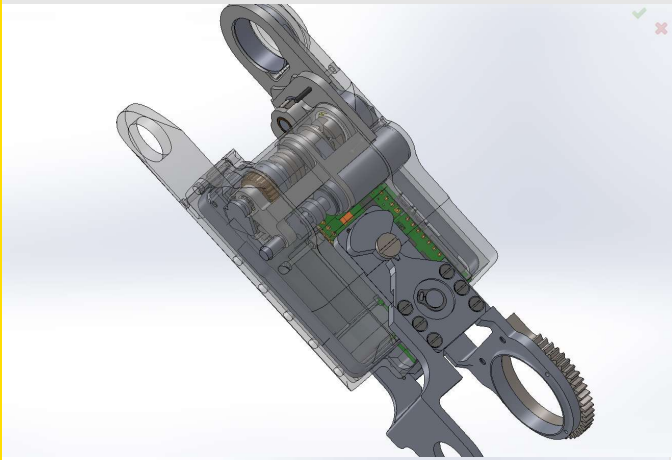
Ontwerp:Uitdagingen

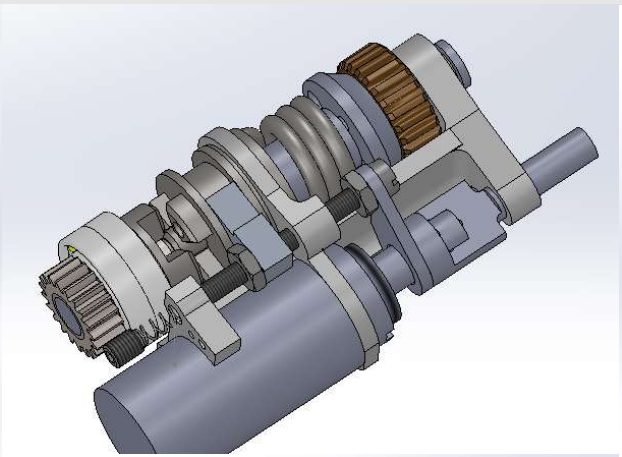
- Gewicht
- Vorm
- Falen

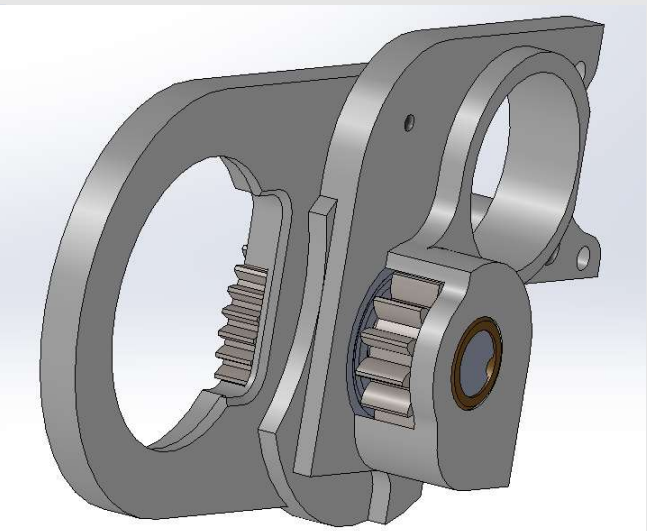


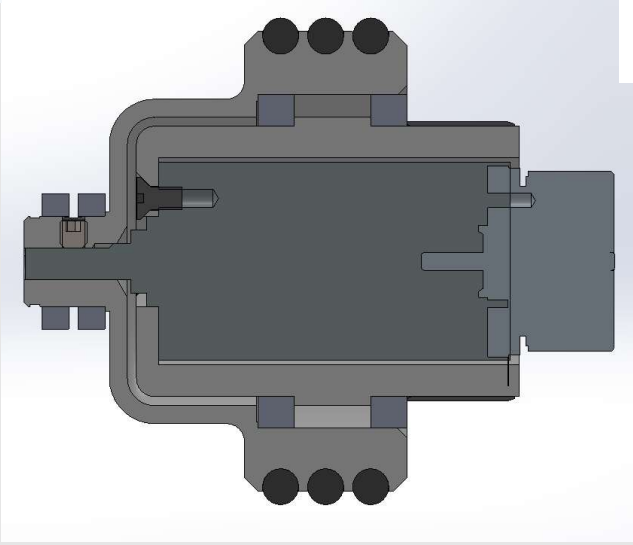
EX ROBOTICS

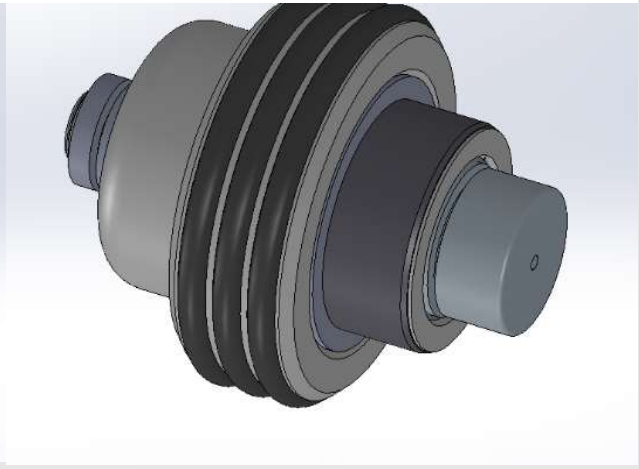
Status all sub assemblies are finished





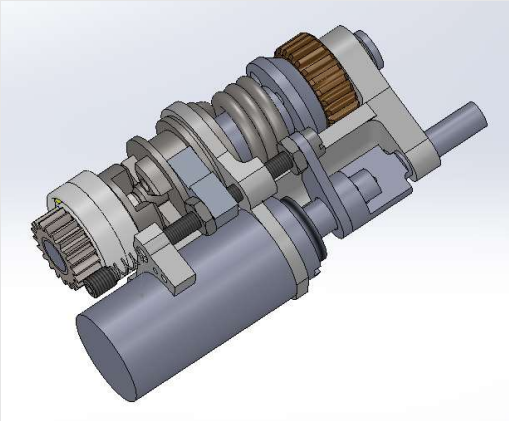


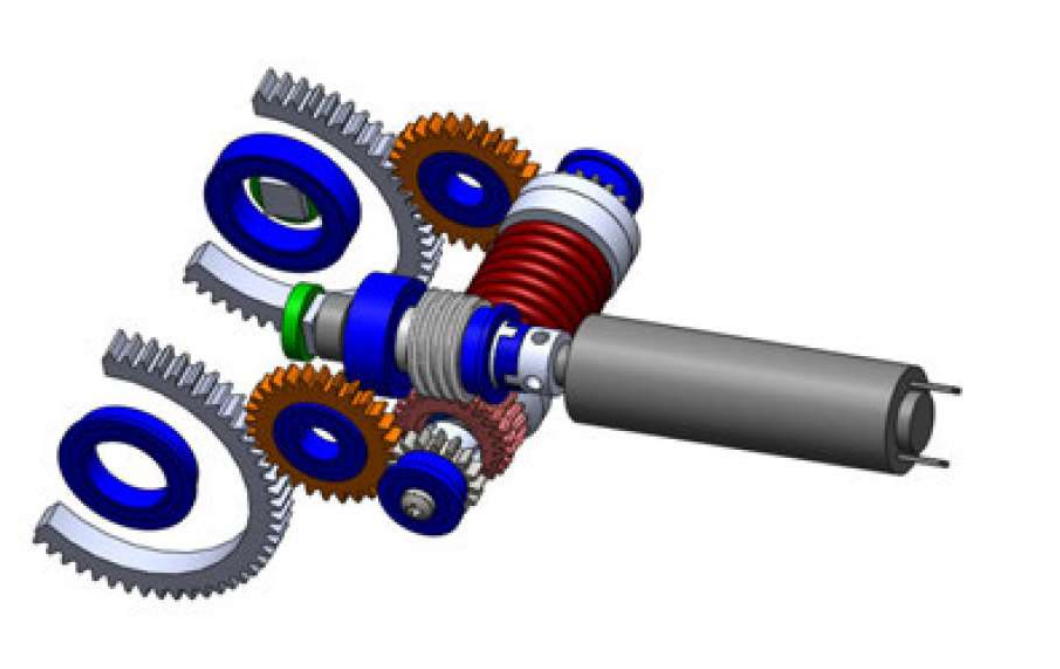




ROBOTICS

Ontwerp: Klem mechanisme



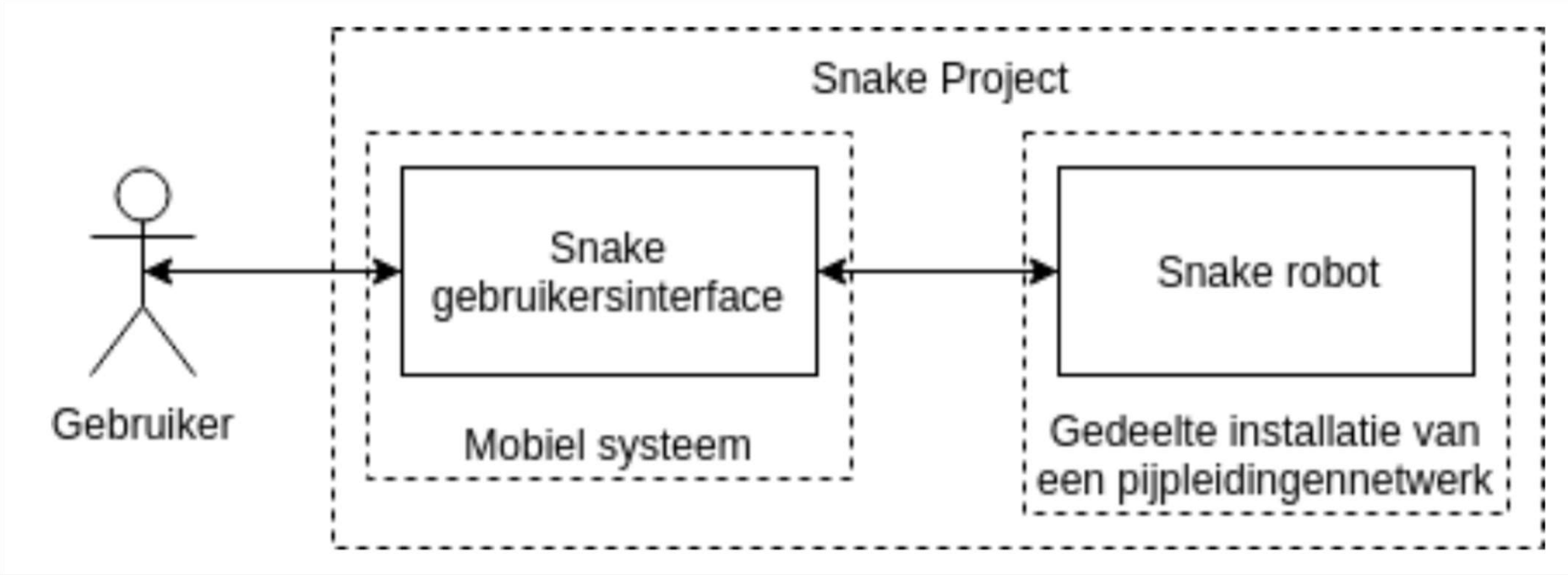


Motor	Gearbox	Worm / wormwheel	Spring	Clutch	Gearset

EX ROBOTICS

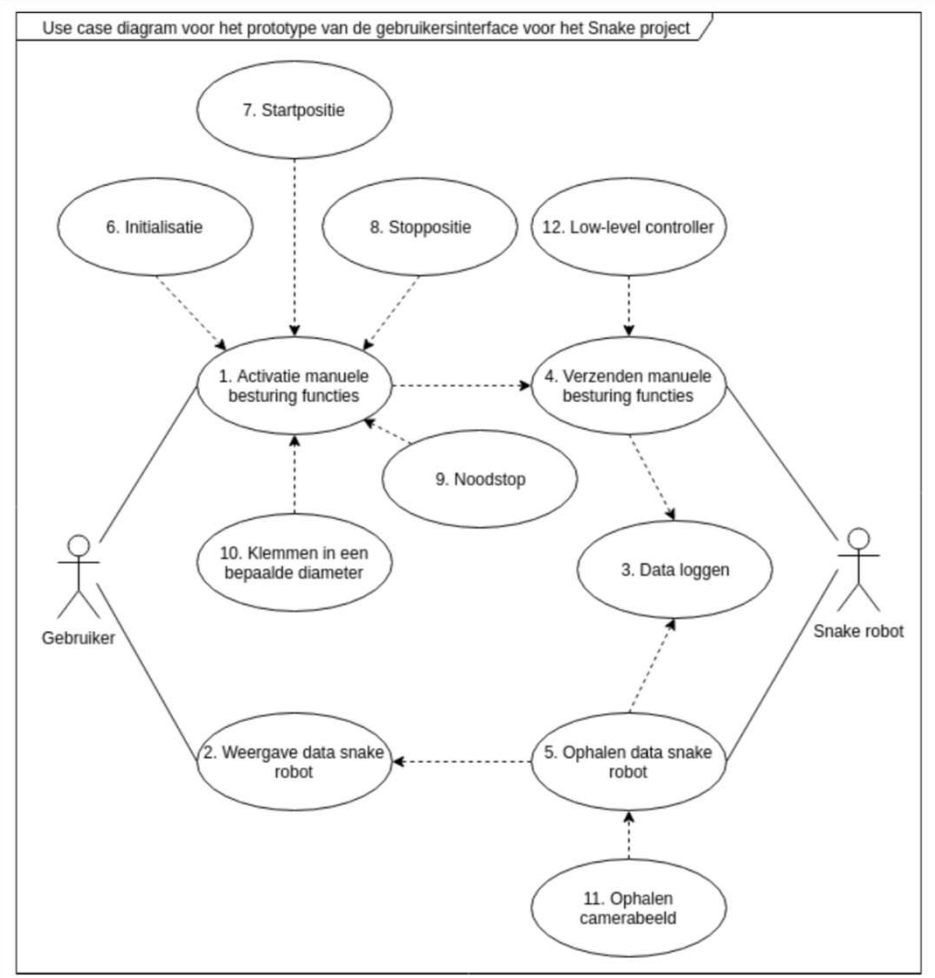
Pictures modified from UTwente

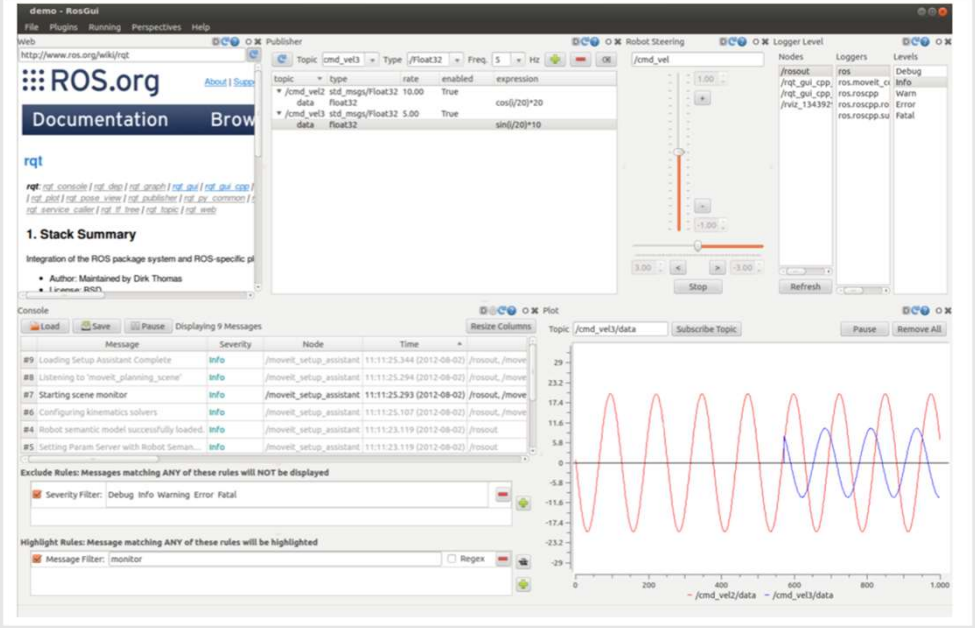
User interface

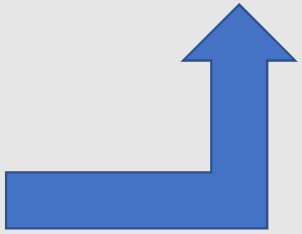


EX ROBOTICS

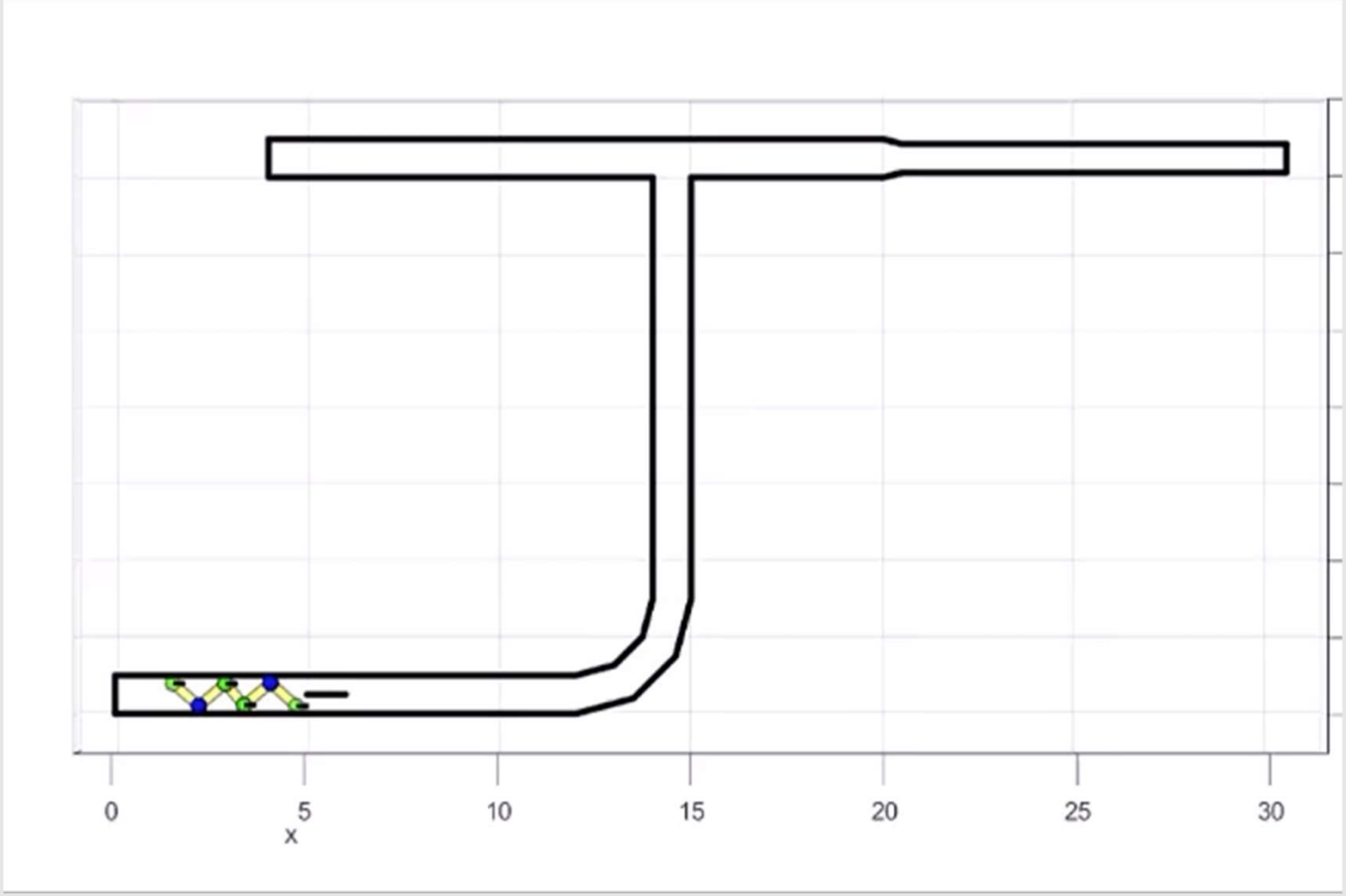
Definitie use case







Simulaties van het hardware ontwerp in matlab



EX ROBOTICS

Next steps

- Bouwen van hardware
- Integratie ExRobotics – UT
- Testen

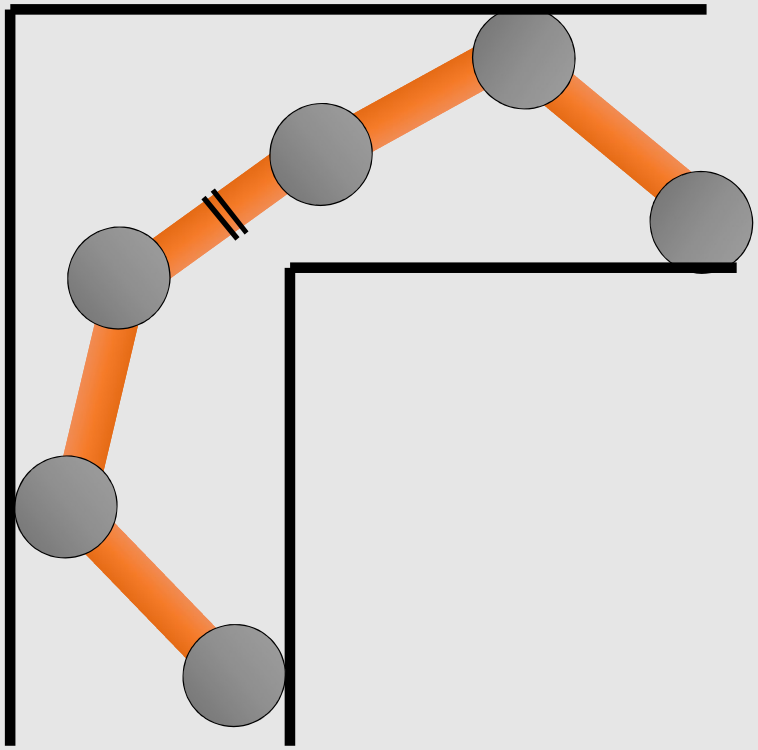
EX ROBOTICS

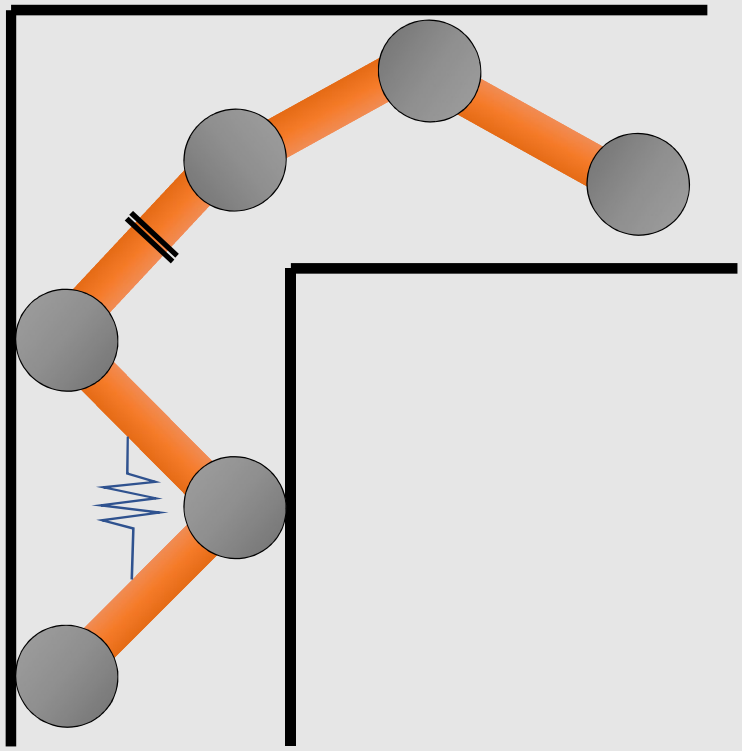
EX ROBOTICS

Ontwikkeling Universiteit Twente

EX ROBOTICS

Principal





ROBOTICS

Smart Tooling event
25 June 2019

Deelproject
Pipeline inspection

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Europees Fonds voor Regionale Ontwikkeling

The aim of the development

- **Common problem in petrochemical plants is the so called “corrosion under isolation”**

https://www.corrosionpedia.com/2/6495/corrosion-under-insulation-cui/a-two-step-solution-to-the-high-cost-of-corrosion-under-insulation

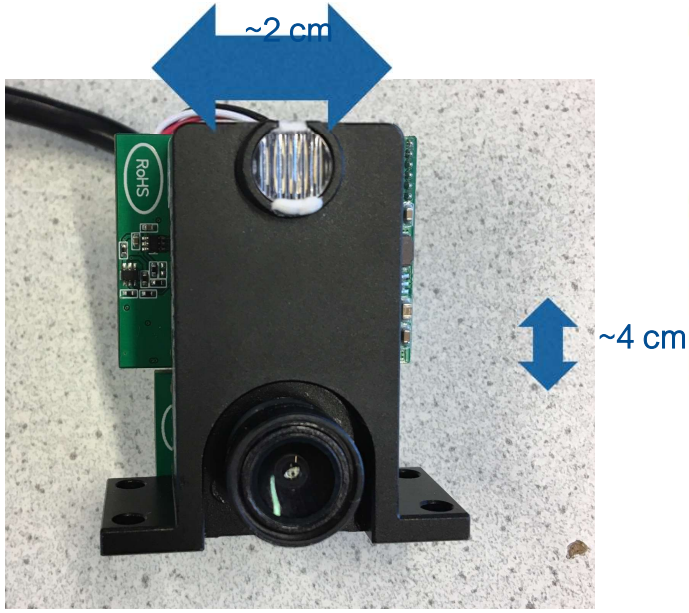
Current work

1. Sensing of the environment

- 2D LiDAR for detection turns and junctions

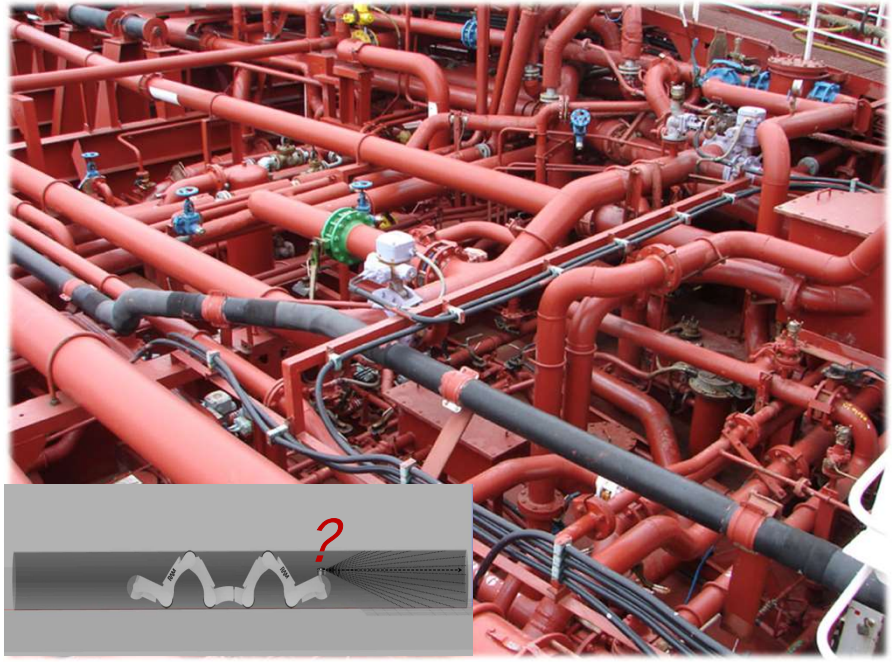
- Turning angles estimation

- Integration of the sensor in the front module of the robot



Current work

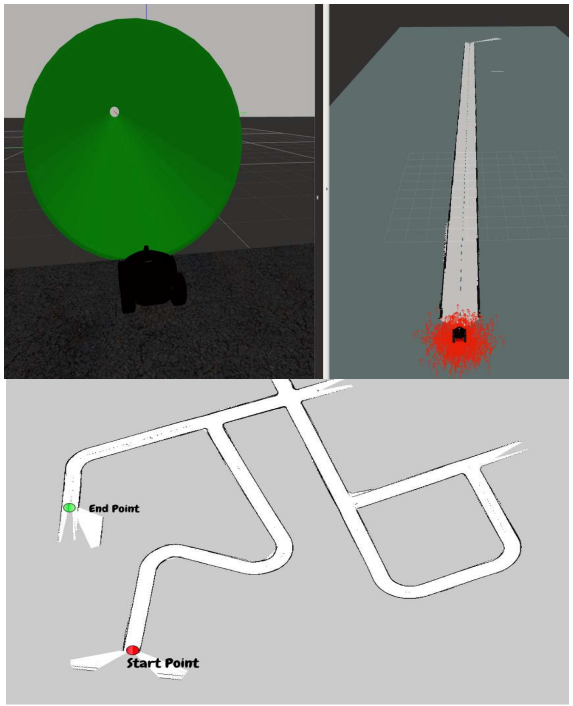
2. Localization and mapping of the pipeline network



Current work

2. Localization and mapping of the pipeline network

- Featureless pipe → no texture inside the pipes
- “Corridor problem” → long straight sections
- Loop closure



Current work

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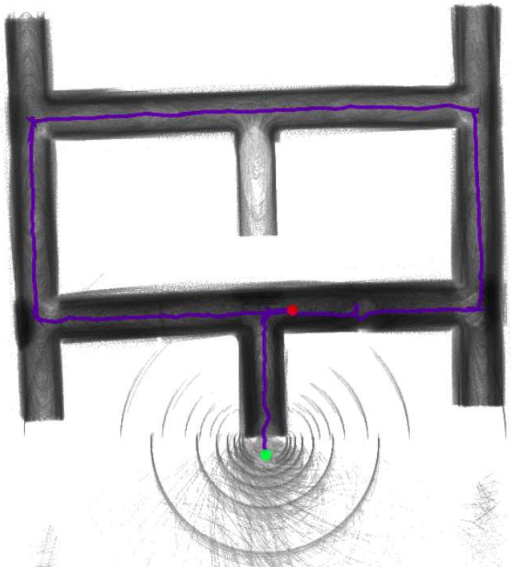
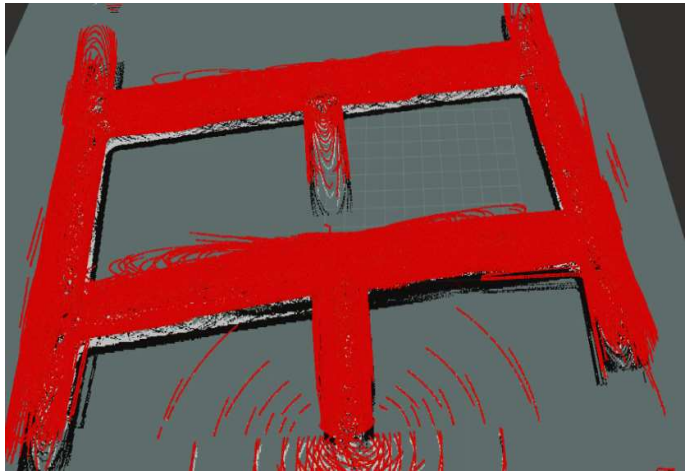
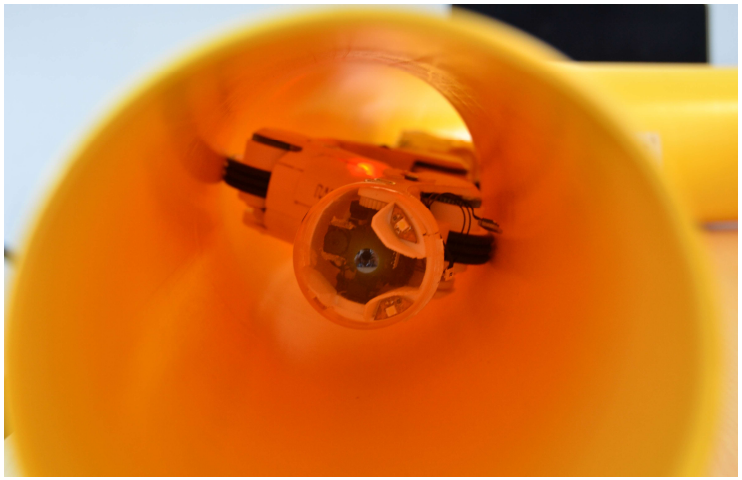




Next steps

- Navigation in simple networks using LiDAR
- Integration with sensors for measuring wall thickness

Thank you for your attention!!!



RAM ROBOTICS AND MECHATRONICS

UNIVERSITY OF TWENTE.

Presentatie Cluster Inspectie Vaten

Presentatie gemaakt door ID-tec B.V.,
toelichting door Erwin Salemink

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Europees Fonds voor Regionale Ontwikkeling

Autonome Inspectie Robot

ID-tec B.V.

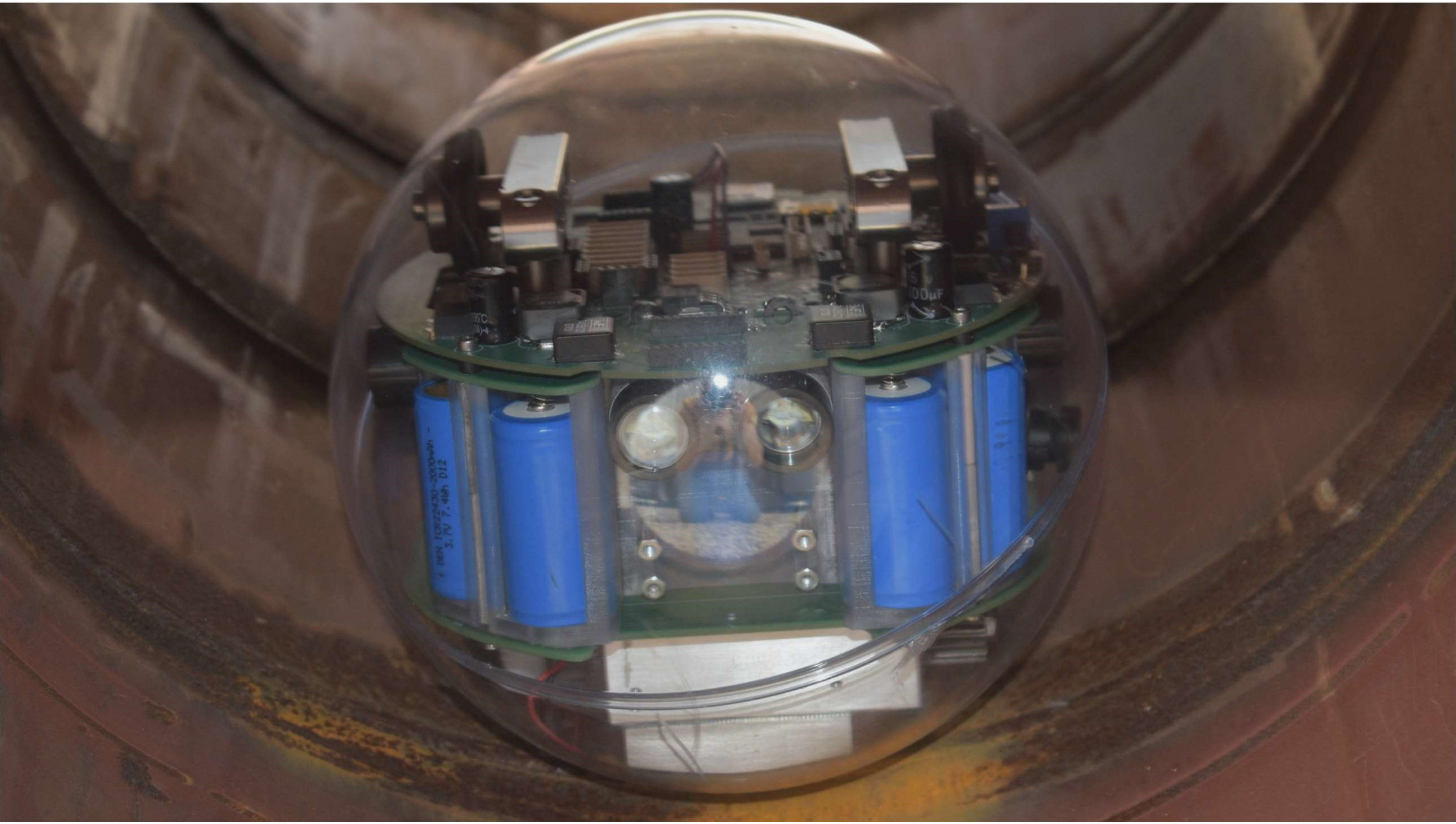
Voor Inspectie van tanks, drukvaten en leidingen

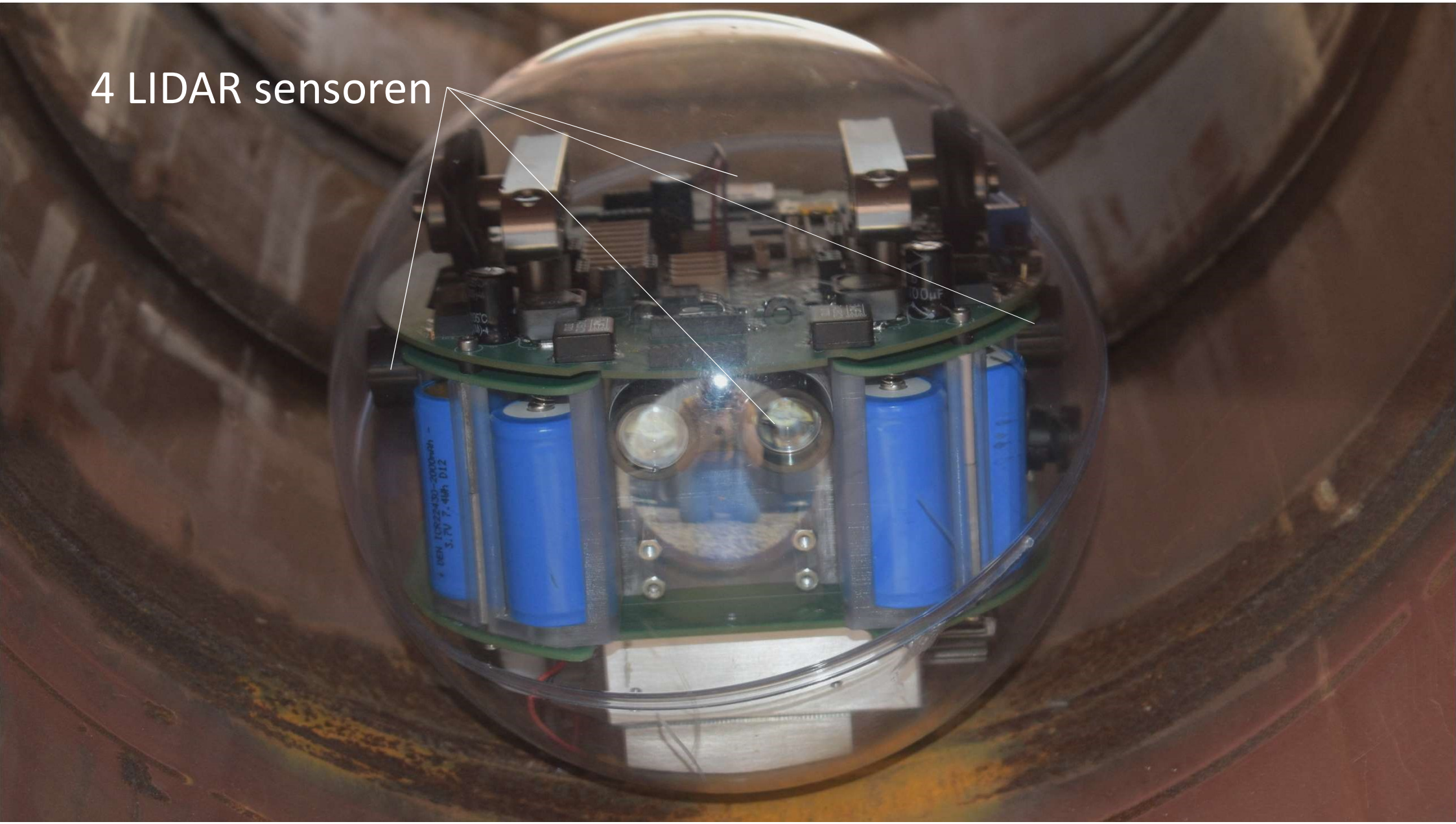
In vloeistoffen & tijdens bedrijf

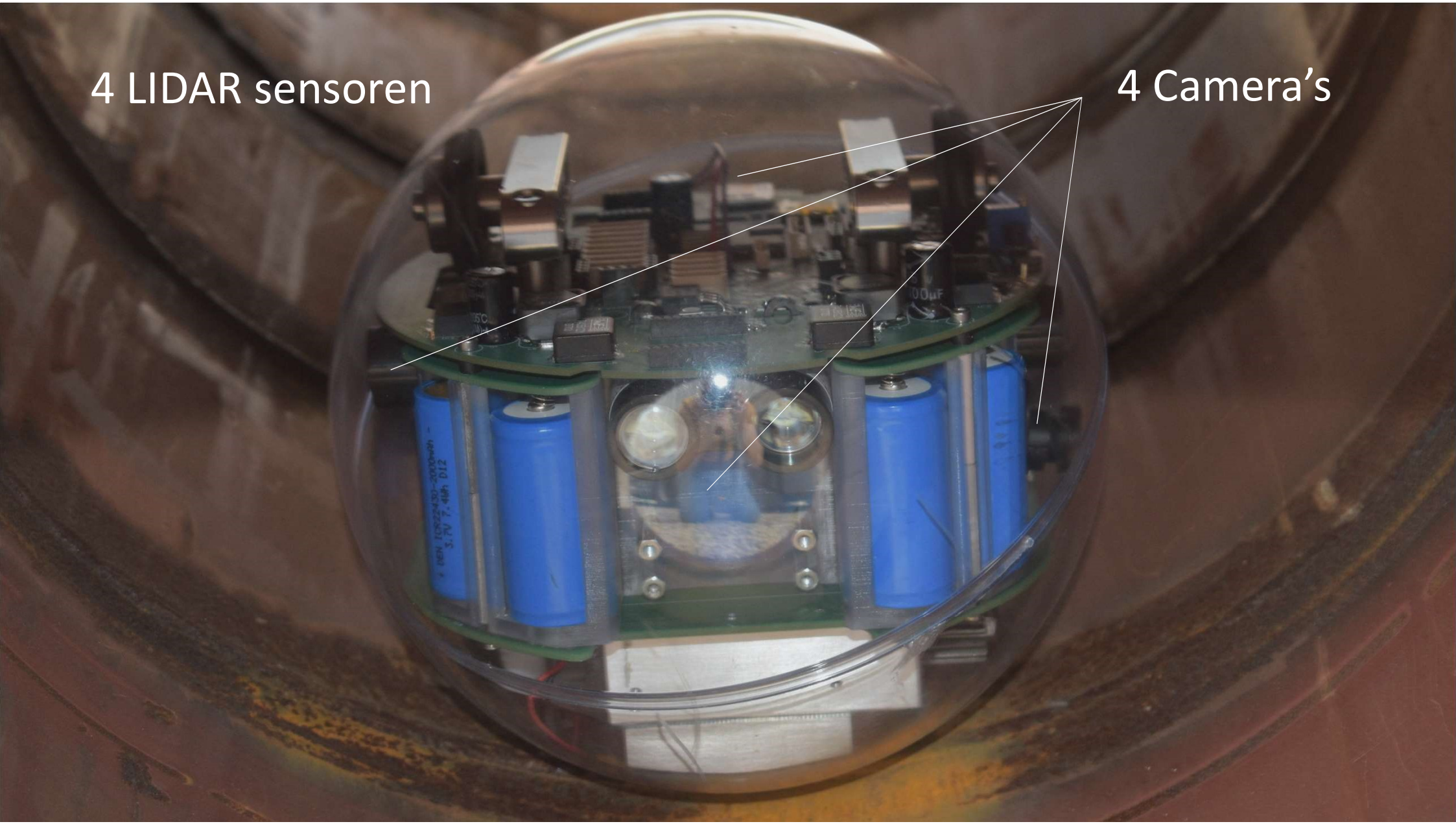
Geen betreding van besloten ruimte door mensen

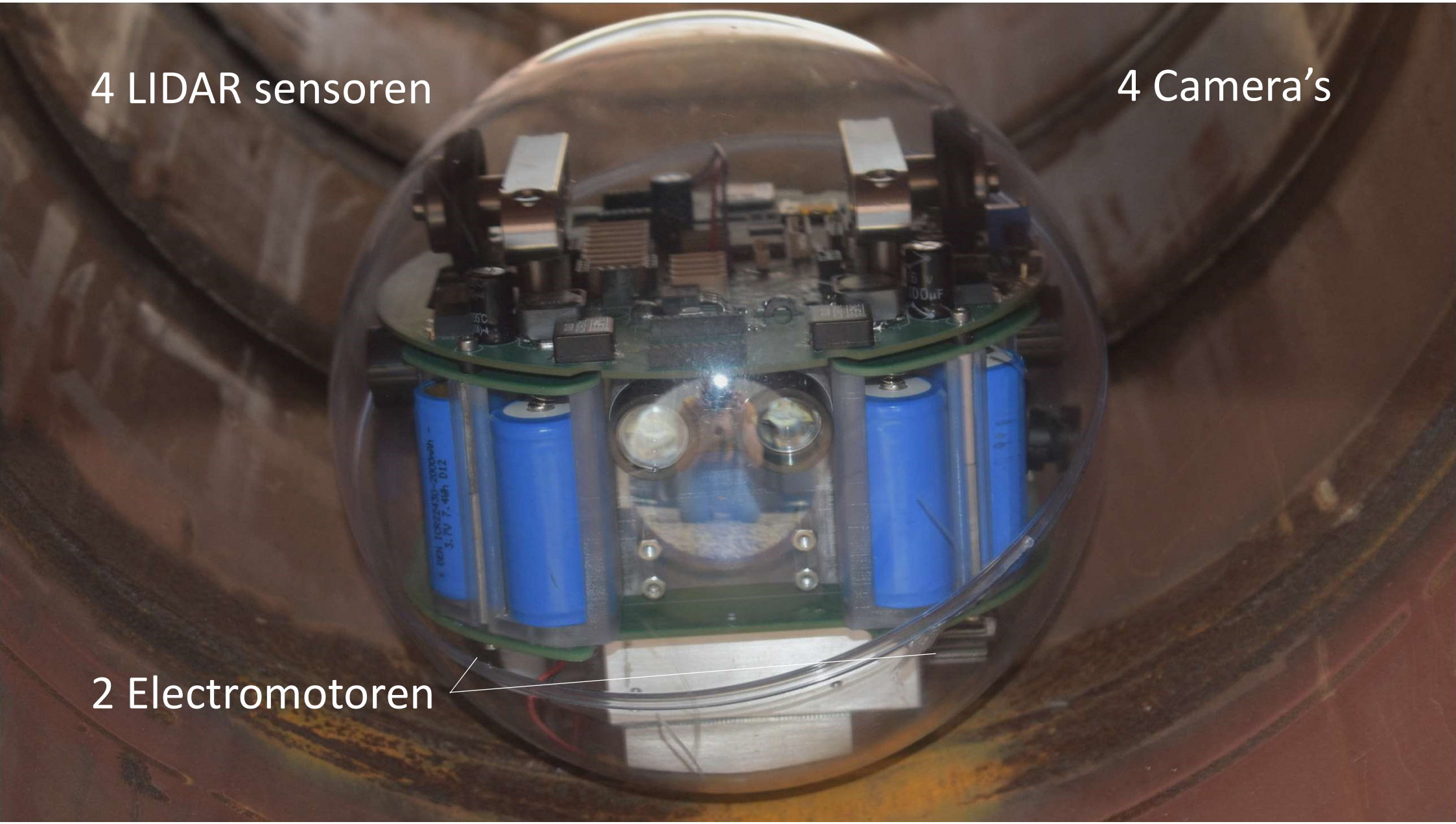
Visuele inspectie, wanddiktemeting & corrosie detectie

Minder contact tussen mens en product tijdens inspectie




4 LIDAR sensoren

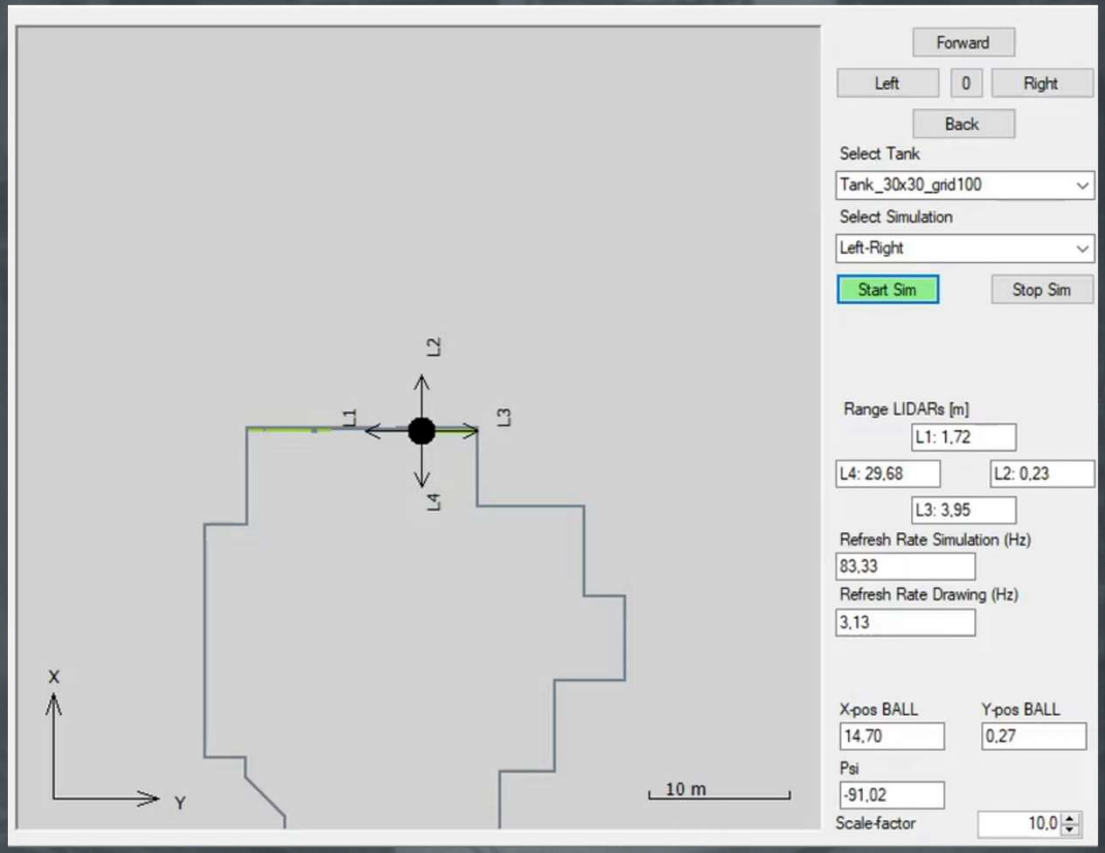

4 LIDAR sensoren
4 Camera’s


4 LIDAR sensoren
4 Camera’s
2 Electromotoren

Werking op basis van 3 stappen:

1. **Inmeten** van de omgeving met “LIDAR”
2. **Berekenen** van de optimale route
3. **Navigeren** tijdens inspectie
   (route wordt aan obstakels aangepast)

Werking op basis van 3 stappen:



Vervolgstappen

- Prototype Autonome Inspectie Robot (BOL)
- LIDAR plaatsbepaling in (schone) vloeistoffen
- Sonar plaatsbepaling in (andere) vloeistoffen
- Sonar communicatie in vloeistoffen

Vervolgstappen

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