Autonomous Robots for Industrial Inspection

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Today’s industrial operations still rely on human presence, despite...

MISSING WORKFORCE
1.5 million plant operators missing until 2030 in the EU alone

LIMITED PRODUCTIVITY
Undetected issues lead to downtime costs of $50 billion each year

HUMAN ERROR
Is the leading cause of most industrial accidents

But things are changing.
We are on the verge of the next robotic revolution

AI-powered, agile robots enable the transition from human-centric operations to the autonomous industry.

AUTOMATED MANUFACTURING
Enabled by 3 million industrial robots in operation

SMART WAREHOUSING
Enabled by 600,000 warehouse robots in operation

AUTONOMOUS INDUSTRY
Enabled by autonomous mobile robots

Workforce shortage
Repetitive work
Structured problem
Dangerous environment

Structured problem
Repetitive tasks
Structured environment
Repetitive motions
Workforce shortage
ANYbotics creates a workforce of autonomous robots

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**ALL-PURPOSE MOBILITY PLATFORM**
Access to hard to reach places in any type of facility

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**LARGE-SCALE AUTONOMY**
Automate tasks while leaving the environment untouched

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**AI FOR THE REAL WORLD**
Uncover invisible risks with superhuman sensing and real-time AI analysis
End-to-end solution for plant operator

Corrective measures, adjustments, repairs, from multiple times a day to once a year

Tasks of the robot

- **Industrial inspection & surveillance**
  - Reading instruments
  - Checking health of equipment
  - Detecting events

- **3D reality capture**
  - 3D scanning & photogrammetry

- **Safety & security**
  - Patrolling
  - Anomaly detection
  - Situational awareness
Substantial cost savings through robotic inspection

- **5x More insights**
- **10x Faster reporting**
- **3x Monitoring frequency**
- **100% Personel safety**
- **100% Accuracy & consistency**

**CUSTOMER CASES**

- **Unplanned downtime**
  - $200-500k cost per incident

- **Inspection during operation**
  - $200-300k revenue loss p. hour

- **Asset damage prevention**
  - $0.5–1.5m cost per incident

- **Remote operation**
  - $30-50k cost per trip

- **Gas leakage detection**
  - $5-10k cost per day

- **3D asset scanning**
  - $100-150k cost per year

- **Frequent sampling**
  - $200-300k cost per year
How does ANYmal learn to move?

Velocity commands → Observations → Internal measurements → Motor commands
How do we train a neural network?

**Training Process**

1. Create random neural network
2. Run neural network in Simulation
3. Collect observations and rewards
4. Learn which actions give better reward
5. Change the neural network to do more good actions!
Applying AI: Extreme mobility in all situations

**Smartly walk over disturbances**
Easily overcomes debris, unforeseen objects in path

**Slippery industrial terrain**
Passes extreme on-site industrial slippage tests (e.g., oil)

**Unstoppable on rough terrain**
Walks up a >30° slope with loose dirt and stones
AUTO FALL RECOVERY //
Digital twin

- Mapping large, multi-floor environments
- Precise SLAM
- Integrates with BIMs
Inspection intelligence
Platform for preventive maintenance

- **Detector (Dectes Object)**
- **Interpreter (Extracts digital data)**

**READING INSTRUMENTS**
Gauges, valves, counters, LCD displays

**CHECKING HEALTH OF EQUIPMENT**
Thermography, vibrations, missing parts

**DETECTING EVENTS**
Hotspots, leakages, acoustic anomalies

**GAS DETECTION**
LEL: CH4, C2H4, C3H8
PPM: O2, CO, H2S, Cl, SO2, NO2, NH3

Specialized applications through modular third-party payloads (up to 15 kg).

Payload partners

Leica Geosystems
Metrohm
Polytec
FLUKE
INFICON
Access **PDF** and **XML** inspection reports with actionable information.

- **Time & Geo-referenced inspection insights**
- **Track patterns and historical issues**
- **Access to raw inspection data for further analysis**
- **Built on standard formats: JPG, WAV, MP4, E57, PLY, CAE**
Software integration

ANYMAL
Autonomously collects inspection data in and around your site

DATA SYNC SERVER
ANYmal syncs data, storing inspection results securely on-premise or in your cloud.

USER PC
Monitor autonomous missions, tele-operate ANYmal, and generate reports.

ANYMAL API
Integrate with the plant’s systems for real-time monitoring, predictive maintenance.

INSPECTION REPORT
Monitor autonomous missions, tele-operate ANYmal, and generate reports.
Working with leaders across industries

INDUSTRY IMPACT //

OIL & GAS    CHEMICALS    POWER    MINING    CONSTRUCTION
ANYmal X

Conformity as of 08.2022

IECEx CONFORM
Ex ib eb db op is pxb sb IIB T4 Gb

ATEX CONFORM
Ex II 2G IIB T4 Zone
Building the Autonomous Industry

Autonomous mobile robots bridge the skill gap required to operate plants without human presence.