AI-RoboSens

Detection of energy waste in industrial factories using autonomous robots, sensor technology and AI evaluation

Programm / Ausschreibung	Digitale Technologien, Digitale Technologien, AI for Green Ausschreibung 2022	**Status**	laufend
Projektstart	01.06.2023	**Projektende**	31.05.2026
Zeitraum	2023 - 2026	**Projektlaufzeit**	36 Monate
Keywords	1		

Projektbeschreibung

Das Hauptziel von AI-RoboSens ist die Entwicklung eines Assistenzsystems für Industrieunternehmen zur Reduzierung ihrer Energieverschwendung und CO2-Emissionen. Ein multisensorischer Roboterhund (z. B. Ultraschallsensoren, Infrarotkameras, Mikrofone, Vibrationssensoren, Gassensoren) inspiziert das Industriegelände selbstständig und erstellt einen Bericht über gefundene Schäden und Energieverschwendungsquellen. Erreicht wird dies durch die Verschmelzung von Robotik und Sensortechnik mit hochentwickelter künstlicher Intelligenz (KI). Energieverschwendungen rasch, automatisiert und kostengünstig in unterschiedlichen Industrieunternehmen zu identifizieren ist einen Notwendigkeit, um die EU-Ziele zur Erreichung der Klimaneutralität bis 2050 zu erreichen. Das Projekt addressiert eine globale Herausforderung und wird signifikant zur Erhöhung der Umsätze bzw. Publikationen der beteiligten Partner beitragen.

Abstract

The main goal of AI-RoboSens is to develop an assistance system for industrial companies to reduce their energy waste and CO2 emissions. A multisensory robotic dog (e.g. ultrasonic sensors, infrared cameras, microphones, vibration sensors, gas sensors) autonomously inspects the industrial site and generates a report about found damages and energy waste sources. This is achieved by merging robotics and sensor technology with sophisticated artificial intelligence (AI). Identifying energy waste quickly, automatically, and cost-effectively across diverse industrial enterprises is a necessity to meet EU targets for achieving climate neutrality by 2050. The project addresses a global challenge and will significantly contribute to increasing the revenues or publications of the participating partners.

Endberichtkurzfassung

The goal of the AI-RoboSens project was to develop a smart assistance system that helps industrial facilities reduce energy waste and CO2 emissions. To achieve this, an autonomous, four-legged robot (“Robodog”) was used, equipped with various sensors (e.g. visual camera, thermal imaging camera, gas sensor, ultrasonic sensor). It can patrol industrial facilities on its own and detect damage as well as sources of energy loss, such as leaky valves, worn pump bearings, or heat loss to avoid costly breakdowns or unnecessary energy consumption.

During the first two years of the project, important foundations were laid and tangible successes were already achieved. Following a comprehensive market analysis, the team identified six key scenarios for energy waste, such as compressed air leaks, cavitation in pumps, and vibration anomalies. The “Spot” robot was equipped with a gripper arm, enabling it to place structure-borne ultrasound sensors on equipment without human intervention. An autonomous inspection tour in a real industrial environment has already been successfully completed, although industrial complexity (e.g. dangling cables) remains a major safety challenge.

To generate valuable data for training artificial intelligence, various test setups were implemented in parallel as part of the project. This allowed sensors such as thermal imaging cameras and ultrasonic sensors to be tested using known valve leaks. The collected data led to the development of a new algorithm for leak detection with very few false alarms, as well as an AI method that automatically detects anomalies in machinery (e.g. cavitation in pumps). A specially developed 3D-printed sensor holder also enables the robotic arm to perform precise and repeatable measurements at marked locations, an important step toward fully automated inspection.

Projektkoordinator

- Senzoro GmbH

Projektpartner

- Smart Inspection GmbH
- WIEN ENERGIE GmbH
- Universität für Weiterbildung Krems