Androids for remote access

Activities and plans at DESY

Rainer Wanzenberg

Digital LEAPS - Androids for remote access

May 23 – 24, 2023

CERN

HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

DESY.

Androids for remote access

Activities and plans at DESY

- Accelerator-based Photon Sources at DESY

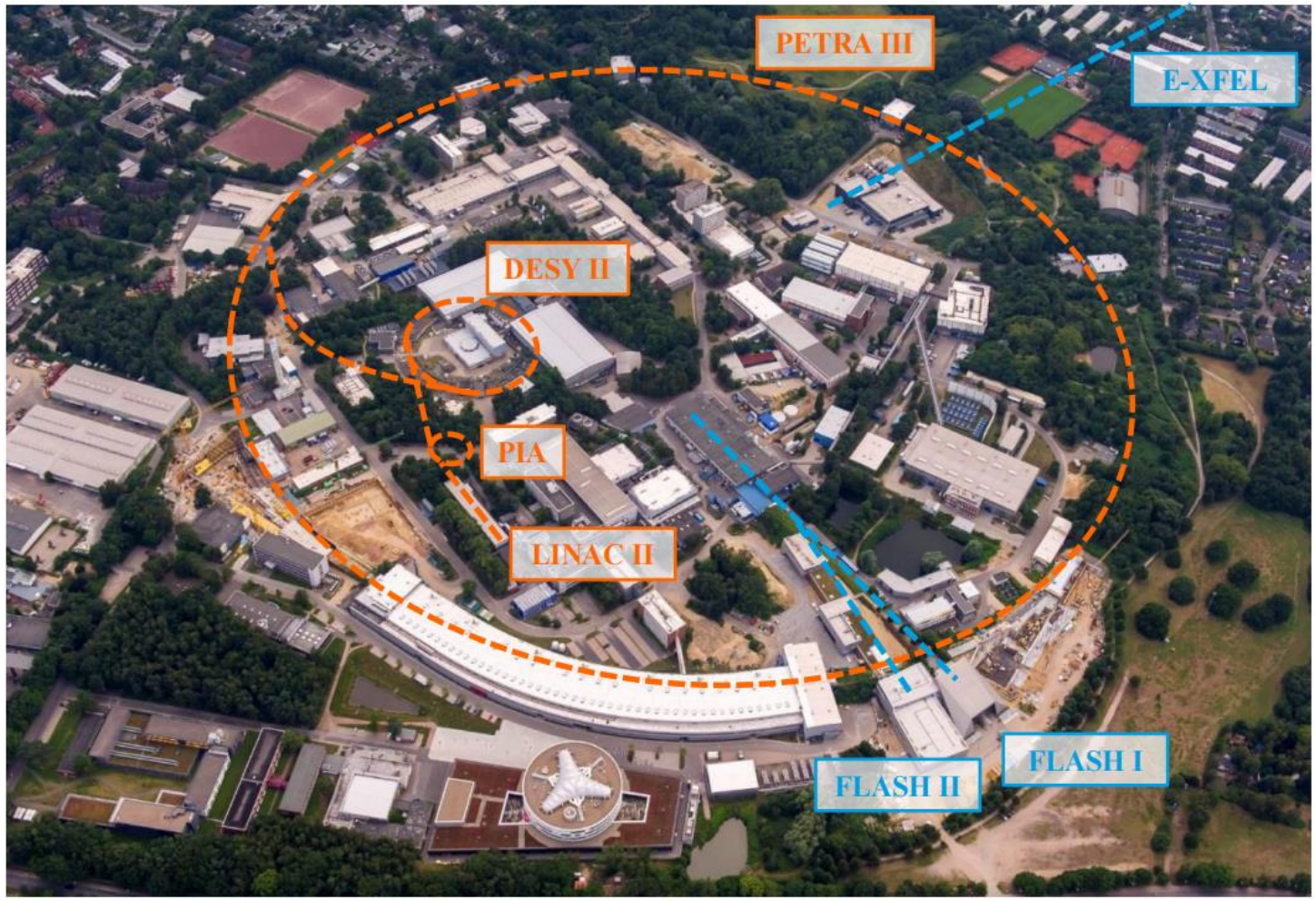
- Androids for remote access in long accelerator tunnels
  - MARWIN robot in the XFEL tunnel
  - Strong interests for Androids for remote access at PETRA III

- Collaboration activities

- Plans
  Workshop on robotics supported by LEAPS and held at CERN

Accelerator-based Photon Sources at DESY

DESY operates three major accelerator facilities



PETRA III
The high brilliance 3rd Generation Synchrotron Radiation Source at DESY.

FLASH
Free-electron laser for VUV and soft X-ray radiation.

The European XFEL
Free-electron laser for ultrashort X-ray flashes.

European XFEL

DESY operates the accelerator for the XFEL GmbH

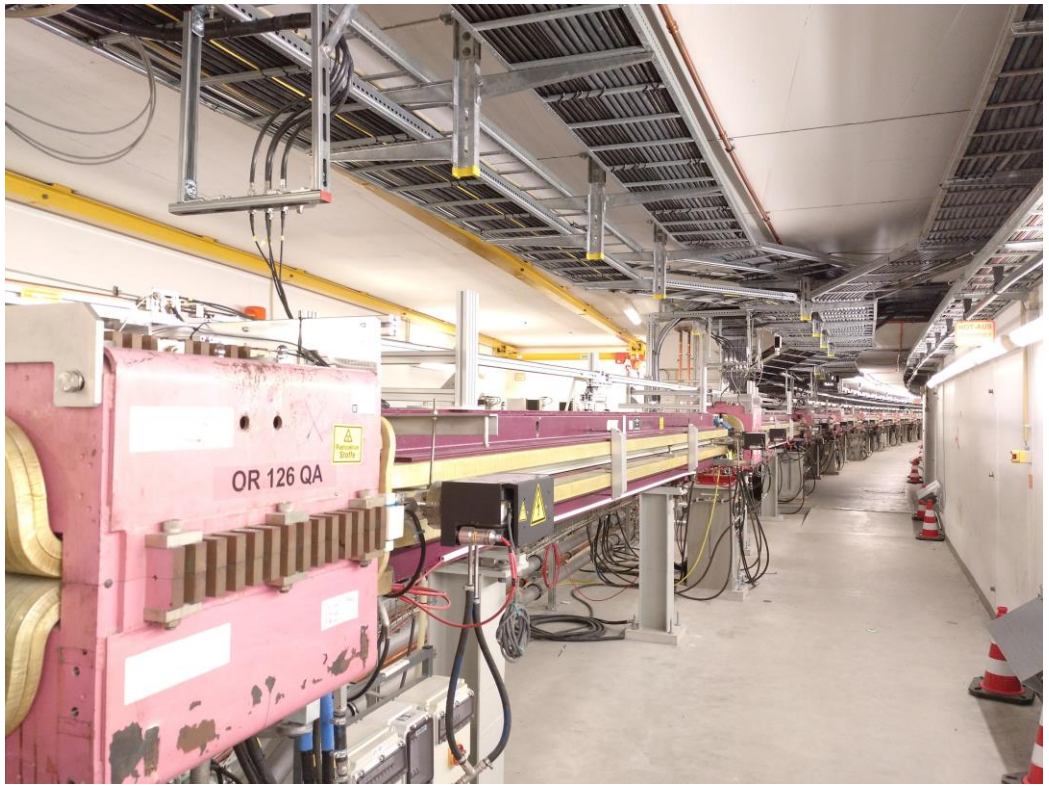
The European XFEL is located mainly in underground tunnels which can be accessed on three different sites. The 3.4 kilometre-long facility runs from the DESY campus in Hamburg to the town of Schenefeld in Schleswig-Holstein. At the research campus in Schenefeld, teams of scientists from all over the world carry out experiments using the X-ray flashes.

https://www.xfel.eu/facility/overview/index_eng.html

Androids for remote access in long accelerator tunnels

EU XFEL 3.4 km and PETRA III 2.3 km

EU XFEL Linac Tunnel



PETRA III Storage ring tunnel

MARWIN robot in the XFEL tunnel

Colloboration between DESY and hochschule 21 gemeinnutzige GmbH, Buxtehude

MARWIN is used in the XFEL tunnel

MARWIN is a mobile autonomous robot platform designed for performing maintenance and inspection tasks alongside the European XFEL accelerator.

It consists of a 4-wheel driven chassis equipped with different sensors.

The primary use case of MARWIN is measuring radiation fields.

For this purpose MARWIN is equipped with a stationary multi-purpose radiation detector attached to the robot's chassis.

Plans: upgrade MARWIN for more general inspection tasks

→ Talk by André Dehne

MARWIN: A MOBILE AUTONOMOUS ROBOT FOR MAINTENANCEAND INSPECTION
A. Dehne, T. Hermes, N. Möller, hochschule 21, Buxtehude, R. Bacher, DESY
Proceedings of ICALEPCS2017, Barcelona, Spain

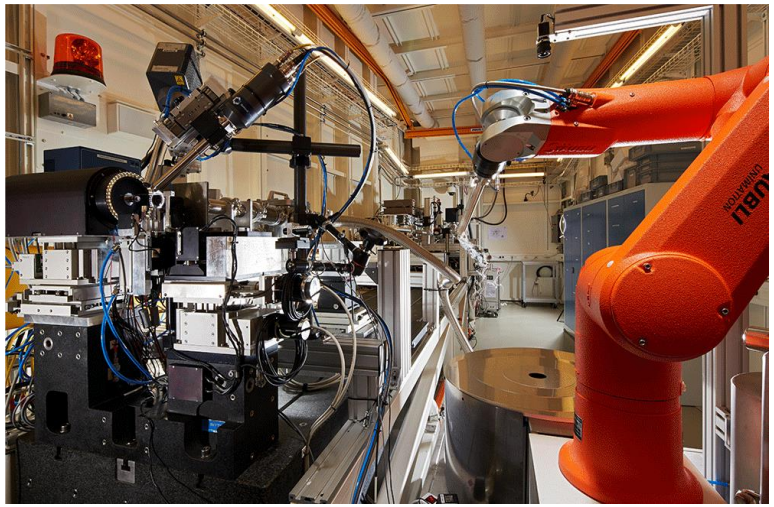
Strong interests for Androids for remote access at PETRA III

Task for a robot in the PETRA III tunnel has been identified

Possible task and requirements for robots in the PETRA III tunnel:

- Accessibility of different tunnel sections for remote operation of a robot (interlock doors)
- General inspection tours using various interchangeable sensors, e.g. 3D optical camera, *thermal camera*, radiation detector
- Maintenance and repair tasks of electronics, e.g. visually monitoring status LEDs of electronic board
- Maintenance of water pipes, leak detection

Presently robots are only used at the beamlines



The High-throughput Macromolecular Crystallography beamline P11 at PETRA III is dedicated to diffraction experiments of biological macromolecules.

Collaboration activities

Joint DESY and University of Hamburg Accelerator Physics Seminar

17.05.2022 Mario Di Castro (CERN/EN) :
Robotic solutions for remote maintenance in particle accelerators

Remote radioprotection surveys

Cabling status inspection

→ Strong interest for further collaboration with CERN at PETRA III
→ and within LEAPS

Androids for remote access

Further plans

- **MARWIN robot in the XFEL tunnel**
  - ➢ Upgrade proposal

- **Collaboration within LEAPS and with CERN**

  Objectives of this workshop

  1. A summary document with the status of the robotic activities at the LEAPS laboratories.
  2. Define the requirements for robots accessibility for remote operation and maintenance in light sources (Synchrotron and FELs).
  3. Establish collaboration(s) between LEAPS laboratories and CERN
  4. Proposal of a working group between European particle accelerators to establish best practice for remote maintenance to improve machines availability and safety

Contact

DESY. Deutsches
Elektronen-Synchrotron

www.desy.de

Rainer Wanzenberg
MPE
Rainer.wanzenberg@desy.de
++49 40 8998 2496