



XR-enhanced training in industrial applications for collaborative robotics

Aleksander Burkiewicz



VRIJE
UNIVERSITEIT
BRUSSEL



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Training in Industry

Current practices

▼ Methods:

- person-to-person – on-site or remote
- online self-study programs
- text instructions/manuals
- training videos

▼ Problems:

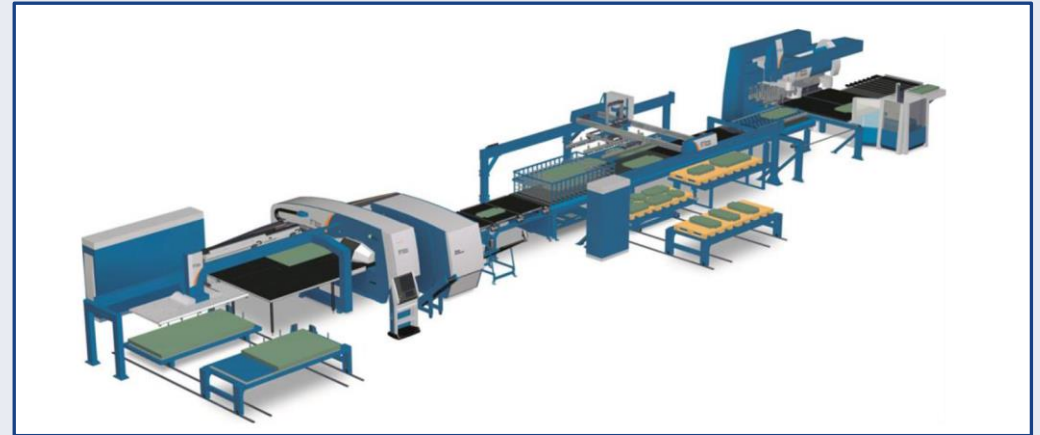
- shortage of qualified instructors
- skilled workers need to be redirected away from their tasks
- inconsistent training
- lacks hands-on practice
- often deemed insufficient by employees
- prone to language barrier exclusion

Training in Industry

Industrial Manufacturing & Assembly focus

▼ Example: Multifunctional machine installation in a production line

- basic training before the system is installed;
- on-site training carried out in parallel with regular production;
- assistance period of up to 6 months



Training in Industry

Industrial Manufacturing & Assembly

▼ Further issues:

- highest average number of hours for training per employee
- highest tendency for budget cuts on training

▼ Current trends:

- manufacturing sector constantly evolving
- increasing level of automation and robotisation
- transition from Industry 4.0 to Industry 5.0
- need for reskilling and upskilling of workforce

Training in Industry

Benefits of XR-enhanced training in industrial applications

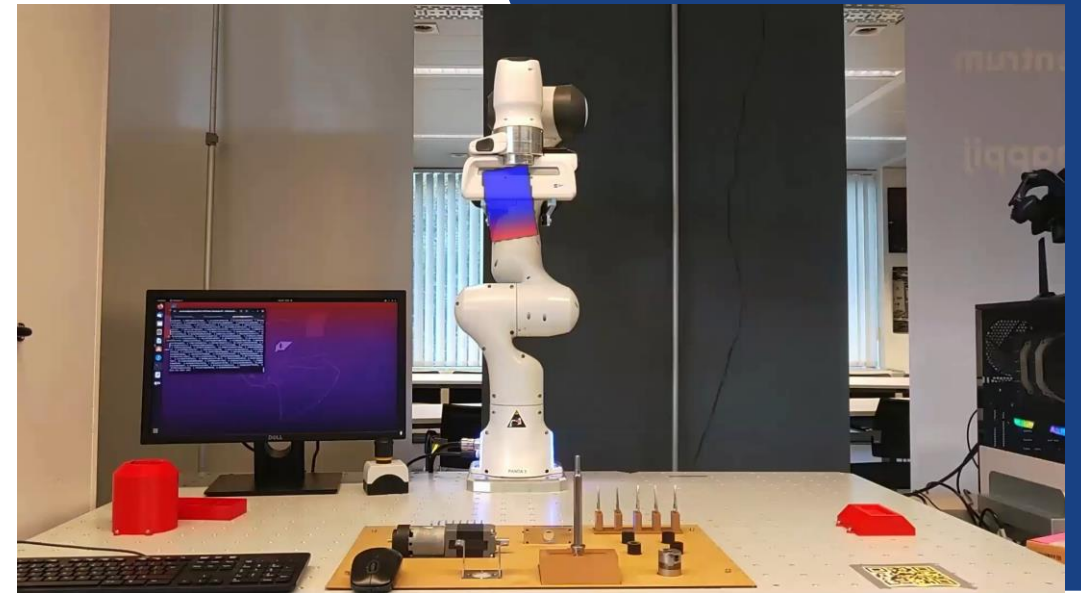
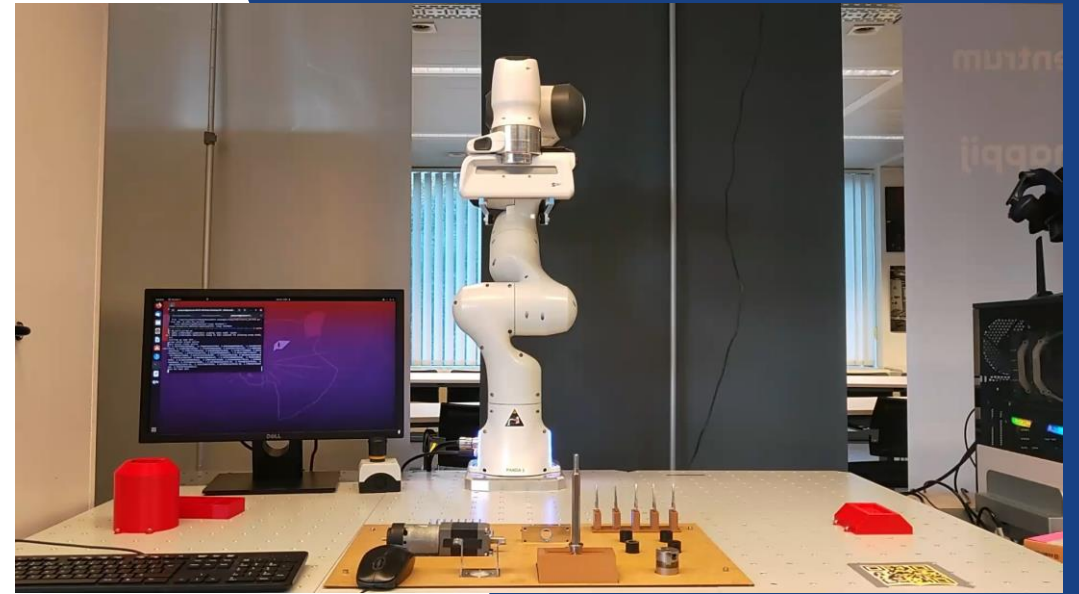
▼ Why XR?

- faithful reproduction of real working environment and specific challenges;
- reduced risk and costs in machinery and equipment operation
- reduced assembly time and error rates compared to traditional or baseline training
- better immediate and long-term recall after training is completed
- training interface available to the workers all the time

BruBotics Research

Guided Collaboration

- AR Digital Twin
- 3-tier Safety Zones
- Robot's trajectory indication



BruBotics Research

Robotic-Skin-Interface

- ▾ Robot-to-human communication:
 - Robot status
 - Task instructions
 - Task status
- ▾ Results in:
 - decreased anxiety
 - improved attitude
 - higher perceived enjoyment
 - increased intention to use



BruBotics Research

Order Fulfilment

- Support in order fulfilment – packing and checking
- Interface suitable for other Quality Assurance tasks
- Checklists suitable for assembly/disassembly instructions

Order number: 3333



Item name: papers
Quantity: 2

Confirm item in the box?

No

yes

Click on order to start

Exit

order number: 1111



order number: 2222

order number: 3333



Order number: 1111



Item name: usb
Quantity: 3

Pick item?

exit

Start Picking

BruBotics Research

Skill capture

Why skill capture?

- shortage of skilled workers
- robots wanted to reproduce motions and take over repetitive tasks
- skill preservation for future training
- training interface available to the workers all the time



Thank you for your attention

Questions & Answers



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