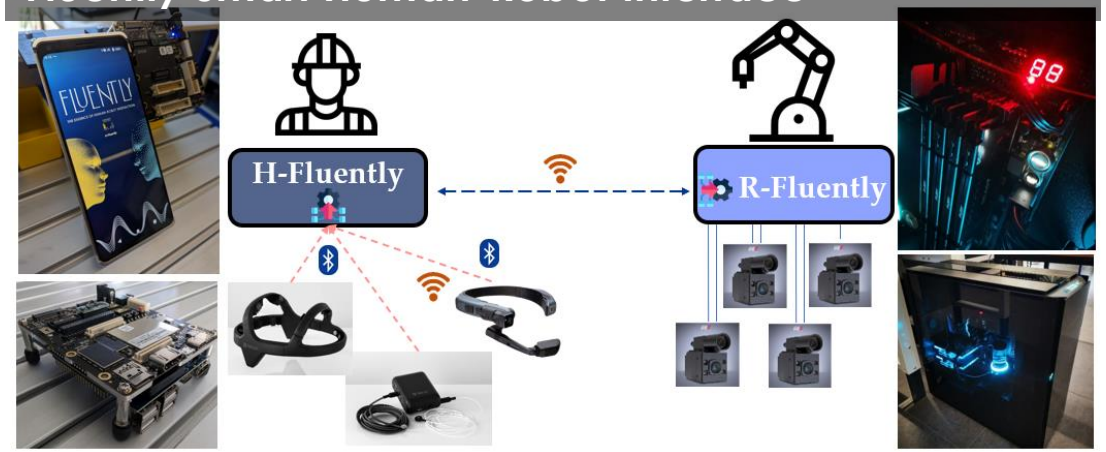
FLUENTLY

THE ESSENCE OF HUMAN-ROBOT INTERACTION

Fluently Smart Human-Robot Interface



Fluently Robo-Gym

Objective

Immersive and interactive training ecosystem for the mutual and continuous building of knowledge and skills of both human and robot.

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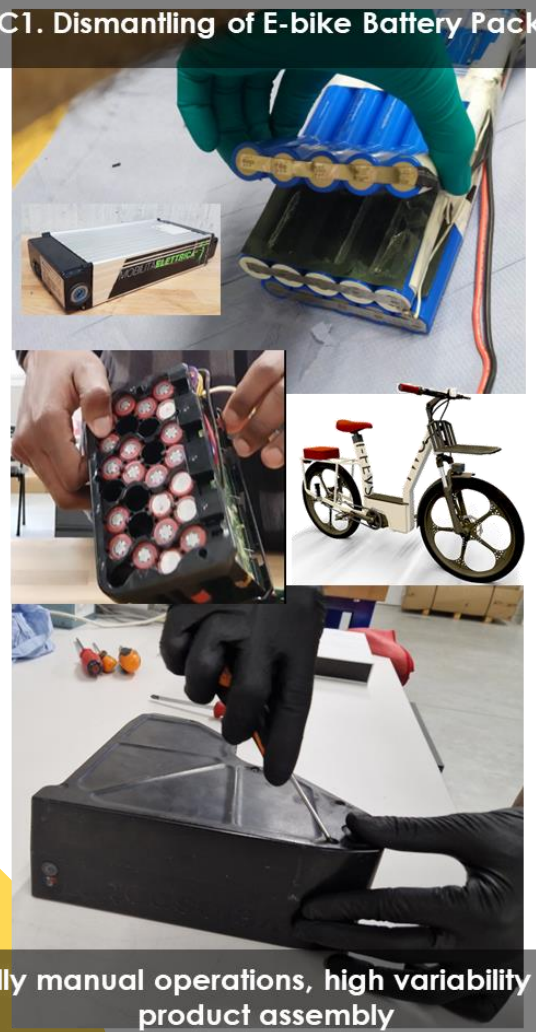
Use cases

UC1. Dismantling of E-bike Battery Packs



Fully manual operations, high variability of product assembly

UC2. Flexible Assembly of Aircraft Engine Nacelle

Highly iterative assembly, positioning and fixing tasks

UC3. Hybrid manufacturing of complex metal components

Extended programming time of the repairing strategy

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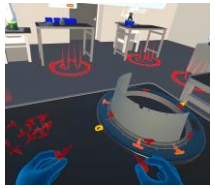
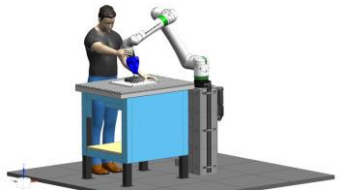
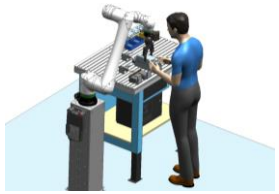
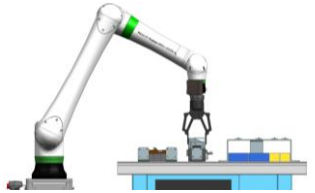
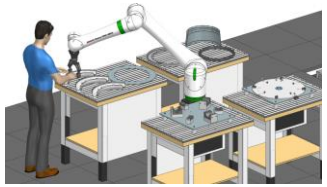
Fluently Training Experience

Edge computing. Distributed processing. Dynamic task planning. Multimodal reasoning. Decision-making

Speech Recognition | Intent Recognition | Posture Detection | Human Segmentation | Gesture Recognition | Visual Grounding | Learning by Demo | Mental State | Activity Recognition | Virtual Reality

WHERE? Day 1
Acquaintance Area
WHAT? Introduction session on: robotization, the training environment, the Fluently hardware and software. Foster positive attitudes and increase participant self-efficacy.
HOW? Introduction sessions, training videos lectures, group activities, workshop.

WHERE? Day 2
Acquaintance Area
WHAT? Simple exercises to induce the desired mental and cognitive states and gather data to train the AI models.
HOW? VR scenarios, psychological tests, data acqusition.

WHERE? Day 3
Dexterity Area
WHAT? Simple exercises with the collaborative robot (e.g. kinesthetic teaching, speech commands) and on the VR environment.
HOW? Interaction with physical robot, pretrain policies, reward learning.

WHERE? Day 4
Application Area
WHAT? Complex manufacturing tasks. Collect personal preferences and physiological data for industrial use case scenarios.
HOW? Hands-on H-R collaboration, task generalization and policies fine-tuning

WHERE? Day 5
Application Area
WHAT? Custom use case workflows.Robot adapts its behavior to the perceived state of the human and environment. Best practices.
HOW? Hands-on H-R collaboration, multimodal programming, H-R team behavior validation.

Readiness for HRC training

HRC training

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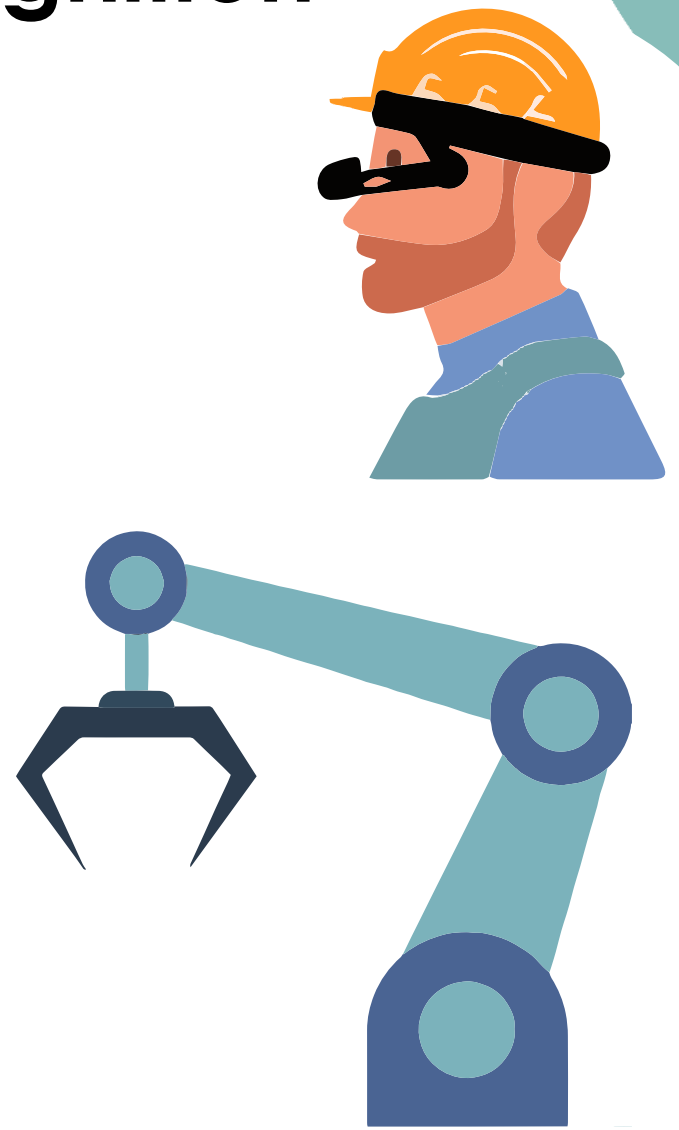
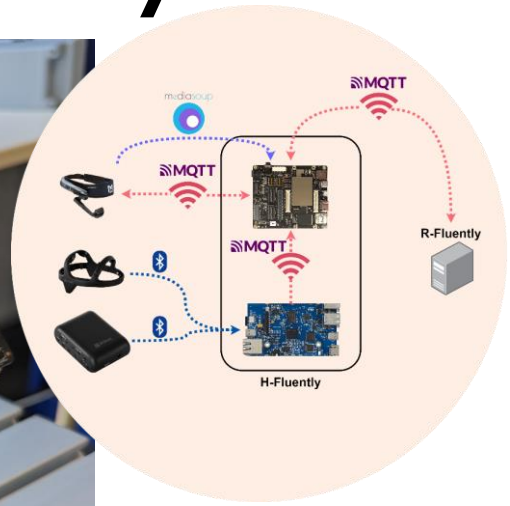
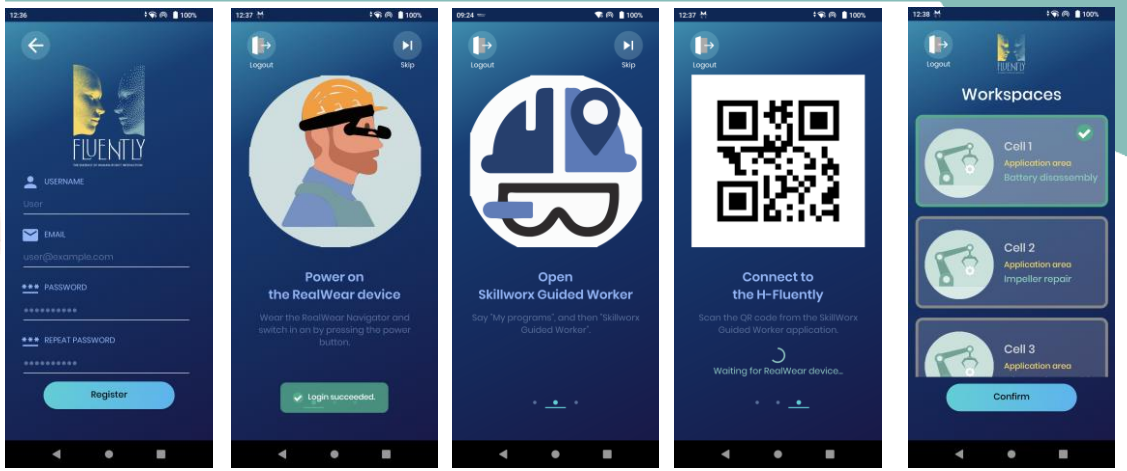
Training for robust speech recognition

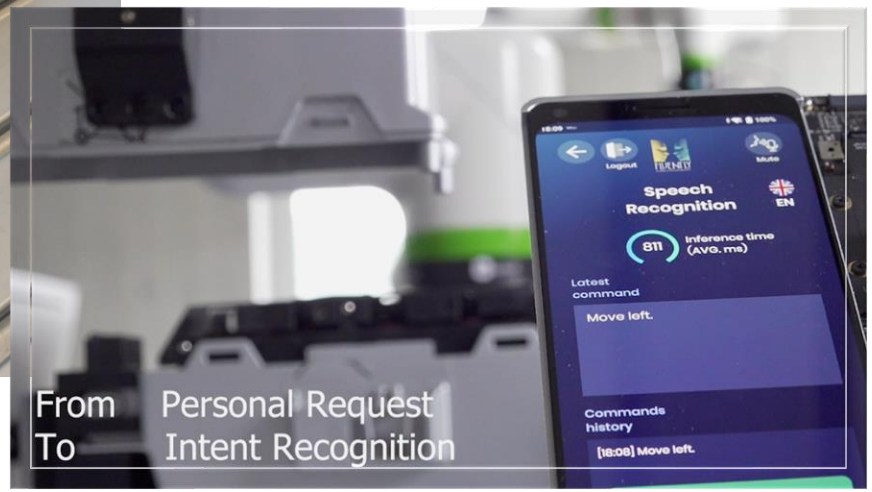


NLP on H-Fluently



Day 1 Discover Fluently hardware and software





Day 3 Speech to command training

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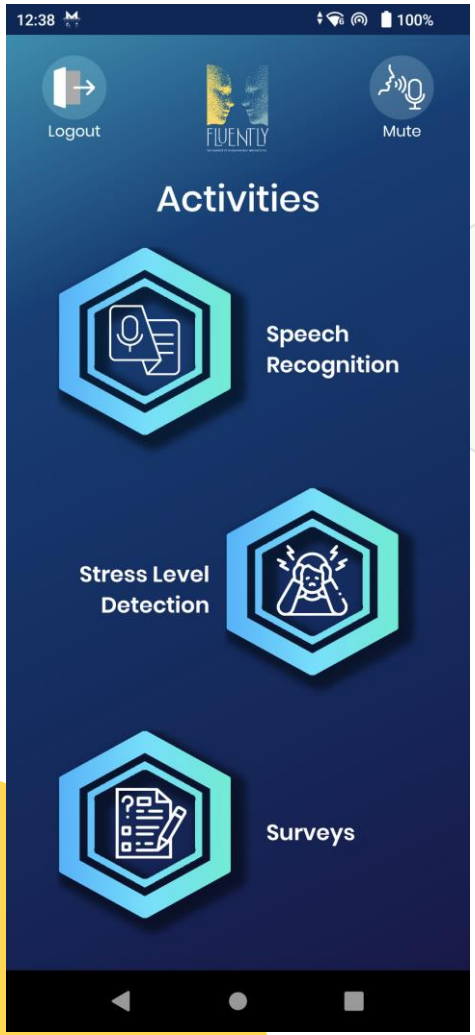
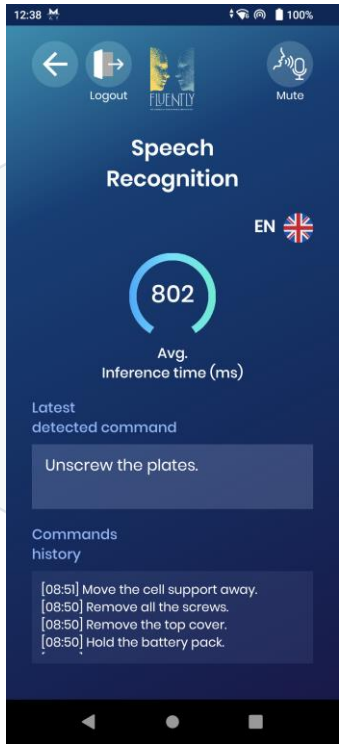
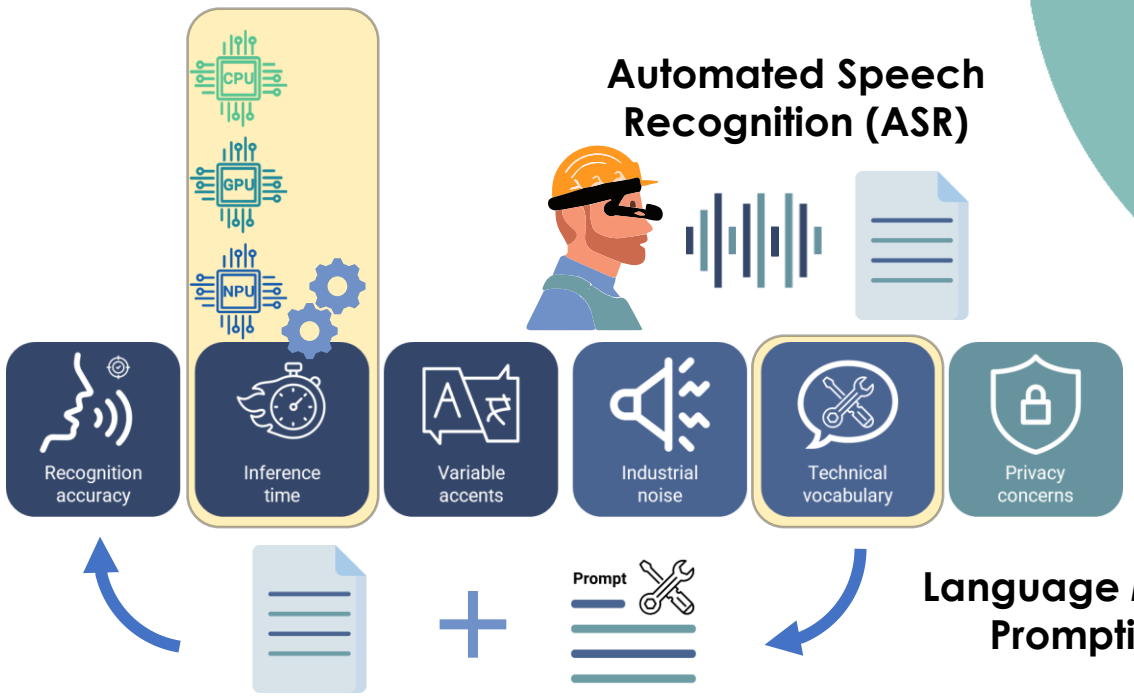
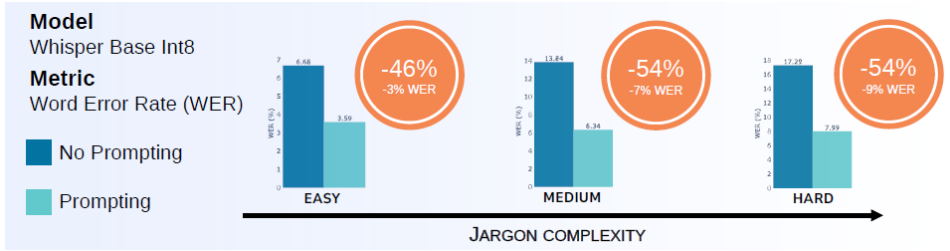
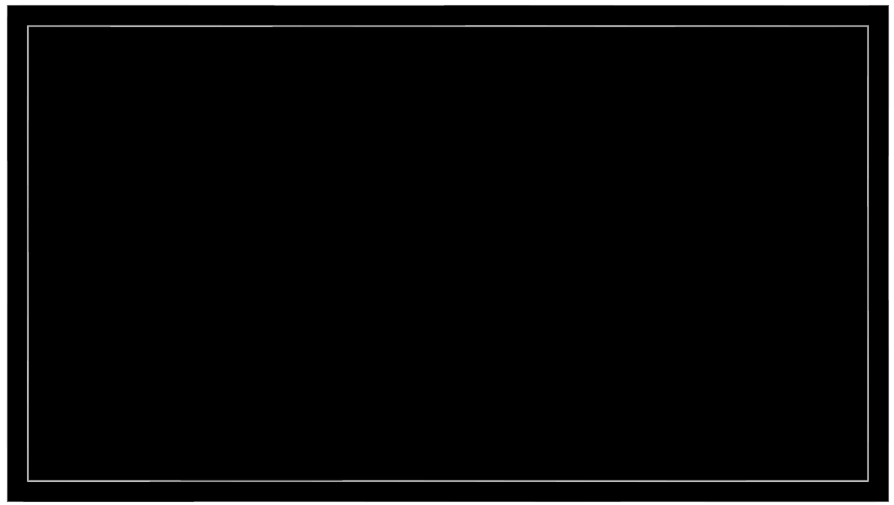
NLP on H-Fluently











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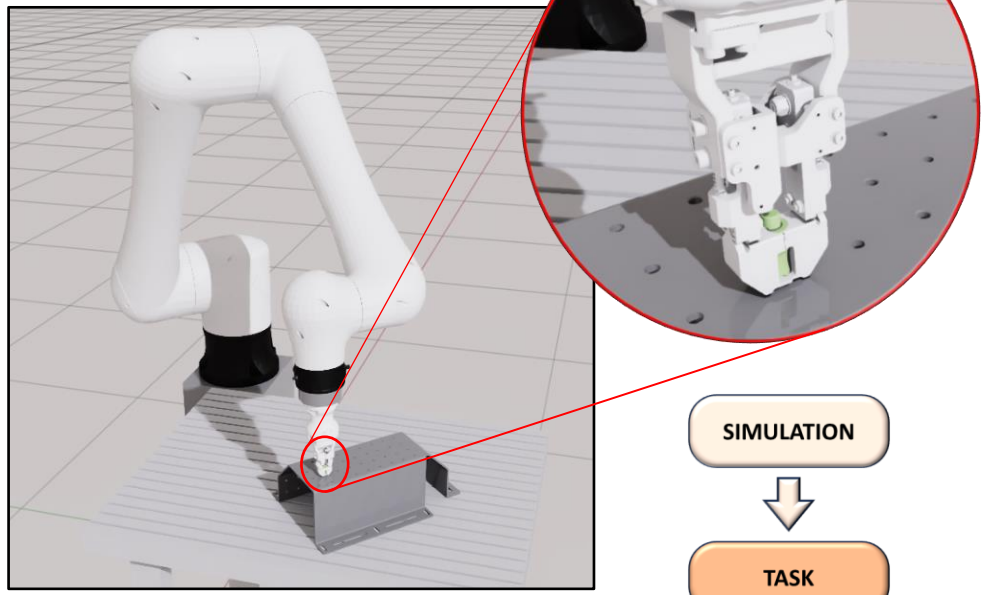
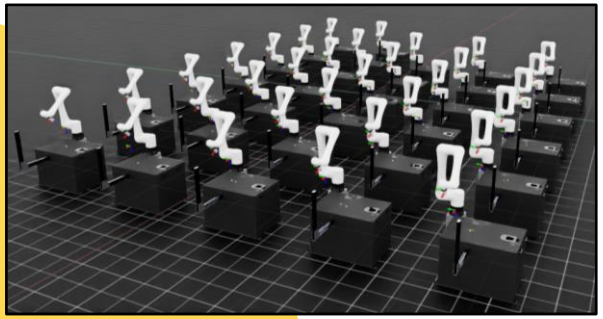
Training for collaborative tasks

Co-Learning Framework

$$R_t = R_{orient} + R_{force} + R_{insertion}$$





SIMULATION

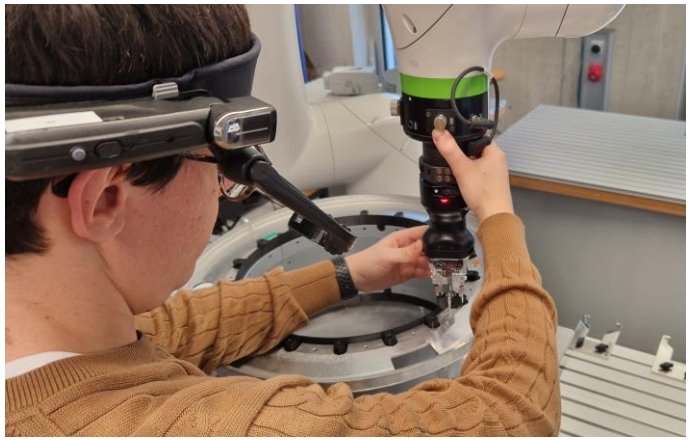
TASK

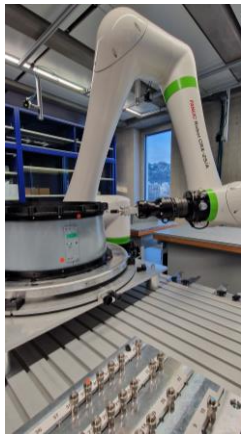
ALGORITHM

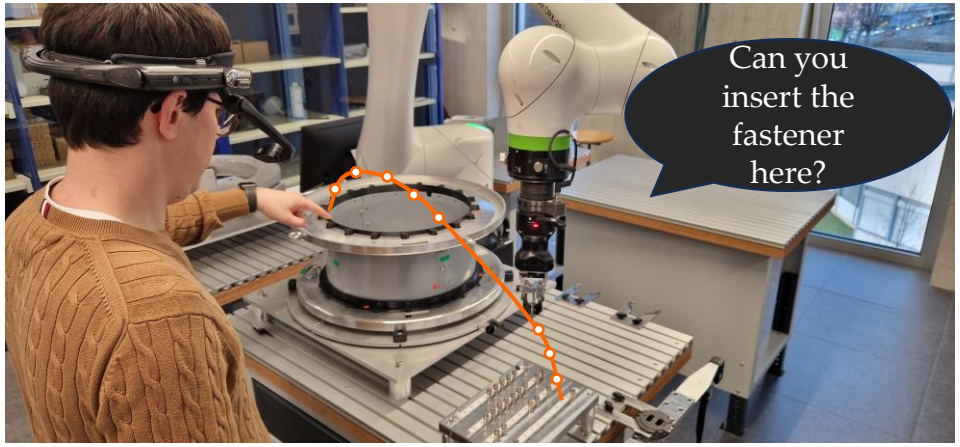
SIM TO REAL

Day 3 Initialize policy

Day 4 Task generalization. HRC







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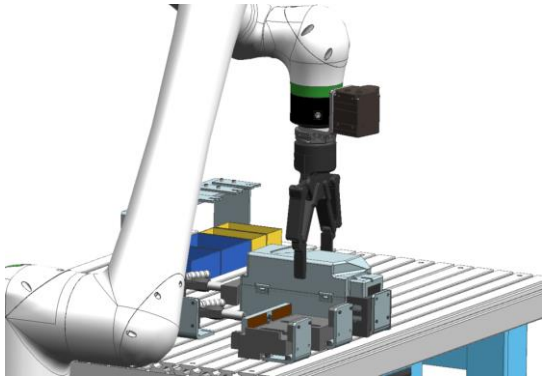
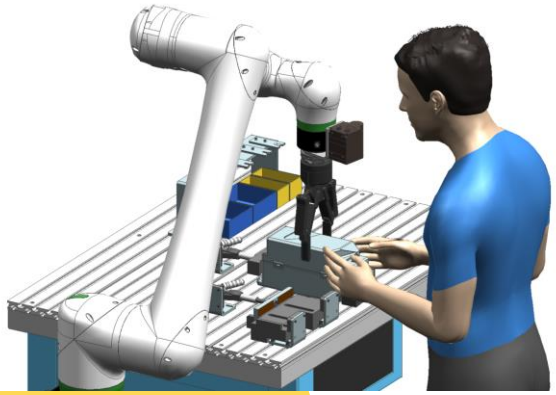
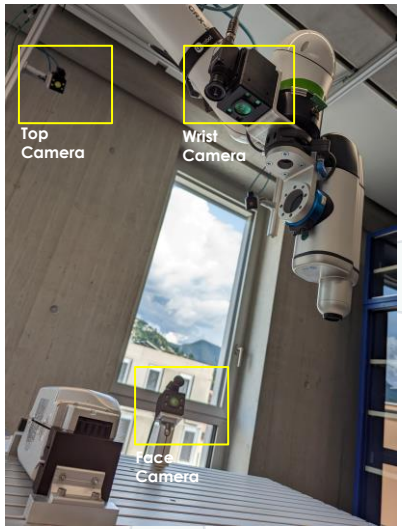
Training for personalized workflow

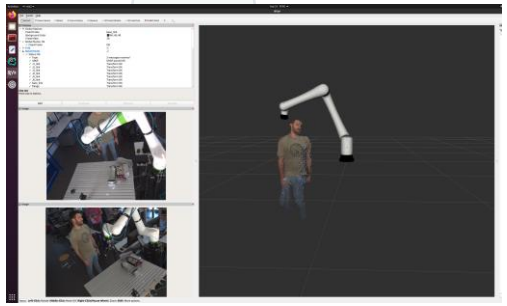


Complete autonomy
or
workload share?



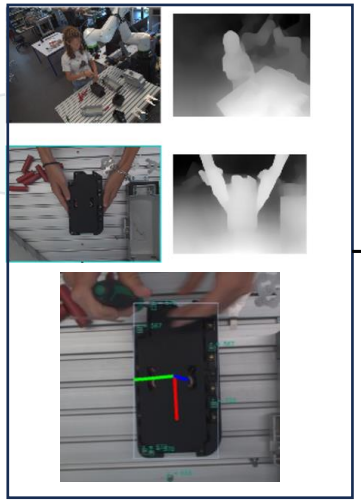


Human Segmentation



Object Recognition

Streaming data



Speech Recognition

User input

The user activates by voice the zero training process

The user defines the name of the new battery pack

Known Pack Vision Module

RGBD

Detector and pose estimator (component #1)

Detector and pose estimator (component #2)

Detector and pose estimator (component #3

Detector and pose estimator (component #n

Recognizer

Detection Model

FYBUC1
YAMAHA_X60_E0
BOSCH
other known pack

Object Detector

YES

is battery pack recognized?

NO

Update

Zero Trainer

Capture new images

The user holds the new battery pack in front of the cameras.

Auto labeling

Detect the battery pack using speech and intent recognition ("object inside human hands")

Train detector

Update dataset and configuration files

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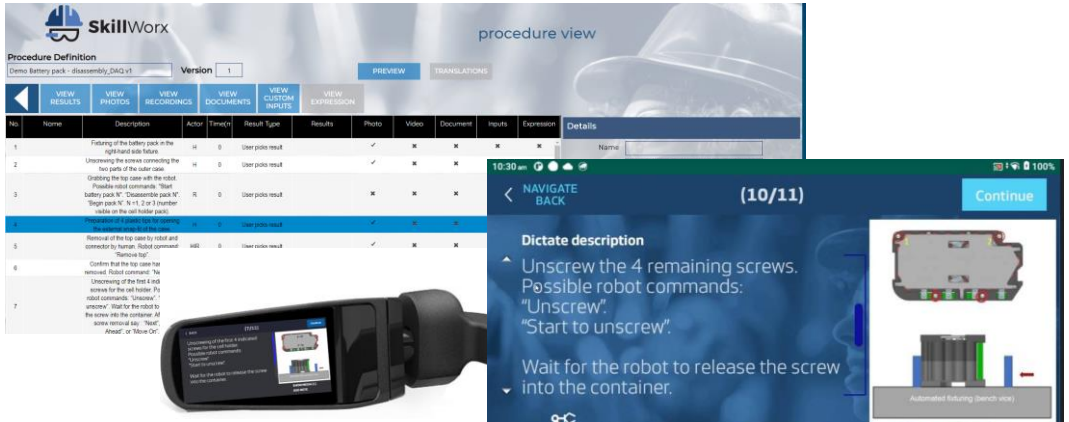
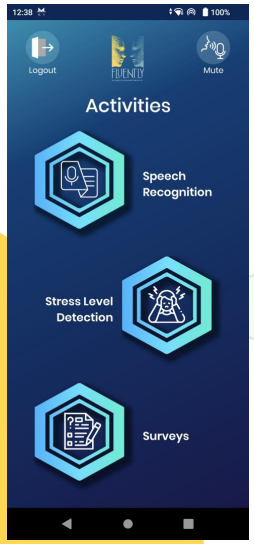
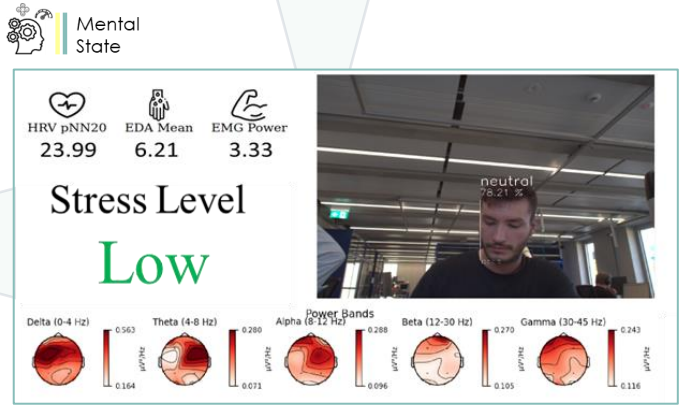
Training for personalized workflow

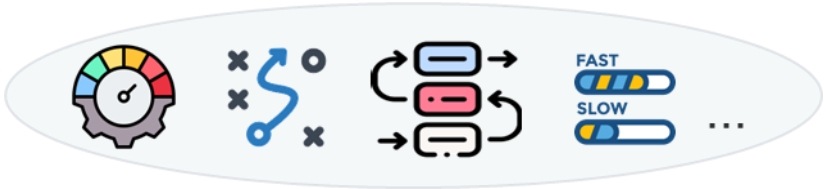
Day 5 Human-robot team workflow validation

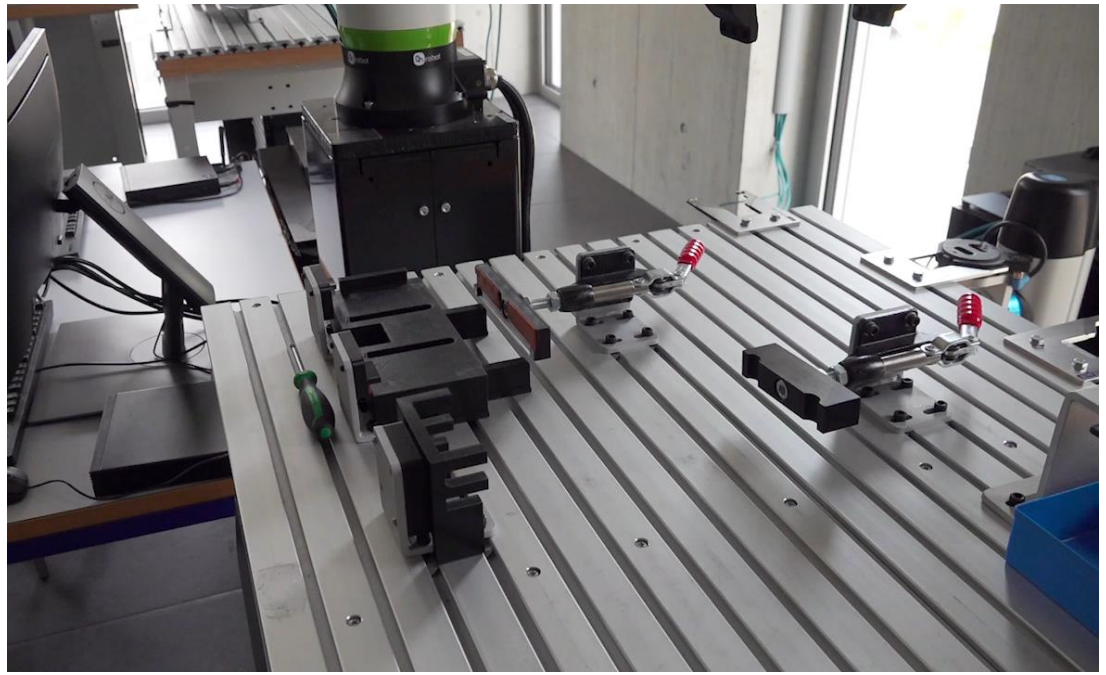






Task personalization





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THANK YOU

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https://www.fluently-horizonproject.eu/