Welcome!

Robot Task Model and Notation

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Contents

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ACROBA - Overview

H2020 Innovation action	**Coordinator: BFH**	**17 partners 9 countries**
~8M€ budget ~7M€ EU funding	**42 months**	Reference Architecture **COPRA-AP**
5 industrial pilots	**2 ACROBA On-Site Lab**	**12 hackathons**

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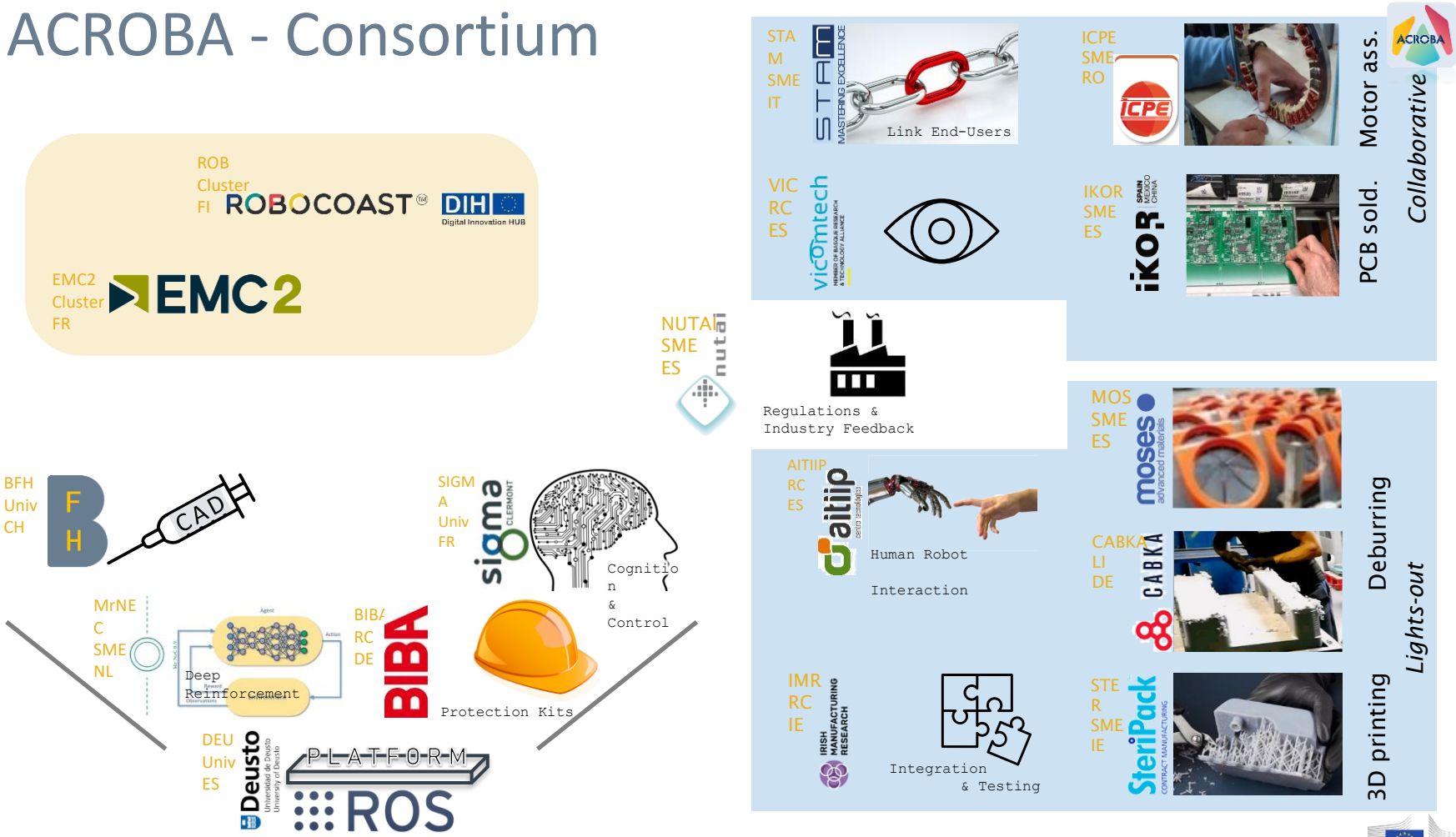
ACROBA - Consortium



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No **1017284**

ACROBA - Impact

A solution

ACROBA will offer
a **cost-effective solution** for a
wide range of **industrial sectors**

A novel ecosystem

ACROBA will contribute to the
fast and economic deployment
of advanced robotics solutions
in agile manufacturing SMEs

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ACROBA - Concept Visualisation

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Research - Background

Robot programming is time consuming and costly and requires high levels of expertise

+

Current systems are difficult understand and control by operators

→

Non-programming experts are facing challenges in the fast-growing agile production industry

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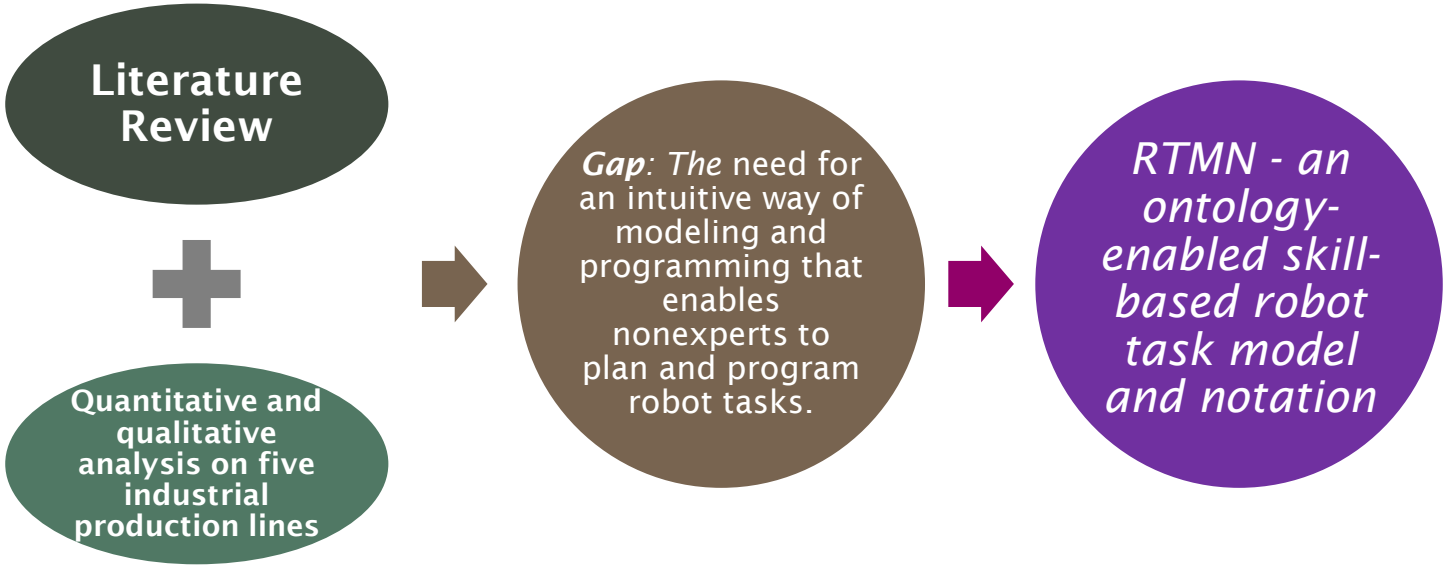
Research - Methodology



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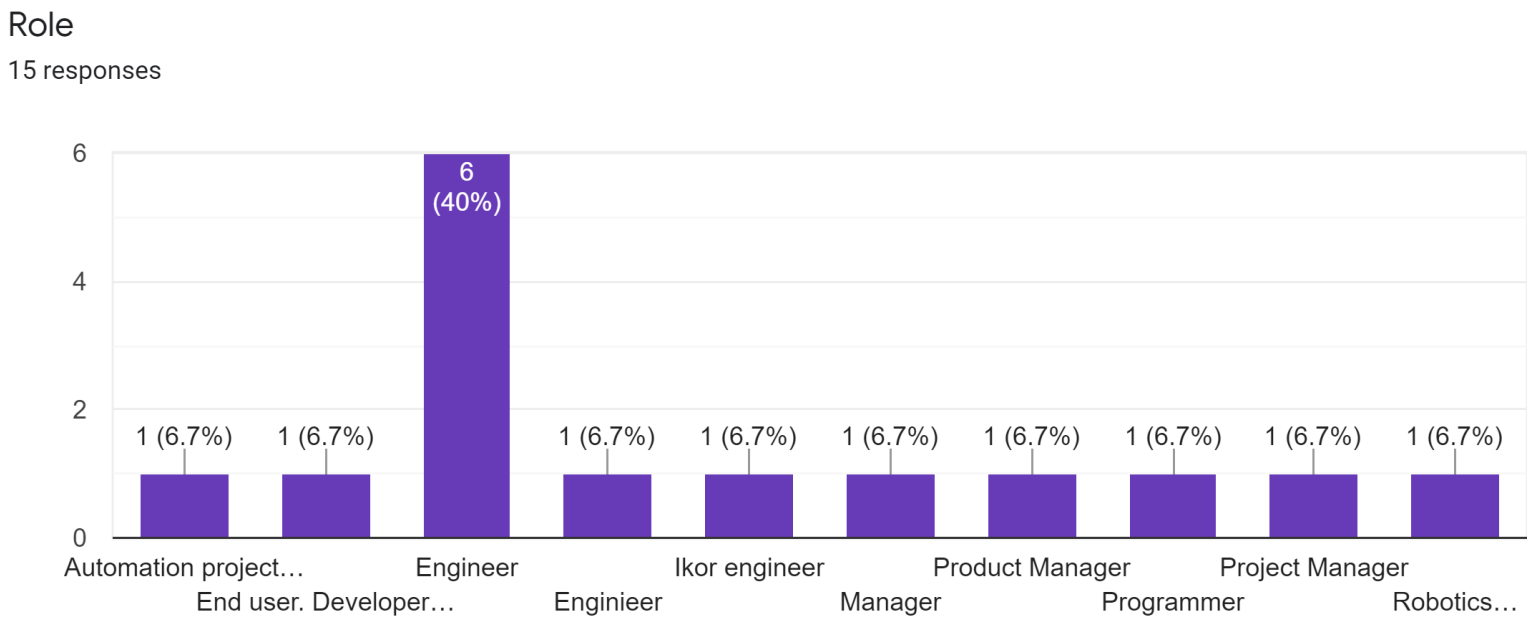
Research - Questionnaire for ACROBA User Interface



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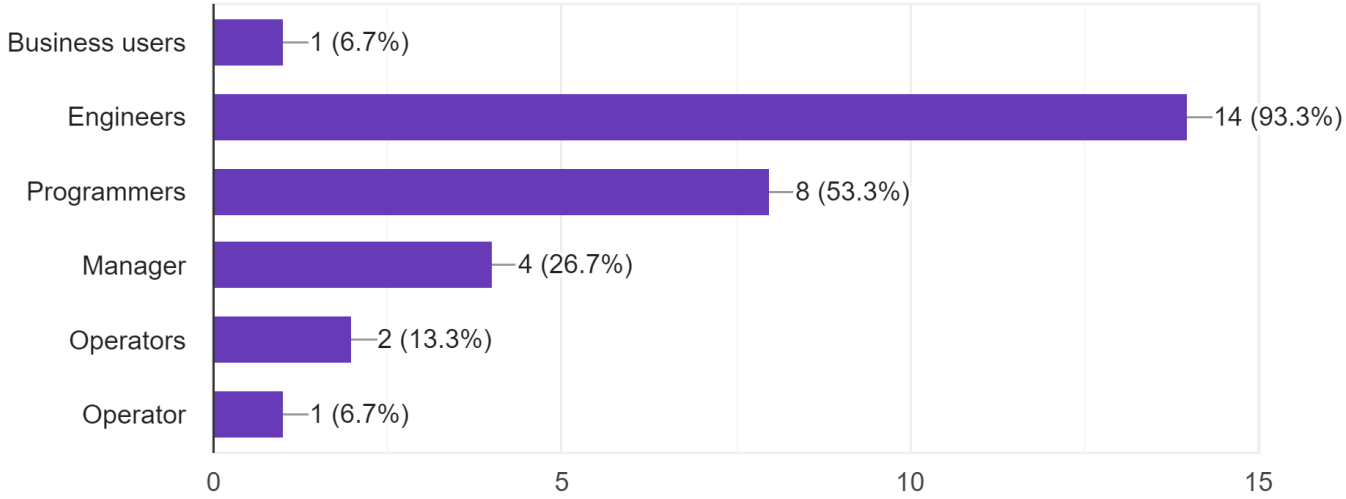
Research - Questionnaire for ACROBA User Interface

1. What are the users of the ACROBA platform?

15 responses



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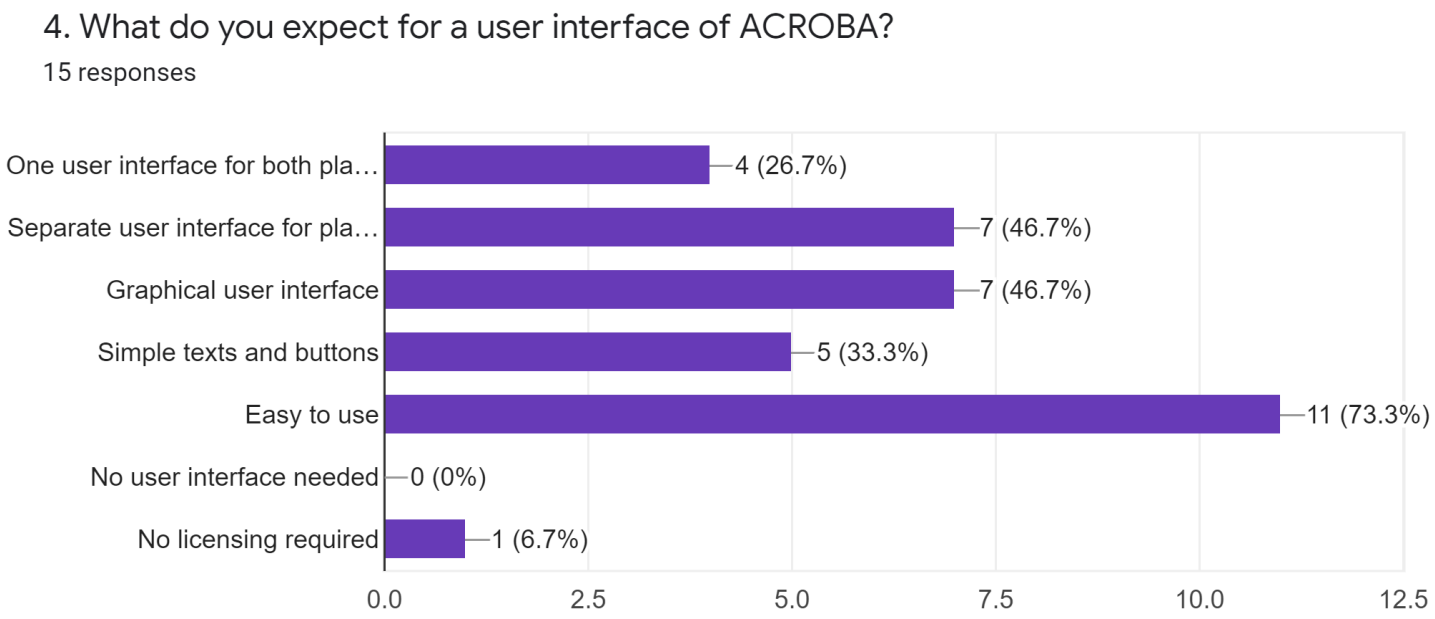
Research - Questionnaire for ACROBA User Interface



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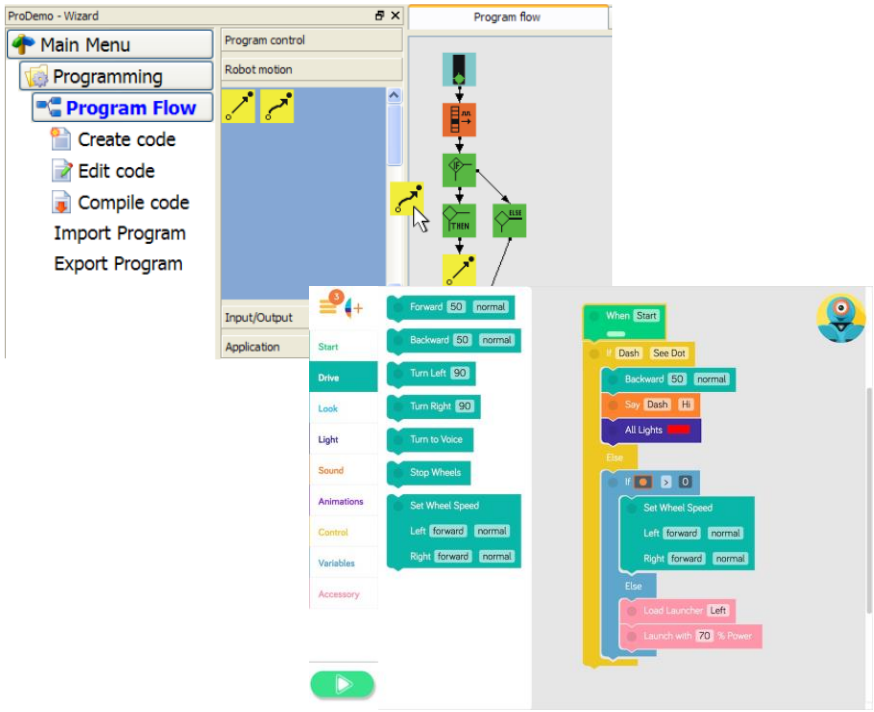
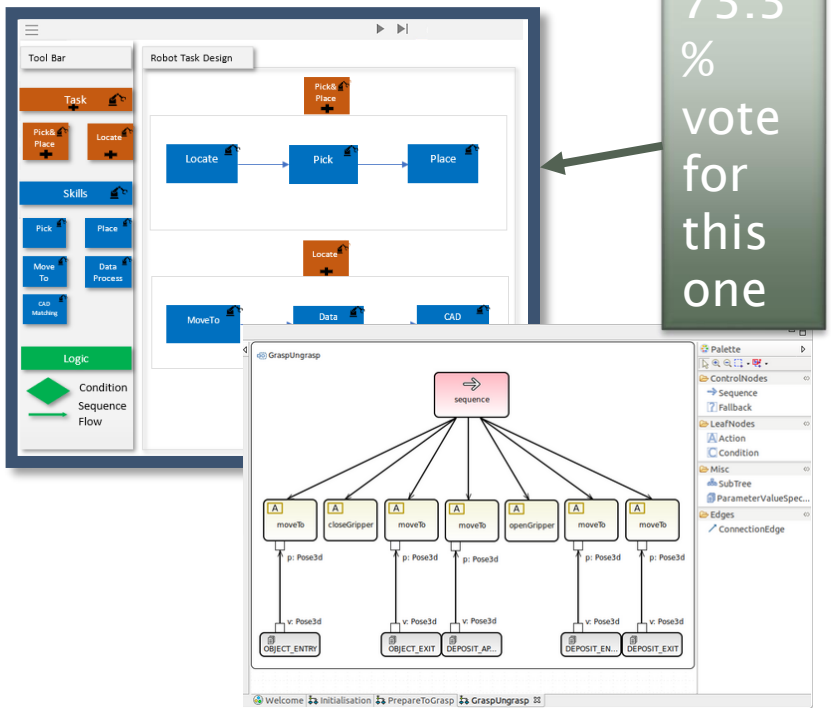
Research - Questionnaire for ACROBA User Interface

- Which task representation do you like the most?





73.3 % vote for this one

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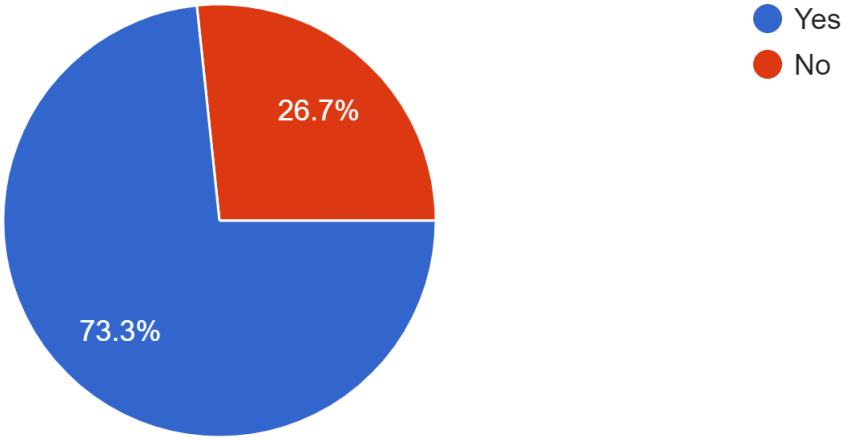
Research - Questionnaire for ACROBA User Interface

10. Do you have experience working with robots in the production line?

15 responses



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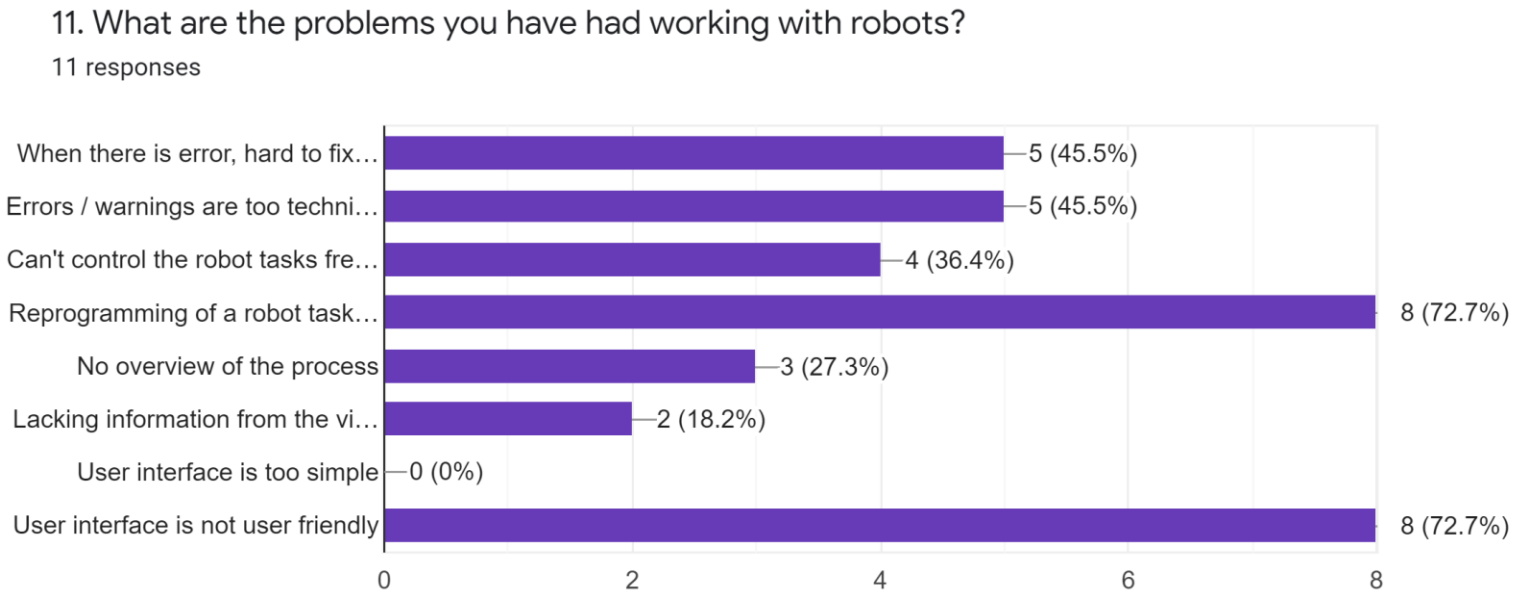
Research - Questionnaire for ACROBA User Interface



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The RTMN Model - Overview

Notation	Notation Name	Attribute	Condition	Cardinality	Relation
	Human task	has name has human performer has inputs has output (button/signal) has loopCharacteristics	no robot involvement	has at least 1 human performer	output is used to continue the process
	Robot Skill	has name has skill has primitive has sequenceElement has inputs has outputs has feedback has precondition has postcondition has loopCharacteristics	no human involvement	has at least 1 primitive	has primitives &/ skills Used to compose robot tasks
	Skill Primitive	has name has inputs has outputs has feedback has precondition has postcondition	no human involvement	atomic, cannot be broken down to a finer level of detail	receives information from other primitives and skills. Used to compose robot skills
	Robot Task	has name has skill has sequenceElement has inputs (goals) has outputs (results) has feedback has precondition has postcondition has loopCharacteristics	no human involvement	no human operator involved.	has skills &/robot task. Used to compose other robot task and processes

	HRC Task	has name has sequenceElement has inputs (goals) has outputs (results) has feedback has precondition has postcondition has loopCharacteristics	human and robot are both involoved in completing the activity	has at least 1 human task and 1 robot task has at least one human input(signal/button)	has human task and robot task Four modes: Coexistence, Sequential work/Cooperation, Parallel work/Syncronised, Collaboration
	Data Flow	has name has sourceDataRef has targetDataRef	Only used for data flow	has only one sourceDataRef and one targetDataRef	connecting data output and input
	Sequence Flow	has name has sourceRef has targetRef	N/A	can connect only one element on the left and one on the	connecting process elements
	Split	has name has gatewayDirection	N/A	at least can be split to two paths	is connected with sequence flows
	Start	has name	N/A	can only be used to start a process	can be connected to a sequence flow
	End	has name	N/A	can only be used to end a process	a sequence flow can be connected to it

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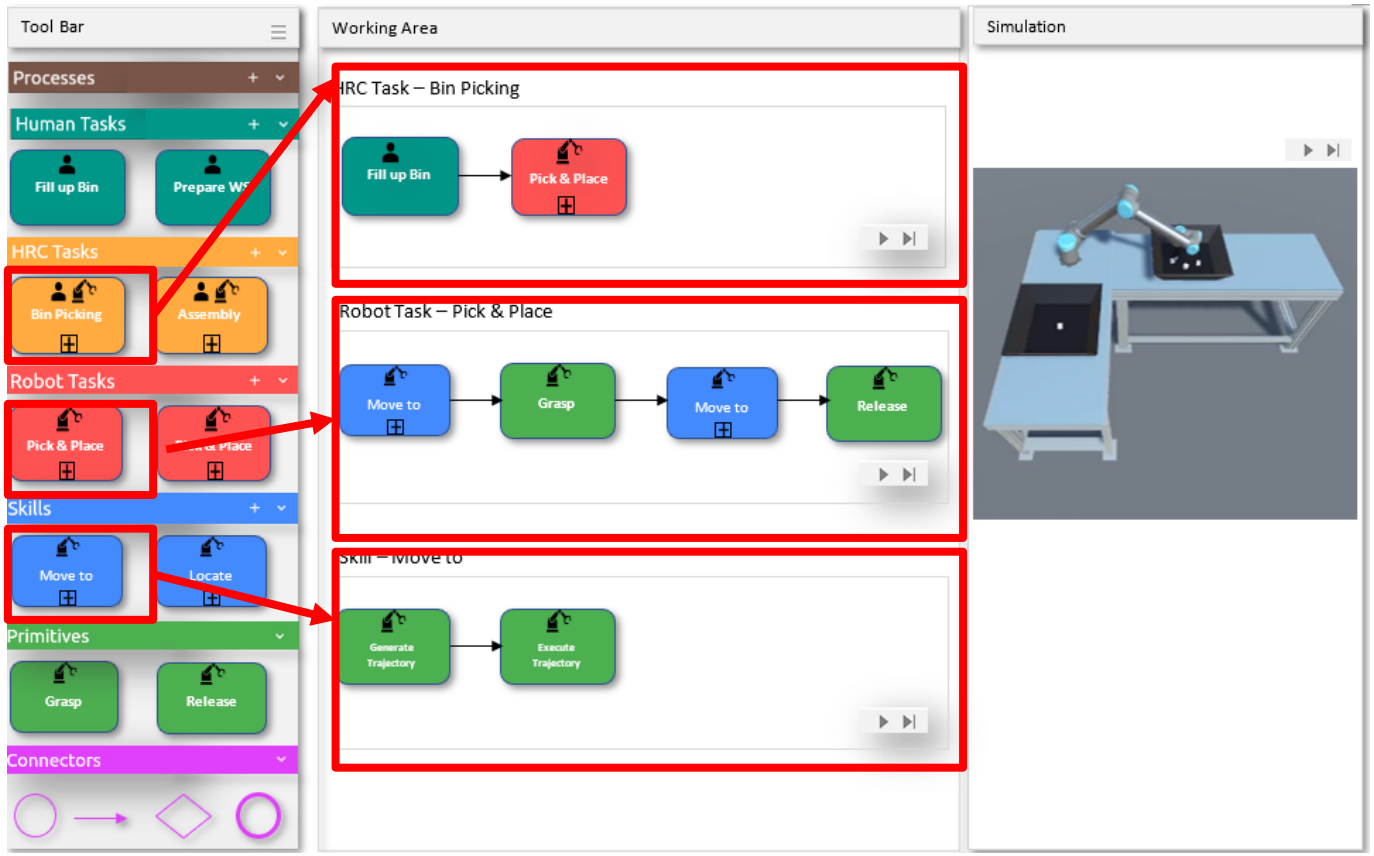
The RTMN Model - User Interface



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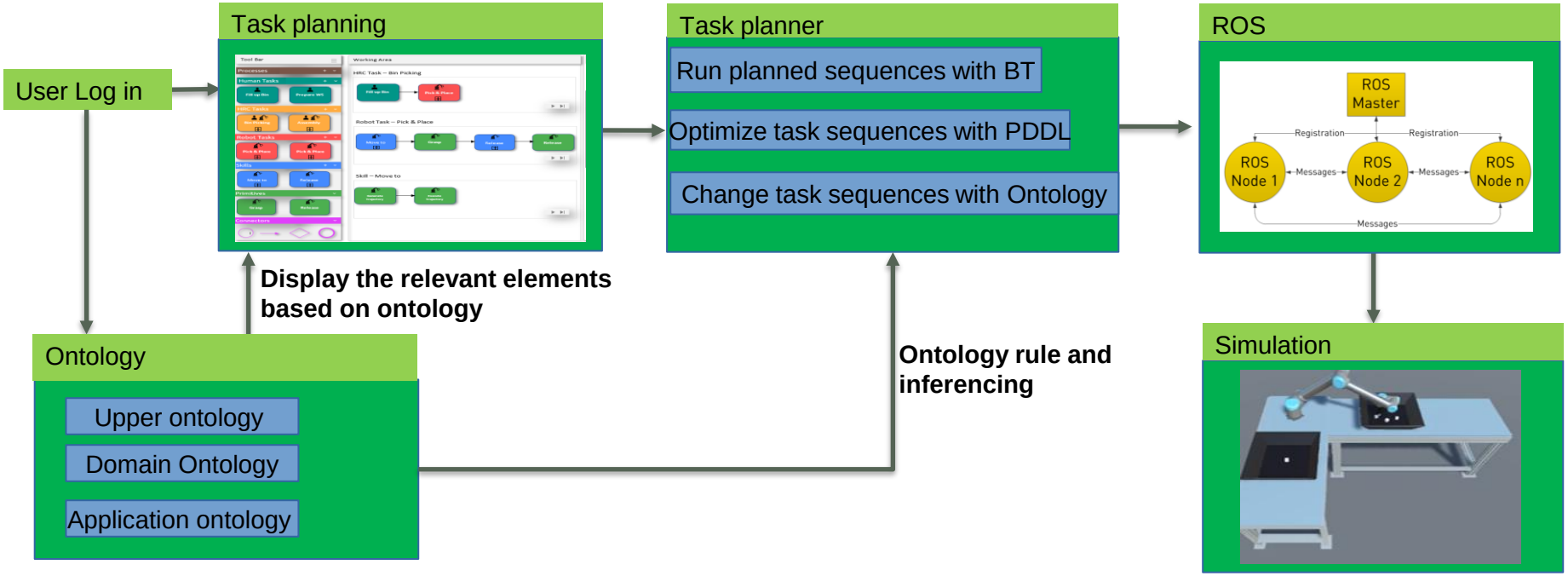
The RTMN Model - How does it work



Discussion

- **Robot task, skill, primitive**
  - Questionnaire: Robot task and skill definitions
  - Discussion

Thank you for your attention!

Any questions??

Nächste Seminare

Biel/Bienne
Quellgasse 21, Aula

28.10.22 **UAS-Thermaldaten zur Erkennung von Steinen auf landwirtschaftlichen Nutzflächen** Prof. Florian Thürkow, Dozent, Fachbereich Wirtschaftsingenieurwesen, BFH-TI nur online

11.11.22 **The GNU Taler Payment System** Prof. Dr. Christian Grothoff, Professor & CEO, Institute for Cybersecurity and Engineering ICE, BFH-TI & Taler Systems SA

25.11.22 **Experimental heart rate variability characterization** Lars Brockmann, Assistant, Institute for Human Centered Engineering HuCE, BFH-TI

09.12.22 **Parylene-based encapsulation technology for wearable or implantable electronic devices** Dr. Andreas Hogg, CEO, Coat-X AG, La Chaux-de-Fonds

13.01.23 **Care@Home mit technischer Unterstützung** Prof. Dr. Sang-Il Kim, Professor, Institute for Medical Informatics I4MI, BFH-TI

Burgdorf/Berthoud
Pestalozzistrasse 20, E 013

04.11.22 **Data Science for Startups** im ZID, Bernapark, Stettlen, Bern Prof. Dr. Erik Graf, Dozent, Institute for Data Applications and Security IDAS, BFH-TI

18.11.22 **Flexible programming of Industrial Robots for Agile Production environments** Laurent Cavazzana, Research scientist, Institute for Intelligent Industrial Systems I3S, BFH-TI

02.12.22 **Wie gefährlich ist ein Unfall mit einem Cabriolet?** Prof. Raphael Murri, Institutsleiter IEM, Institut für Energie- und Mobilitätsforschung IEM, BFH-TI

16.12.22 **Systemtechnologie für die Mikrobearbeitung mit Hochleistungs-UKP-Lasern** Prof. Dr. Beat Neuenschwander, Institutsleiter ALPS, Institute for Applied Laser, Photonics and Surface Technologies ALPS, BFH-TI