Programme Discussion Report

Jenny Read | Robotic Dexterity — Handling our future | February 2024

Workshop Report

The purpose of this report is to outline the key details and outcomes of the workshop held in Newcastle in February 2024 for the programme *Robot Dexterity* .

SECTION 1: Workshop Overview

Opportunity space / PD	Smart machines need smarter bodies / Jenny Read
Date	19/02/2024 - 20/02/2024
Location	The Biscuit Factory, Newcastle, NE2 1AN
Goal	Test the thesis laid out in the pre-read, "Robotic Dexterity - handling our future". Gather views, criticisms, comments and feedback.
Goals met?	Yes
Pre-reads	Opportunity Space + Programme Thesis

Background

The primary objective of this workshop was for the experts in various related fields to rigorously evaluate and challenge this thesis. Feedback was crucial for identifying any weaknesses and proposing improvements. Additionally, we welcomed suggestions for potential projects that could be developed within the scope of this program, should it receive approval and move forward.

Day 1:

On the first day, the agenda included providing an overview of the thesis, listening to lightning talks from key industry experts. The lightning talks featured speakers from diverse industries and covered a range of technologies from robot arms to agile jumping robots.

Breakout 1

Participants were tasked with envisioning the future of robotic manipulation, considering the advancements that might be achieved by the year 2124. Groups brainstormed and outlined dream manipulators across various sectors such as logistics, household tasks, nuclear operations, space exploration, and surgical procedures. Each group summarised their vision for these manipulators, utilising visual aids to present their ideas. This exercise encouraged participants to think big while also considering the practical pathways necessary to realise these ambitious goals, fostering both creative thinking and strategic planning within the session.

Day 2:

On the second day, the agenda included lightning talks from large construction companies and government agencies, as well as a deep dive talk on how textiles can integrate with robotics.

Breakout 2

Participants delved into the risks and rewards associated with an ARIA programme focusing on robotic dexterity. The session highlighted two primary ways in which such a programme could fail: by not achieving its stated goals or by lacking ambition and funding work that would have occurred anyway through non-ARIA mechanisms. Participants discussed potential risks, such as duplication or competition with well-funded tech companies, and explored strategies to mitigate these risks. They also brainstormed ways to design the programme to leverage its unique position for catalysing transformative change and ensuring differentiation in approach. Ultimately, the goal was to ensure that the ARIA programme in robotics maximises its impact without duplicating existing efforts.

Breakout 3

Participants explored the concept of co-designing hardware and software for robotics, as proposed in the programme thesis. They discussed the value of this approach and its practical implementation. Key considerations included the critical role of simulation in co-design, the potential for generative AI, application of existing machine learning techniques, and considerations of modularity in design. Additionally, they discussed methods to facilitate usability, such as the potential use of ROS (Robot Operating System).

Breakout 4

Focused on brainstorming new "components" for robotics to enhance robotic functionality. Participants envisioned capabilities like haptic sensing, proximity sensing, accurate force/torque sensing, and the use of gecko skin for object manipulation. They also explored differing opinions on actuators and their role in robotic dexterity. These sessions provided opportunities for participants to engage deeply with key aspects of robotics research and development, fostering collaboration and innovative thinking within the group.

These discussions aimed to identify the obstacles, necessary advancements, and strategic plans required to achieve the development of advanced robotic manipulators.

Experts/Domains

The workshop brought together experts from diverse fields to explore the future of robotic manipulation. Key domains covered included medical robotics, AI and public funding, materials science, biomechanics, industrial innovation, sensing technologies, machine learning, haptics, and teleoperation. Discussions also delved into soft robotics, smart textiles, and cross-sector solutions. With an emphasis on collaboration and innovation, the workshop aimed to address challenges and chart new directions in robotics.

Key Discussion Points

Overall the workshop proved to be hugely valuable for the development of this programme, including by refining Jenny's thinking in the following areas:

Modularity is Key:

- Reducing duplication of design effort is essential. A shared portal or marketplace for suppliers and technology could unlock significant industry potential.

Open Source Hardware:

- Embracing open source hardware would be transformative for the industry.

Advanced Simulation and Emulation:

- Effective simulation is crucial. Modular models for simulations are important, with emulation providing an even better approach, especially when integrated with real-time systems.
- High-quality synthetic datasets using generative AI would be highly beneficial.
- A well-documented toolbox to accelerate new designs would be powerful.
- Current simulation capabilities are deficient; having combinable simulation models, like Lego blocks, would be ideal.
- Mandating creators to use this suite of tools is recommended.

Manufacturing Integration

- Manufacturing is critical for translating designs into products and must be seamlessly integrated into the process.

SECTION 2: Agenda

Day 1 Agenda | 19/02/2024

Time	Session Name
10:30	Arrivals, Registration, Icebreaking & Breakfast
11:00	Welcome & Housekeeping
11:05	ARIA Q&A
11:35	Introduction to Workshop
11:50	Coffee Break
12:00	Online presentation
12:30	Online presentation
13:00	Online presentation
13:30	Lunch
14:30	Lightning Talk
14:34	Lightning Talk
14:38	Lightning Talk
14:42	Lightning Talk
14:46	Lightning Talk
14:50	Lightning Talk
14:54	Lightning Talk
14:58	Breakout Briefing
15:05	Breakout 1a

Time	Session Name
15:45	Coffee Break
16:00	Breakout 1b
17:15	Breakout feedback
17:45	Day 1 summary & close
18:00	Optional Networking Dinner

Day 2 Agenda | 20/02/2024

Time	Session Name
09:00	Welcome
09:10	Lightning Talk
09:14	Lightning Talk
09:18	Lightning Talk
09:22	Lightning Talk
09:26	Lightning Talk
09:30	Lightning Talk
09:34	Lightning Talk
09:34	Breakout briefing
09:40	Breakout
10:30	Coffee break
10:45	Breakout feedback
11:10	Breakout briefing
11:20	Breakout
12:00	Lunch
13:00	Breakout
13:50	Breakout feedback

14:20	Breakout briefing
14:30	Coffee break
14:45	Breakout
15:25	Breakout feedback
15:55	Summary & close
16:05	Optional Tea & Networking