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Machine learning improves the reprocessing of electronic waste

Fraunhofer IPA is working with ten project partners on the “Desire4Electronics” project to advance research into automated disassembly processes for the remanufacturing of small electrical appliances. The project runs from 2023 to 2025 and addresses 7 of the 17 United Nations (UN) Sustainable Development Goals (SDGs).

The German population is currently generating an average of 19.4 kilograms of electronic waste per capita per annum – and the trend is rising. In the case of small electrical appliances, in particular, many of the components containing valuable materials such as copper, polymers or lithium are still functional and could be remanufactured. At present, this process is still very time-consuming. Consequently, the mission of the “Desire4Electronics” project is to develop methods that automate and simplify the remanufacturing of components. As a subdivision of artificial intelligence (AI), machine learning (ML) techniques will be developed and later applied to the entire remanufacturing process.

Interdisciplinary project network

The consortium is led by the Robot and Assistive Systems department at Fraunhofer IPA. The Process Innovation project group based at the institute’s Bayreuth site is also collaborating on the research project. Three other partners are involved in the project: acp systems AG, Deprag Schulz GmbH and the United Nations Institute for Training and Research. In addition, six associated partners from the waste management industry are lending their support to the project in the form of practical knowledge and can transfer important findings from the project directly into practical application. A resolution adopted by the Bundestag, the German Parliament, has authorized funding for the project from the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV).

Focus on sustainability

As part of this project, the research network will develop low-risk and intelligent automation solutions for remanufacturing. The focus here is on sustainability. Machine learning techniques will be used to identify device types and joining methods, which will be tested using image and tool data. The results will enable the development of multi-tools that can be used to resolve a series of joining techniques for the disassembly of small electrical devices. Beyond this, methods for automated disassembly are being researched that can also establish the refurbishment process on a profitable basis, including for industrialized countries, thereby contributing to improved sustainability in production and use.

Supported by:

based on a decision of
the German Bundestag

Press communication

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In its 2030 Agenda for Sustainable Development, the UN has developed 17 SDGs, of which 7 are addressed by the project either directly or indirectly:

- Decent work and economic growth through the creation of higher-value jobs
- Strengthening industry, innovation and infrastructure with the introduction of new, resilient value chains by dismantling end-of-life products
- Sustainable cities and communities by way of local dismantling of end-of-life electrical equipment
- Responsible consumption and production by closing lifecycles through recycling and reuse
- Global climate protection by means of reduced resource and primary energy consumption
- Protection of life below water by means of plastics recycling
- Protection of life on land by reducing landfill areas

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Project overview**Funding source:**

Resolution adopted by the Bundestag, the German Parliament, authorizing funding for the project from the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)

Project partners:

acp systems AG, Deprag Schulz GmbH u. Co., Fraunhofer IPA, United Nations Institute for Training and Research

Title in full:

Disassembly automation in the remanufacturing process of small electrical appliances (Desire4Electronics).

Project duration:

From January 1, 2023 to December 31, 2025



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The “Desire4Electronics” project uses machine learning to improve the remanufacturing process and, for example, enable automated disassembly.

Source: Fraunhofer IPA/Rainer Bez

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With nearly 1200 employees, the **Fraunhofer Institute for Manufacturing Engineering and Automation**, Fraunhofer IPA, is one of the largest institutes in the Fraunhofer-Gesellschaft. The total budget amounts to € 82 million. The institute's research focus is on organizational and technological aspects of production. We develop, test and implement not only components, devices and methods, but also entire machines and manufacturing plants. Our 19 departments are coordinated via six business units, which together conduct interdisciplinary work with the following industries: automotive, machinery and equipment industry, electronics and microsystems, energy, medical engineering and biotechnology as well as process industry. The research activities of Fraunhofer IPA aim at the economic production of sustainable and personalized products.