



Disassembly method of new energy batteries

1 INTRODUCTION 1.1 The current status of lithium-ion battery (LIB) waste and metal supply-demand scenario. Increasing global energy demands and environmental devastation [1, 2] have fueled the development of green ...

The new method carries out automatic disassembly of electric car batteries using robots with fine-tuned gripping arms. The robot is in turn controlled by an advanced 3D camera with artificial intelligence.

Context. The EVs market is growing fast, setting new records year by year. According to the Global EV Outlook 2023 of the International Energy Agency (IEA) [1], the number of EVs globally reached 26 million in 2022 with an increment of 60% relative to 2021, reaching 10 million of sales (6 million only in China) in a year. The 14% of new cars sold globally in 2022 ...

Batteries 2023, 9, 57 3 of 27 batteries [28]. EV battery disassembly into modules or cells also corresponds to two types of echelon utilization: module-level utilization and cell-level ...

network-based disassembly sequencing method based on a disassembly graph model for ELV batteries, which provides manufacturers with dynamic process optimisation. In their study, Tan et al. (2021) proposed a hybrid disassembly framework for battery disassembly with a focus on improving disassembly efficiency. Alfaro et al. (2020) proposed a ...

The past two decades have witnessed the wide applications of lithium-ion batteries (LIBs) in portable electronic devices, energy-storage grids, and electric vehicles (EVs) due to their unique advantages, such as high energy density, superior cycling durability, and low self-discharge [1,2,3]. As shown in Fig. 1a, the global LIB shipment volume and market size are ...

We examine the optimal disassembly sequence for end-of-life power batteries and present a disassembly information model that captures the knowledge and information ...

Manual disassembly of the lithium-ion battery (LIB) modules of electric vehicles (EVs) for recycling is time-consuming, expensive, and dangerous for technicians or workers. Dangers associated with high voltage and thermal runaway make a robotic system suitable for the automated or semi-automated disassembly of EV batteries. In this paper, we explore battery ...

Journal of Energy Storage 83:110571; ... " This new method does not create dust, ... Comparison of different disassembly methods for cylindrical battery cells ...

Retired electric-vehicle lithium-ion battery (EV-LIB) packs pose severe environmental hazards. Efficient recovery of these spent batteries is a significant way to achieve closed-loop lifecycle ...



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End-of-life (EOL) products are getting more and more attention as a result of the rapid decline in environmental resources and the dramatic rise in population at the moment. Disassembly is a crucial step in the reuse of EOL products. However, the disassembly process for EOL products is highly uncertain, and the disassembly planning method may not produce ...

The two methods of advanced battery disassembly are depicted in Figs. 4 ... Microwave-assisted carbothermic reduction roasting is an environment-friendly and energy-efficient method that uses microwaves instead of conventional heat sources. ... future technologies should focus on designing a recycling process based on the characteristics of ...

Echelon utilization of waste power batteries in new energy vehicles has high market potential in China. However, bottlenecks, such as product standards, echelon utilization technology, and recycling network systems, have given rise to the urgent need for policy improvement. ... Other enterprises include the outsourcing of battery disassembly ...

A battery disassembly time comparison between manual and automatic disassembly of a small single module battery is proposed in a study by Zhou et al. [28], which highlights the large percentage of ...

Fig. 1 shows China's new energy vehicle (battery electric vehicles and plug-in hybrid electric vehicles) sales in 2016-2018 [6]. The recycling process comprises of mechanical process and chemical process. ... For batteries of different sizes and structures, the same disassembly method may cause battery damage and cause safety problems. At the ...

Increasing numbers of lithium-ion batteries for new energy vehicles that have been retired pose a threat to the ecological environment, making their disassembly and recycling methods a research ...

Major enterprises have also produced a large number of new energy vehicles powered by batteries. The worldwide sales of electric vehicles are expected to increase from the current 1.1 million to 11 million in ... its corresponding disassembly sequence can be found by using the above method. The disassembly sequence is a sequence of n elements, ...

In order to establish a complete and open product information model to realize the automatic disassembly task planning of end-of-life automobile power battery, a disassembly task planning method ...

There is increasing application of automation and mechanical disassembly to spent batteries. Dr. Dilong's team (Shang et al., 2024) applied multi-dimensional precise identification and screening technologies to the battery disassembly process, as shown in the prototype configuration in Fig. 5 (a). Initially, their team obtained and analyzed ...



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Increasing numbers of lithium-ion batteries for new energy vehicles that have been retired pose a threat to the ecological environment, making their disassembly and recycling methods a research priority. Due to the variation in models and service ... due to differences in new energy models" production and maintenance processes, there are numerous LIB

With the increase in the production of electric vehicles (EVs) globally, a significant volume of waste power battery modules (WPBM) will be generated accordingly, posing challenges for their disposal. An intelligent ...

2.1 Battery Disassembly. Disassembly strategy study is one of the earliest researches for battery disassembly tasks, which currently are primarily carried out by humans [2,3,4] from 2014 to 2015, researchers designed a disassembly workstation and conducted in-depth research on the Audi Q5 battery pack []. Recent research work is to further refine the ...

The framework focuses on optimizing several identified parameters. These parameters (Design, Safety, and Cost) were identified through a comprehensive review and analysis of the schematics and properties of ...

The recycling of retired new energy vehicle power batteries produces economic benefits and promotes the sustainable development of environment and society. However, few attentions have been paid to the design and optimization of sustainable reverse logistics network for the recycling of retired power batteries. To this end, we develop a six-level sustainable ...

Abstract. With the wide application of new Electric Vehicle (EV) batteries in various industrial fields, it is important to establish a systematic intelligent battery recycling system that can be used to find out the resource wastes and environmental impacts of the retired EV battery. By combining the uncertain and dynamic disassembly and echelon utilization of ...

New energy vehicle batteries include Li cobalt acid battery, Li-iron phosphate battery, nickel-metal hydride battery, and three lithium batteries. Untreated waste batteries will have a serious impact on the environment. ... At present, the commonly used waste battery treatment methods are echelon utilization, disassembly, recycling, and reuse ...

Context. The EVs market is growing fast, setting new records year by year. According to the Global EV Outlook 2023 of the International Energy Agency (IEA) [], the number of EVs globally reached 26 million in 2022 ...

In 2020, China's new energy vehicle (NEV) sales accounted for a mere 5.4% of the total vehicle sales, exhibiting slower growth rates compared to European countries such as Germany and France. ... As such, this study delves into the disassembly sequence of power batteries and presents an efficient planning method for power battery disassembly ...



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However, it is a potential trend to enhance the efficacy and safety of the disassembly of EV batteries based on human-robot collaboration (HRC) method. Because of the uncertainty of retired EV battery disassembly and the inefficiency of the existing disassembling sequence, it is difficult to be fully accomplished through HRC disassembly.

The existing HRC relies heavily on the experience of operators, while the existing disassembly system fails to update new disassembly strategies in real time when facing new battery varieties. Therefore, this paper proposes an augmented reality-assisted human-robot collaboration (AR-HRC) power battery dismantling system based on transfer learning.

Demand for lithium-ion batteries (LIBs) increased from 0.5 GWh in 2010 to approximately 526 GWh in 2020 and is expected to reach 9,300 GWh by 2030 [1, 2]. The technology has inherent advantages compared to lead-acid, nickel-metal hydride, and nickel-cadmium storage technologies due to its high energy density [3], high life cycle [4], and ...

This paper discusses the future possibility of echelon utilization and disassembly in retired EV battery recycling from disassembly optimization and human-robot collaboration, facing uncertain disassembly and echelon ...

To address this issue, Hellmuth et al. [18] introduced a method for the automated assessment of EV LIB disassembly. The method comprises two evaluation ...

The disassembly of spent lithium batteries is a prerequisite for efficient product recycling, the first link in remanufacturing, and its operational form has gradually changed from traditional manual disassembly to robot-assisted human-robot cooperative disassembly. Robots exhibit robust load-bearing capacity and perform stable repetitive tasks, while humans ...

Xiao et al. [22] presented a disassembly sequence optimization method based on a dynamic Bayesian network that can handle the uncertainty of battery categories and quality. In our previous publication, Baazouzi et al. [23], we developed an optimization method for obtaining optimal disassembly strategies for EVBs. This method combines three ...

Robust Robotic Disassembly of EV Battery Packs using Open-World Vision Language Models and Symbolic Replanning - \$1,800,024 ... a refabrication method for 3R cells into new energy systems. Together, these innovations will enable a scenario where end-of-life lithium-ion batteries are systematically evaluated, classified, and reused prior to being

To efficiently disassemble power batteries, a human-robot collaboration model to minimize the completion time is developed by integrating optimization problems containing ...



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EV batteries, the optimal depth of disassembly is up to the cell level, it provides a framework of overhaul, sort and repurpose of battery cells, which differs from traditional remanufacturing [19]. The proposed disassembly method is close to selective disassembly as proposed by [39],

Disassembly is a pivotal technology to enable the circularity of electric vehicle batteries through the application of circular economy strategies to extend the life cycle of ...

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