Weekly Newsletter
TECHNOLOGY SURVEILLANCE

Nº 34-2023 AUG 25TH, 2023

CONCYTEC

OBJECTIVE: *To provide weekly information about the latest global scientific and technological advancements, as well as the most innovative products and services entering the international market.*

I. NEWS

1.1 Augmented reality technology helps non-speaking autistic population find their voice

HoloLens 2 acts similarly to a standard virtual reality (VR) device with one main difference: the visor on the headset is transparent, allowing the user to see their real-world surroundings. Using the HoloBoard system, interactive holographic images emerge in the room via the headset. The concept of the system is for the user to practise their pointing and motor skills by interacting with the holographic keyboards and educational content that virtually appear in front of them.

Credit: University of Calgary

Not only does the HoloBoard help users communicate, it can also help improve movement, explains Madison Imber, a practitioner with Mentoring Minds, who has been working with autistic students for the past seven years. Practitioners like Imber customize the delivery of educational lessons to fit the unique sensory and motor profiles of a student — a technique that has informed the UCalgary team's research.

For more information, visit the following link:
https://www.ucalgary.ca/news/augmented-reality-technology-helps-non-speaking-autistic-population-find-their-voice

Reference
McInnes, B. (Aug 21, 2023). Augmented reality technology helps non-speaking autistic population find their voice. Recovered Aug 21, 2023, University of Calgary: https://www.ucalgary.ca/news/augmented-reality-technology-helps-non-speaking-autistic-population-find-their-voice

Information source: (University of Calgary, 2023)

1.2 Combine Deep Learning and physics to fix motion-corrupted MRI scans

Compared to other imaging modalities like X-rays or CT scans, MRI scans provide high-quality soft tissue contrast. Unfortunately, MRI is highly sensitive to motion, with even the smallest of movements resulting in image artifacts. These artifacts put patients at risk of misdiagnoses or inappropriate treatment when critical details are obscured from the physician. But researchers at MIT may have developed a Deep Learning model capable of motion correction in brain MRI.

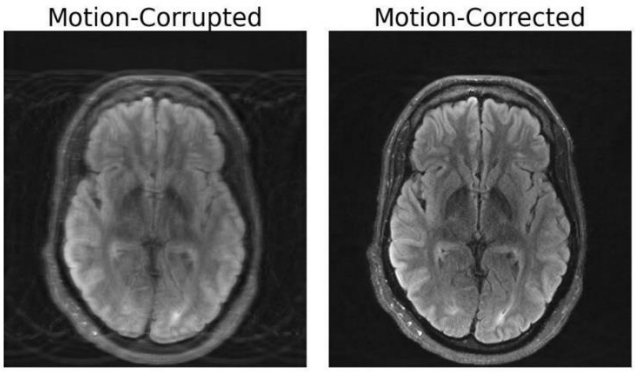


Image on the left depicts an MRI scan of the human brain corrupted by motion artifacts, whereas the image on the right depicts the same image with motion correction applied by a Deep Learning model developed by researchers at MIT. Credit: courtesy of the researchers, Massachusetts Institute of Technology

The method computationally constructs a motion-free image from motion-corrupted data without changing anything about the scanning procedure. *"Our aim was to combine physics-based modeling and Deep Learning to get the best of both worlds,"* Singh says. The importance of this combined approach lies within ensuring consistency between the image output and the actual measurements of what is being depicted, otherwise the model creates *"hallucinations"* — images that appear realistic, but are physically and spatially inaccurate, potentially worsening outcomes when it comes to diagnoses.

For more information, visit the following link:
https://news.mit.edu/2023/mit-researchers-combine-deep-learning-physics-fix-motion-corrupted-MRI-scans-0817

Reference
Ouyang, A. & Latif, A. (Aug 17, 2023). MIT researchers combine Deep Learning and physics to fix motion-corrupted MRI scans. Recovered Aug 17, 2023, Massachusetts Institute of Technology: https://news.mit.edu/2023/mit-researchers-combine-deep-learning-physics-fix-motion-corrupted-MRI-scans-0817

Information source: (Massachusetts Institute of Technology, 2023)

1.3 To improve EV batteries, study them on the road

Most electric vehicles are equipped with an electronic brain that manages day-to-day battery performance and safety. This battery management system, or BMS, includes software that uses algorithms to monitor the overall health of the powerful lithium-ion battery pack. *"The algorithm tells you things like if your battery is doing OK, or how far you can drive before you need to recharge,"* said Simona Onori, an assistant professor of energy science and engineering in the Stanford Doerr School of Sustainability. *"The problem is that BMS algorithms are designed in ideal laboratory conditions that do not reflect what a battery pack sees in the real world."*

Driving styles, temperature, and charging patterns can affect battery health.
Credit: Getty Images, Stanford University

To demonstrate the gap between controlled laboratory testing and actual road experience, Onori and colleagues at Stanford collaborated with researchers at the Volkswagen Innovation and Engineering Center located near the university campus. *"Algorithms based on unrealistic driving data are likely to be inaccurate in the field,"* said Onori, lead author of the study. *"Our goal is to increase the longevity of the battery pack by designing algorithms trained from real-world data."*

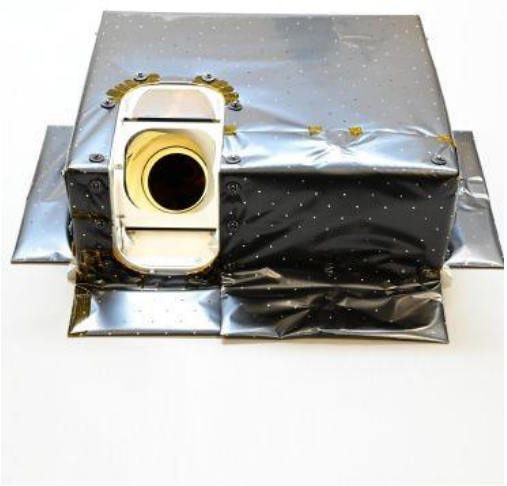
For more information, visit the following link:
https://news.stanford.edu/2023/08/18/improving-ev-batteries-real-world-driving-data/

Reference
Shwartz, M. (Aug 18, 2023). To improve EV batteries, study them on the road. Recovered Aug 18, 2023, Stanford University:
https://news.stanford.edu/2023/08/18/improving-ev-batteries-real-world-driving-data/

Information source: (Stanford University, 2023)

1.4 Oxford University-built instrument ready to map water on the Moon

A thermal imaging camera built by the University of Oxford's Department of Physics will form an integral part of NASA's Lunar Trailblazer mission, scheduled to launch in 2024. This aims to map the distribution of the different forms of water on the surface of the Moon to better understand the lunar water cycle and inform future human missions.



The Lunar Thermal Mapper wrapped in a multilayer insulation blanket.
Credit: University of Oxford for Lunar Trailblazer

The University of Oxford's Lunar Thermal Mapper (LTM) instrument has passed an important milestone on its journey to the Moon, with its recent installation on NASA's Lunar Trailblazer spacecraft at Lockheed Martin Space in Colorado, USA. The cutting-edge camera, supported by the UK Space Agency, will map the surface temperature and composition of the lunar surface at a resolution of around 50 metres. In combination with the spacecraft's High-resolution Volatiles and Minerals Moon Mapper (HVM3), this will help scientists to determine the abundance, location, and form of the Moon's water.

For more information, visit the following link:
https://www.ox.ac.uk/news/2023-08-17-oxford-university-built-instrument-ready-map-water-moon

Reference
University of Oxford. (Aug 17, 2023). Novel physics-encoded Artificial Intelligence model helps to learn spatiotemporal dynamics. Recovered Aug 18, 2023, University of Oxford: https://www.ox.ac.uk/news/2023-08-17-oxford-university-built-instrument-ready-map-water-moon

Information source: (University of Oxford, 2023)

1.5 Platelets can replicate the benefits of exercise in the brain

Pre-clinical trials by University of Queensland researchers have found an injection of a specific blood factor can replicate the benefits of exercise in the brain. Dr Odette Leiter and Dr Tara Walker from UQ's Queensland Brain Institute led a team which discovered platelets, the tiny blood cells critical for blood clotting, secrete a protein that rejuvenates neurons in aged mice in a similar way to physical exercise.

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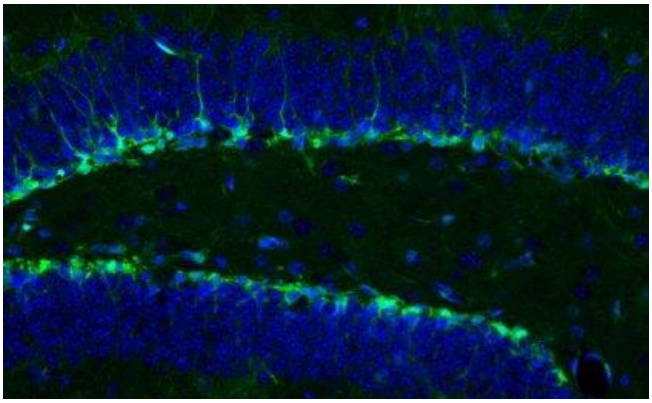


Neural stem cells in the mouse hippocampus shown in green (cell bodies shown in blue) give rise to new mature neurons throughout life.
Credit: The University of Queensland

"For a lot of people with health conditions, mobility issues or of advanced age, exercise isn't possible, so pharmacological intervention is an important area of research," she said. "We can now target platelets to promote neurogenesis, enhance cognition and counteract age-related cognitive decline." The researchers said the next step is to test the response in Alzheimer diseased mice, before moving towards human trials.

For more information, visit the following link:
https://www.uq.edu.au/news/article/2023/08/platelets-can-replicate-benefits-of-exercise-brain

Reference
Pye, M. & Pye, E. (Aug 17, 2023). Platelets can replicate the benefits of exercise in the brain. Recovered Aug 18, 2023, The University of Queensland:
https://www.uq.edu.au/news/article/2023/08/platelets-can-replicate-benefits-of-exercise-brain

Information source: (The University of Queensland, 2023)

1.6 Solid-state batteries could soon make electric cars safer and better

Today's electric cars use large lithium-ion batteries, which work fairly well. They can store a fairly high amount of energy in relation to their weight. They also don't need to be completely discharged each time before being recharged, so you can usually put the car on charge when it suits you without thinking too much about whether you are damaging the battery. But these batteries still don't have enough energy density for emerging applications and EVs. They are unstable and flammable, so it is perhaps not surprising that the search is on for alternatives. *"Solid-state batteries can be the future for tomorrow's electric cars,"* says Daniel Rettenwander, a professor at NTNU's Department of Materials Science and Engineering.

With solid-state batteries, electric cars can become both more reliable and less of a fire hazard. The technology is on its way.
Credit: Colourbox, Norwegian SciTech News

Solid-state batteries have several advantages compared to lithium-ion batteries. They can have higher voltage and higher energy capacity for energy storage in relation to their weight and volume.. These kinds of batteries are used today in pacemakers and portable electronics, where it is particularly important for the batteries to be small. Small batteries are also easier to make – which is why solid-state batteries are only commercial available at small scale. The production costs for larger batteries would be far too high since their manufacture is expensive.

For more information, visit the following link:
https://norwegianscitechnews.com/2023/08/solid-state-batteries-could-soon-make-electric-cars-safer-and-better/

Reference
Brandslet, S. (Aug 17, 2023). Solid-state batteries could soon make electric cars safer and better. Recovered Aug 18, 2023, Norwegian SciTech News:
https://norwegianscitechnews.com/2023/08/solid-state-batteries-could-soon-make-electric-cars-safer-and-better/

Information source: (Norwegian SciTech News, 2023)

1.7 Monitoring wind, gas density and temperatures together can better predict mine disasters

Greater monitoring of wind, gas density and temperatures in coal mines can help reduce the risk of disasters, according to a new joint study with Charles Darwin University (CDU) and University Technology Sydney (UTS). The study, "An First-round—Second-round—Verification round (FSV) *analysis approach to verify the robustness of the triple-correlation analysis theoretical framework"*, focused on developing a gas monitoring system which takes a holistic approach to assessing wind, gas, and temperature conditions..

Greater monitoring wind, gas density and temperatures in coal mines can help reduce the risk of disasters, according to a new joint Charles Darwin University (CDU) and University Technology Sydney (UTS) study
Credit: Bar-Nur lab, Charles Darwin University

Co-author and CDU Faculty of Science and Technology Associate Professor Niusha Shafiabady said the study examined real-time data and all tests indicated three significant correlations between gas, temperature, and wind. The project confirmed the framework could be used to develop a gas warning system with improved sensitivity to reduce the incidence of gas explosions. The study was undertaken by CDU, University of Technology Sydney, Shanxi Normal University, Central Queensland University, Taiyuan Normal University, Shanxi Fenxi Mining Industry Group Co and Shanxi Fenxi Mining Zhongxing Coal Industry Co. Associate Professor Shafiabady said the results of the study could be used by different mining companies to avoid gas incidents.

For more information, visit the following link:
https://www.cdu.edu.au/news/monitoring-wind-gas-density-temperatures-together-can-better-predict-mine-disasters

Reference
Charles Darwin University. (Aug 18, 2023). Monitoring wind, gas density and temperatures together can better predict mine disasters. Recovered Aug 18, 2023, Charles Darwin University: https://www.cdu.edu.au/news/monitoring-wind-gas-density-temperatures-together-can-better-predict-mine-disasters

Information source: (Charles Darwin University, 2023)

1.8 Zinc-air batteries a cheaper and safer alternative

Zinc-air batteries have emerged as a better alternative to lithium in a recent Edith Cowan University (ECU) study into the advancement of sustainable battery systems. ECU's Dr Muhammad Rizwan Azhar led the project which discovered lithium-ion batteries, although a popular choice for electric vehicles around the world, face limitations related to cost, finite resources, and safety concerns.

"Rechargeable zinc-air batteries (ZABs) are becoming more appealing because of their low cost, environmental friendliness, high theoretical energy density, and inherent safety," Dr Muhammad Rizwan Azhar said. *"With the emergence of next-generation long-range vehicles and electric aircraft in the market, there is an increasing need for safer, more cost-effective, and high-performance battery systems that can surpass the capabilities of lithium-ion batteries."* ECU's breakthrough has enabled engineers to use a combination of new materials, such as carbon, cheaper iron and cobalt based minerals to redesign zinc-air batteries. *"The new design has been so efficient it suppressed the internal resistance of batteries, and their voltage was close to the theoretical voltage which resulted in a high peak power density and ultra-long stability,"* Dr Azhar said.

For more information, visit the following link:
https://www.ecu.edu.au/newsroom/articles/research/move-over-lithium-ion-zinc-air-batteries-a-cheaper-and-safer-alternative

Reference
Azhar, M. (Aug 21, 2023). Move over lithium-ion: Zinc-air batteries a cheaper and safer alternative. Recovered Aug 21, 2023, Edith Cowan University: https://www.ecu.edu.au/newsroom/articles/research/move-over-lithium-ion-zinc-air-batteries-a-cheaper-and-safer-alternative

Information source: (Edith Cowan University, 2023)

1.9 Closing the carbon cycle with green propane production

Researchers from the University of Pennsylvania, Illinois Institute of Technology, and the University of Illinois at Chicago have developed a system that can convert CO_2 emissions into propane (C_3H_8), a cleaner, more energy-dense fuel source. *"Electrochemical conversion of CO_2 can serve future energy needs by storing renewable energy and closing the anthropogenic carbon cycle,"* says coauthor Andrew Rappe of the School of Arts & Sciences at Penn. *"This research paves the way to new solutions that will tackle energy storage challenges and meaningfully reduce CO_2 levels."*

"Making renewable chemical manufacturing is really important," says coauthor Mohammad Asadi of Illinois Institute of Technology. *"It's the best way to close the carbon cycle without losing the chemicals we currently use daily."* Copper has traditionally been the go-to element for researchers investigating efficient ways to convert CO_2 into valuable chemicals and fuels, both to curb its environmental impact and provide new energy storage solutions. However, the fuels produced have been low-energy density single-carbon compounds like methane.

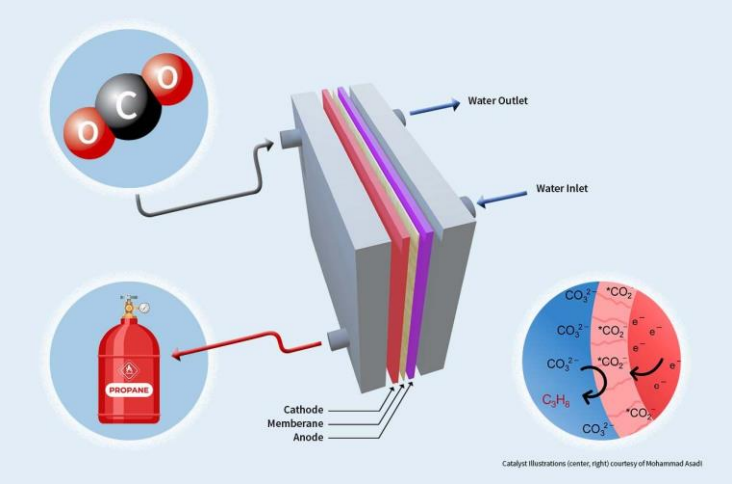
For more information, visit the following link:
https://penntoday.upenn.edu/news/closing-carbon-cycle-green-propane-production

Reference
Magubane, N. (Aug 17, 2023). Closing the carbon cycle with green propane production. Recovered Aug 21, 2023, University of Pennsylvania:
https://penntoday.upenn.edu/news/closing-carbon-cycle-green-propane-production

Information source: (University of Pennsylvania, 2023)

1.10 Leading to groundbreaking green propane production method

Pioneering research done at Illinois Institute of Technology reveals a promising breakthrough in green energy: an electrolyzer device capable of converting carbon dioxide into propane in a manner that is both scalable and economically viable. The team employed a combination of experimental and computational methods. This rigorous approach illuminated the crucial elements influencing the catalyst's reaction activity, selectivity, and stability.



Credit: Illinois Institute of Technology

A distinctive feature of this technology, lending to its commercial viability, is the implementation of a flow electrolyzer. This design permits continuous propane production, sidestepping the pitfalls of the more conventional batch processing methods. *"Designing and engineering this laboratory-scale flow electrolyzer prototype has demonstrated Illinois Tech's commitment to creating innovative technologies. Optimizing and scaling up this prototype will be an important step toward producing a sustainable, economically viable, and energy-efficient carbon capture and utilization process,"* says Advanced Research Projects Agency-Energy Program Director Jack Lewnard.

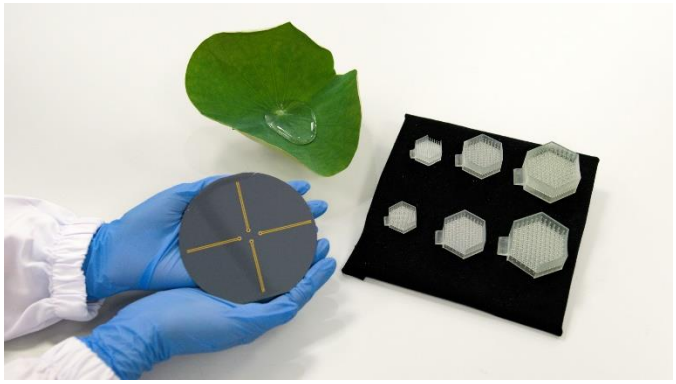
For more information, visit the following link:
https://www.iit.edu/news/illinois-tech-engineer-spearheads-research-leading-groundbreaking-green-propane-production-method

Reference
Dollear, K. (Aug 18, 2023). Illinois tech engineer spearheads research leading to groundbreaking green propane production method. Recovered Aug 21, 2023, Illinois Institute of Technology: https://www.iit.edu/news/illinois-tech-engineer-spearheads-research-leading-groundbreaking-green-propane-production-method

Information source: (Illinois Institute of Technology, 2023)

1.11 Nature-inspired pressure sensing technology aims to transform healthcare and surgical robots

Researchers at the National University of Singapore (NUS) have developed a novel aero-elastic pressure sensor, called ‘eAir’. This technology can be applied to minimally-invasive surgeries and implantable sensors by directly addressing the challenges associated with existing pressure sensors. The eAir sensor promises increased precision and reliability across medical applications. It can potentially transform laparoscopic surgeries by enabling tactile feedback for surgeons, allowing more precise manipulation of patient tissues. In addition, the sensor can improve patient experiences by offering a less invasive means of monitoring intracranial pressure (ICP), a key health metric for individuals with neurological conditions.



NUS scientists drew inspiration from the 'lotus leaf effect' -a unique natural phenomenon where water droplets effortlessly roll off the leaf’s surface, made possible by its minuscule, water-repelling structures. Credit: National University of Singapore

To address these challenges in pressure sensing, the NUS team drew inspiration from a phenomenon known as the 'lotus leaf effect' — a unique natural phenomenon where water droplets effortlessly roll off the leaf’s surface, made possible by its minuscule, water-repelling structures. Mimicking this effect, the team has engineered a pressure sensor designed to significantly improve the sensing performance.

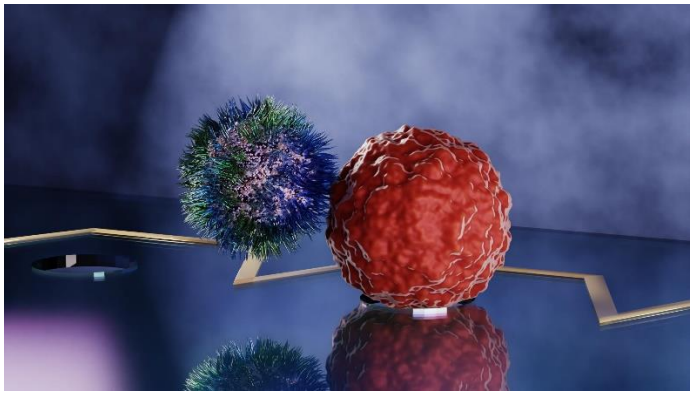
For more information, visit the following link:
https://news.nus.edu.sg/nature-inspired-pressure-sensing-technology/

Reference
National University of Singapore. (Aug 18, 2023). A quantum leap in mechanical oscillator technology. Recovered Aug 21, 2023, National University of Singapore: https://news.nus.edu.sg/nature-inspired-pressure-sensing-technology/

Information source: (National University of Singapore, 2023)

1.12 A lab-on-a-chip for T cell screening and sorting

Currently, it is a difficult and laborious process to place two cells in contact with each other to examine their binding characteristics. It is however a necessary step in understanding how cells interact in the hopes of finding novel cancer treatments, especially cell-based cancer immunotherapies. EPFL researcher Clémentine Lipp's new technology brings a significant improvement in this field by combining two different trapping technologies in a lab-on-a-chip system, enabling high-throughput analysis of essential cell to cell interactions.



Credit: © 2023 Nadya Rofman / nrpdesign.com / EPFL CC-BY-NC-ND

"When I tell people what I do, the easiest way to explain it is to say that I create a speed-dating environment for cells," says Lipp. And while this may sound as if she's half-joking, the analogy is an apt one. Understanding cell to cell interaction is essential in many scientific endeavors, and accelerating the process will likely speed up entire fields of study. In cell therapy specifically, cancer researchers are looking for T cells that can respond to and destroy tumor cells. In order for a T cell to trigger a response of the immune system it must attach itself to the tumor cell through its specialized receptor, a parameter known as its adhesion state. Up until now, individual cells or cell populations needed to be manually placed in contact with each other in difficult to manipulate microscopic environments. Whereas the new microfluidic tool allows independent control of these two types of cells, with the potential to revolutionize cell screening for T cells and other applications.

For more information, visit the following link:
https://news.epfl.ch/news/a-lab-on-a-chip-for-t-cell-screening-and-sorting/

Reference
David, M. (Aug 18, 2023). A Lab-on-a-Chip for T cell screening and sorting. Recovered Aug 21, 2023, Ecole Polytechnique Fédérale de Lausanne:
https://news.epfl.ch/news/a-lab-on-a-chip-for-t-cell-screening-and-sorting/

Information source: (Ecole Polytechnique Fédérale de Lausanne, 2023)

1.13 Nearly zero-waste solution for construction: Reusable robotic 3D-printed formwork from upcycled sawdust

The BioMatters team at the University of Michigan has developed a fully biodegradable, reusable and recyclable material to replace the wasteful concrete formwork traditionally used across the construction industry. The base of this material is upcycled sawdust—millions of tons of sawdust waste are created each year from the 15 billion cut trees and often burned or dumped in landfills left to contribute to environmental pollution.

Robotic 3D printing of wood-based material paired with incremental set-on-demand concrete casting to create zero-waste freeform concrete structures.
Crédito: Tharanesh Varadharajan, Zachary Keller, Muhammad Dayyem Khan, University of Michigan

The BioMatters team at the Taubman College of Architecture and Urban Planning and Digital Architecture Research & Technology (DART) Laboratory is making productive use of this readily available resource. Currently, they are using sawdust created at the Fabrication Laboratory at Taubman. *"We have made a recyclable, all natural biomaterial which is made out of sawdust. Other sawdust-based solutions are using other petroleum-based polymers—we use biopolymers which are completely decomposable,"* said Muhammad Dayyem Khan, researcher at the DART laboratory. *"And the biggest thing is it's very easy to recycle and reuse."*

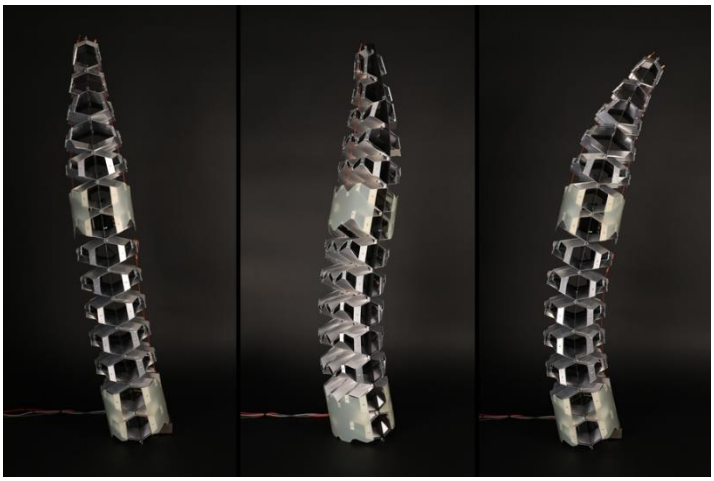
For more information, visit the following link:
https://news.umich.edu/nearly-zero-waste-solution-for-construction-reusable-robotic-3d-printed-formwork-from-upcycled-sawdust/

Reference
Sherman, J. (Aug 21, 2023). Nearly zero-waste solution for construction: Reusable robotic 3D-printed formwork from upcycled sawdust. Recovered Aug 21, 2023, University of Michigan: https://news.umich.edu/nearly-zero-waste-solution-for-construction-reusable-robotic-3d-printed-formwork-from-upcycled-sawdust/

Information source: (University of Michigan, 2023)

1.14 Use kirigami to make ultrastrong, lightweight structures

Cellular solids are materials composed of many cells that have been packed together, such as a honeycomb. The shape of those cells largely determines the material's mechanical properties, including its stiffness or strength. Bones, for instance, are filled with a natural material that enables them to be lightweight, but stiff and strong. Inspired by bones and other cellular solids found in nature, humans have used the same concept to develop architected materials. By changing the geometry of the unit cells that make up these materials, researchers can customize the material's mechanical, thermal, or acoustic properties. Architected materials are used in many applications, from shock-absorbing packing foam to heat-regulating radiators.



MIT researchers used kirigami, the art of Japanese paper cutting and folding, to develop ultrastrong, lightweight materials that have tunable mechanical properties, like stiffness and flexibility. These materials could be used in airplanes, automobiles, or spacecraft.
Credit: Massachusetts Institute of Technology

Using kirigami, the ancient Japanese art of folding and cutting paper, MIT researchers have now manufactured a type of high-performance architected material known as a plate lattice, on a much larger scale than scientists have previously been able to achieve by additive fabrication. This technique allows them to create these structures from metal or other materials with custom shapes and specifically tailored mechanical properties.

For more information, visit the following link:
https://news.mit.edu/2023/using-kirigami-ultrastrong-lightweight-structures-0822

Reference
Fleischman, T. (Aug 22, 2023). MIT engineers use kirigami to make ultrastrong, lightweight structures. Recovered Aug 22, 2023, Massachusetts Institute of Technology: https://news.mit.edu/2023/using-kirigami-ultrastrong-lightweight-structures-0822

Information source: (Massachusetts Institute of Technology, 2023)

1.15 Platform could boost development of carbon-capturing batteries

The technology has been developed by the University of Surrey, Imperial College London, and Peking University to address the slow and inefficient methods currently used to produce catalysts for Li-CO_2 batteries. In the study, researchers used their tool to test and screen materials like platinum, gold, silver, copper, iron and nickel to easily investigate whether they would be suitable candidates for developing high-performing Li-CO_2 batteries.

Credit: University of Surrey

Dr Kai Yang, corresponding author of this work, project co-leader and Lecturer from the Advanced Technology Institute at the University of Surrey, explained: *"We have created a cutting-edge lab-on-a-chip electrochemical testing platform that can do multiple things at the same time. It helps evaluate electrocatalysts, optimise operation conditions, and study CO_2 conversion in high-performance lithium-CO_2 batteries. This new method is more cost-effective, efficient, and controllable than traditional ways of making these materials."*
Li-CO2 batteries are a promising new type of battery that work by combining lithium and carbon dioxide; they not only store energy effectively but also offer a way to capture CO_2, potentially making a dual-contribution to the fight against climate change.

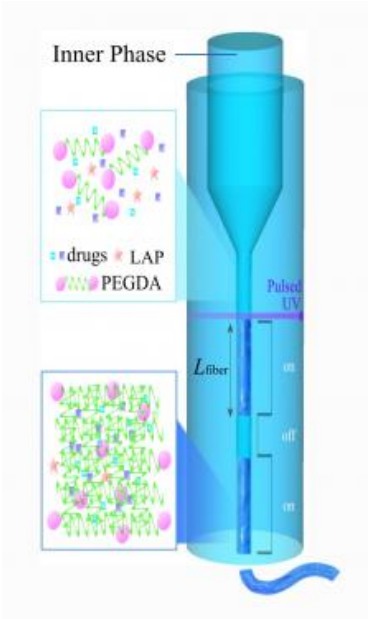
For more information, visit the following link:
https://www.surrey.ac.uk/news/new-platform-could-boost-development-carbon-capturing-batteries

Reference
Yang, K. & Zhao, Y. (Aug 22, 2023). New platform could boost development of carbon-capturing batteries. Recovered Aug 22, 2023, University of Surrey:
https://www.surrey.ac.uk/news/new-platform-could-boost-development-carbon-capturing-batteries

Information source: (University of Surrey, 2023)

1.16 Injectable hydrogel that can revolutionise regenerative medicine

Researchers from the University of Hong Kong (HKU), the HKU-Shenzhen Hospital and the Princeton University, collaborated to achieve a breakthrough in the development of injectable hydrogels, a highly effective method of administering medicine. Their innovative product, Fibro-Gel, offers numerous advantages over existing hydrogels and has promising applications in wound healing. Injectable hydrogel delivery is a highly effective method of administering medicine. A drug is incorporated into a soft gel which is then injected directly where it is required. Another advantage of this method is that the gel releases the drug gradually, allowing for better, more precise control of drug dosage.



The fabrication of Fibro-gel. The material containing the molecules of a drug, photo initiator (LAP) and polymer (PEGDA) is squeezed out through a microscopic nozzle to form a microfibre that is cut to specified length (Lfibre) by a pulse of the UV light.
Credit: © 2023 Shen et al. Advanced Materials published by Wiley-VCH GmbH, The University of Hong Kong

Injectable hydrogels have a number of applications – from cancer therapy where they can deliver drugs directly to the tumours, to treating diabetes, regenerating human tissues, and chronic pain management. They are especially suitable for treating wounds, including burns and surgical sites. Hydrogels can deliver growth factors, antibiotics, or anti-inflammatory drugs directly to the wound, aiding the healing process. However, there have been challenges in hydrogel development, such as the high cost of production, difficulty in scaling up, and the potential for adverse reactions in patients.

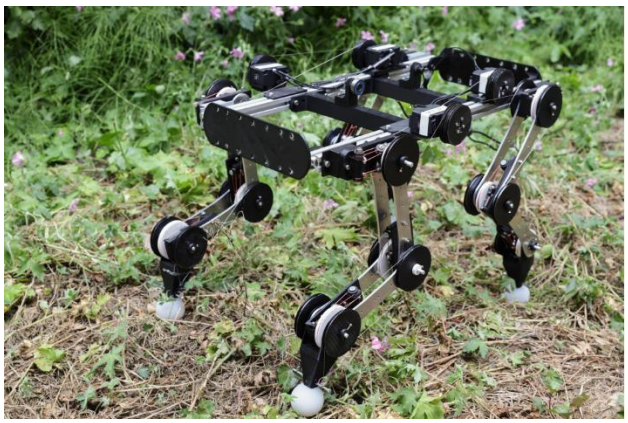
For more information, visit the following link:
https://hku.hk/press/news_detail_26506.html

Reference
Lee, C. & Lai, C. (Aug 21, 2023). HKU Biomedical Engineering team develops a novel injectable hydrogel that can revolutionise regenerative medicine. Recovered Aug 22, 2023, The University of Hong Kong: https://hku.hk/press/news_detail_26506.html

Information source: (The University of Hong Kong, 2023)

1.17 Robotic dog runs (almost) entirely on its own

Engineers at EPFL's Computational Robot Design & Fabrication Lab (CREATE), headed by Prof. Josie Hughes, are coming up with new ways of building robots possessing never-before-seen capabilities. For instance, Hughes and two other researchers used ChatGPT to design a robotic gripper for harvesting tomatoes. And Mickaël Achkar used motion-capture data from live dogs to build a robotic one. More specifically, Achkar studied dogs' biological mechanisms to create a smarter robot design and build a prototype that can run by itself once set in motion, without activating his motors.



Credit: Alain Herzog, Ecole Polytechnique Fédérale de Lausanne

"I wanted to engineer a robot with animal characteristics, bearing in mind that animals – like humans – move in a huge variety of ways," says Achkar. *"But most of these movements are executed by just a few joints."* He therefore drew inspiration from animals' motor control processes to guide him in his robot design. Achkar could have chosen just about any animal – a grasshopper, mouse, elephant or cheetah, for example – but a dog turned out to be the obvious choice. *"We found a vast dataset on the motion of dogs, and it was even available in open source!"* he says. The first step was to extract data on dogs' synergistic movements and then structure the data so they could be *"summarized"* in a meaningful way, through a method known as principal component analysis.

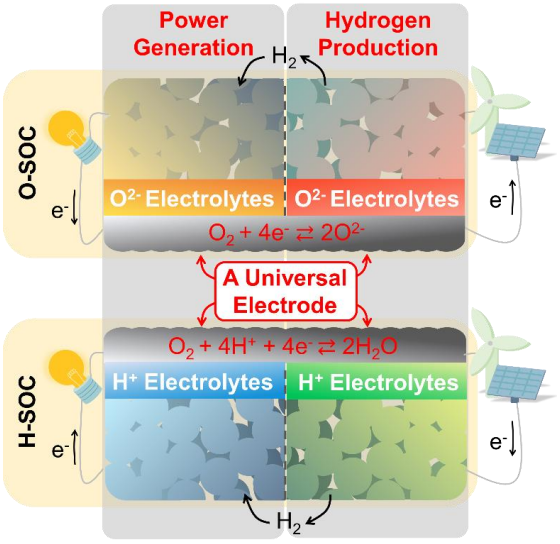
For more information, visit the following link:
https://news.epfl.ch/news/robotic-dog-runs-almost-entirely-on-its-own/

Reference
Muriel, A. (Aug 21, 2023). Robotic dog runs (almost) entirely on its own. Recovered Aug 22, 2023, Ecole Polytechnique Fédérale de Lausanne:
https://news.epfl.ch/news/robotic-dog-runs-almost-entirely-on-its-own/

Information source: (Ecole Polytechnique Fédérale de Lausanne, 2023)

1.18 Ultra-High Performing "Universal Electrode" for Next-Generation Fuel Cells

Fuel cells are devices that generate electricity with high efficiency using hydrogen, a clean energy source, and are expected to play an important part in the upcoming hydrogen society. The recent development of an excellent universal electrode material that is applicable to all next-generation fuel cells and can withstand 700 hours of operation has therefore garnered a great deal of attention.



Schematic diagram of high-performance oxygen ion conductive solid oxide fuel cell (SOFC) and proton conductive ceramic fuel cell (PCFC) operates with the new universal electrodes
Credit: Korea Advanced Institute of Science and Technology

A joint research team led by Prof. WooChul Jung from the KAIST Department of Materials Science and Engineering, Prof. Kang Taek Lee from the KAIST Department of Mechanical Engineering, and Prof. Jun Hyuk Kim from the Department of Chemical Engineering at Hongik University announced the development of an electrode material that is applicable to both oxygen- and proton-conducting solid oxide cells. Depending on the type of ion conducted by the electrolyte, ceramic fuel cells are categorized into either solid oxide fuel cells (SOFC) or protonic ceramic fuel cells (PCFC). As they can both convert between electricity and hydrogen production, fuel cells can be categorized into a total of four device types. These devices are applicable in hydrogen fuel cell vehicles, hydrogen charging stations, and power generation systems, and are henceforth emerging as core next-generation technologies for a carbon-neutral society.

For more information, visit the following link:
https://news.kaist.ac.kr/newsen/html/news/?mode=V&mng_no=30970

Reference
Korea Advanced Institute of Science and Technology. (Aug 22, 2023). A KAIST Research Team Develops an Ultra-High Performing "Universal Electrode" for Next-Generation Fuel Cells. Recovered Aug 17, 2023, Korea Advanced Institute of Science and Technology:
https://news.kaist.ac.kr/newsen/html/news/?mode=V&mng_no=30970

Information source: (Korea Advanced Institute of Science and Technology, 2023)

1.19 Driverless cars worse at detecting children and darker-skinned pedestrians say scientists

Researchers have revealed major age and race biases in autonomous vehicles' detection systems, in what could prompt a major re-think of the future of driverless cars. In collaboration with colleagues, Dr. Jibe Zhang from the Department of Informatics, assessed eight artificial intelligence (AI) powered pedestrian detection systems used in autonomous vehicle research.

Credit: King's College London

They found through testing over 8,000 images through these pieces of software that detection accuracy for adults was almost 20% higher than it was for children, and just over 7.5% more accurate for light-skinned pedestrians compared to their darker-skinned counterparts. A major cause of this discrepancy is that the main collections of pedestrian images which are used to train the AI systems used in pedestrian detection, that is the system which tells a driverless car whether they are approaching a pedestrian, feature more people with light skin than dark skin. The result of this uneven data source is a lack of fairness in the AI system it's used to train.

For more information, visit the following link:
https://www.kcl.ac.uk/news/driverless-cars-worse-at-detecting-children-and-darker-skinned-pedestrians-say-scientists

Reference
Zhang, J. (Aug 23 2023). Driverless cars worse at detecting children and darker-skinned pedestrians say scientists. Recovered Aug 23, 2023, King's College London: https://www.kcl.ac.uk/news/driverless-cars-worse-at-detecting-children-and-darker-skinned-pedestrians-say-scientists

Information source: (King's College London, 2023)

1.20 How artificial intelligence gave a paralyzed woman her voice back

Breakthrough brain implant and digital avatar allow stroke survivor to speak with facial expressions for first time in 18 years. It is the first time that either speech or facial expressions have been synthesized from brain signals. The system can also decode these signals into text at nearly 80 words per minute, a vast improvement over the 14 words per minute that her current communication device delivers. Edward Chang, MD, chair of neurological surgery at UCSF, who has worked on the technology, known as a brain-computer interface, or BCI, for more than a decade, hopes this latest research breakthrough, will lead to an FDA-approved system that enables speech from brain signals in the near future.

Chang implanted a thin rectangle of electrodes on the surface of Ann's brain to pick up signals sent to speech muscles when Ann tries to talk.
Credit: University of California San Francisco

The team implanted a paper-thin rectangle of 253 electrodes onto the surface of her brain over areas they previously discovered were critical for speech. The electrodes intercepted the brain signals that, if not for the stroke, would have gone to muscles in Ann's lips, tongue, jaw and larynx, as well as her face. A cable, plugged into a port fixed to Ann's head, connected the electrodes to a bank of computers.

For more information, visit the following link:
https://www.ucsf.edu/news/2023/08/425986/how-artificial-intelligence-gave-paralyzed-woman-her-voice-back

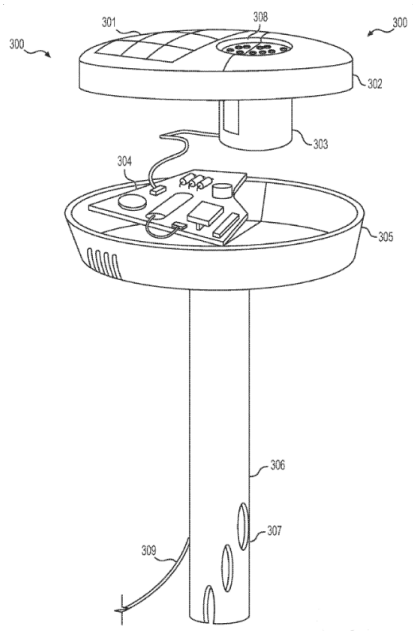
Reference
Marks, R. & Kurtzman, L. (Aug 23, 2023). How artificial intelligence gave a paralyzed woman her voice back. Recovered Aug 23, 2023, University of California San Francisco: https://www.ucsf.edu/news/2023/08/425986/how-artificial-intelligence-gave-paralyzed-woman-her-voice-back

Information source: (University of California San Francisco, 2023)

II. PATENTS

2.1. Systems and methods for automatic environmental planning and decision support using artificial intelligence and data fusion techniques on distributed sensor network data

Disclosed are systems and methods for community-based multi-sensor fused data processing to determine natural hazard risk. In one embodiment, a system comprises one or more memory units storing instructions and one or more processors configured to execute the instructions to receive localized data from a distributed multi-sensor network.



Illustrates an exemplary embodiment of a multi-sensor station, according to various embodiments. Credit: Modugula, V. & Vinukollu, R., WIPO IP Portal

The distributed multi-sensor network including a plurality of sensor devices associated with a community, receive property data, community infrastructure data and environmental data from at least one external repository, generate combined data using data fusion, the combined data being based on the localized data from the distributed multi-sensor network and at least one of the property data, community infrastructure data or the environmental data, determine a community risk score for a natural hazard by implementing a machine learning method on the combined data, and perform a mitigating action based on the community risk score.

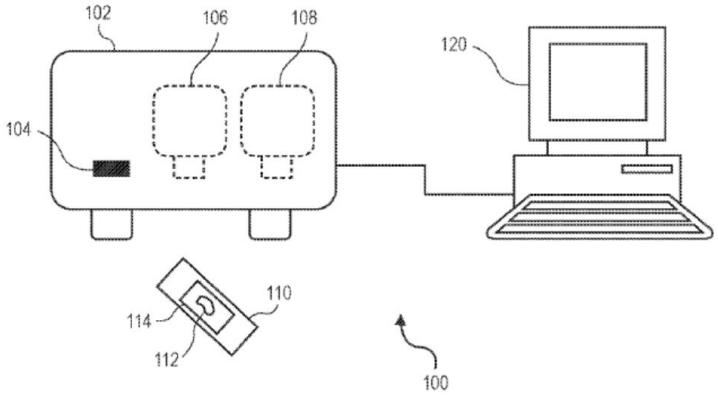
For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US404729577&_cid=P20-LLPAES-42554-1

Reference
Modugula, V. & Vinukollu, R. (Aug 17, 2023). Systems and methods for automatic environmental planning and decision support using artificial intelligence and data fusion techniques on distributed sensor network data. Recovered Aug 18, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US404729577&_cid=P20-LLPAES-42554-1

Information source: (WIPO IP Portal, 2023)

2.2. Digital pathology artificial intelligence quality check

Techniques of automated quality control for digital pathology whole slide images are presented. The techniques include obtaining a thumbnail image derived from a whole slide image of a pathology slide.



Is a schematic diagram of a system for automated quality control for digital pathology whole slide images. Credit: Ianni, J.; Spurrier, V. & Grullon, S., WIPO IP Portal

Determining whether the whole slide image includes an artifact in a first class of artifacts by providing the thumbnail image to an electronic neural network trained to detect artifacts in the first class of artifacts by analyzing a plurality of labeled training thumbnail images; generating a tissue mask representing tissue depicted in the thumbnail image; determining whether the whole slide image includes an artifact in a second class of artifacts by performing a comparison using the tissue mask; and providing an indication of whether the whole slide image includes an artifact in the first class of artifacts or an artifact in the second class of artifacts.

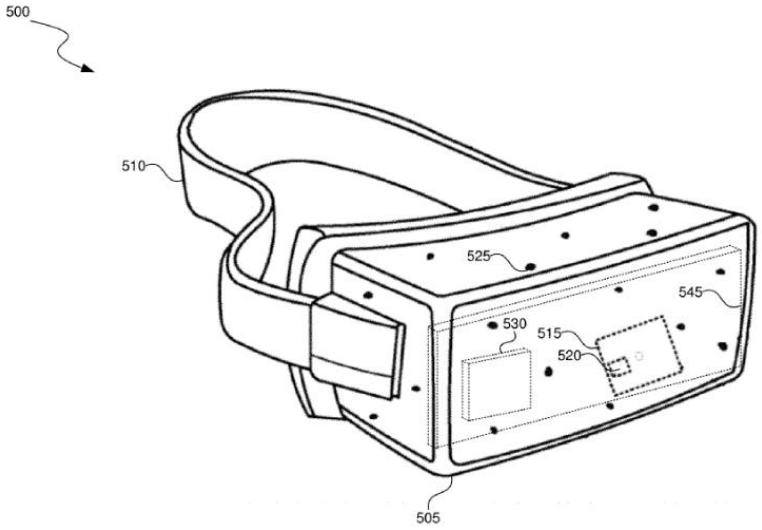
For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US404729939&_cid=P20-LLPAES-42554-1

Reference
Ianni, J.; Spurrier, V. & Grullon, S. (Aug 17, 2023). Digital pathology artificial intelligence quality check. Recovered Aug 18, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US404729939&_cid=P20-LLPAES-42554-1

Information source: (WIPO IP Portal, 2023)

2.3. Artificial intelligence-assisted virtual object builder

Aspects of the present disclosure are directed to an artificial intelligence ("AI") application running in conjunction with an artificial reality ("XR") space. The AI Builder responds to user commands, verbal or gestural, to build or edit spaces or objects in space.



Is a wire diagram illustrating a virtual reality headset which can be used in some implementations of the present technology.
Credit: Cheung, V.; Zhang, J.; Kowalk, B. & Wang, M., WIPO IP Portal

If the requested object is of a type recognized by the AI Builder, then the AI Builder builds the object from one or more stored templates. The new object's location is determined by the objects that already exist in the user's XR environment and on commands or gestures from the user. If the AI Builder does not recognize the requested object, the user can show an image to the AI Builder, and the AI builds a 3D object in the XR space according to that image. To ease collaboration among users, the AI Builder may present its user interface as a non-player character within the XR world.

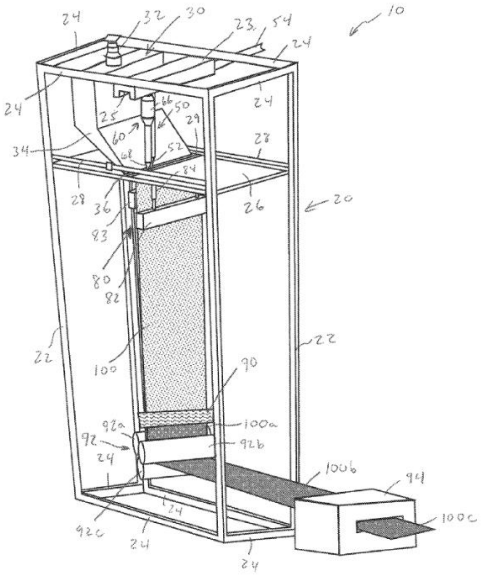
For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US404730033&_cid=P20-LLPAES-42554-1

Reference
Cheung, V.; Zhang, J.; Kowalk, B. & Wang, M. (Aug 17, 2023). Artificial intelligence-assisted virtual object builder. Recovered Aug 22, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US404730033&_cid=P20-LLPAES-42554-1

Information source: (WIPO IP Portal, 2023)

2.4. System and method of 3D printing

An apparatus and method for fabricating a three-dimensional object from a representation of the object stored in memory. The apparatus includes a build platform having a build gap defined therein. A base plate is initially supported along a lower surface of the build platform such that an edge of the base plate extends along and closes off the build gap.



Is a diagram of the patient system according to another exemplary embodiment.
Credit: Pan, N., WIPO IP Portal

A powder delivery assembly is configured to supply powder to the build gap. At least one directed energy source is configured to apply directed energy to at least a portion of the build gap to form a layer of the three-dimensional structure. An advancement assembly configured to selectively engage with the base plate and/or the three-dimensional structure to hold the base plate and the three-dimensional structure in a fixed position during forming of a layer and to advance the base plate and the three-dimensional structure once the layer is formed.

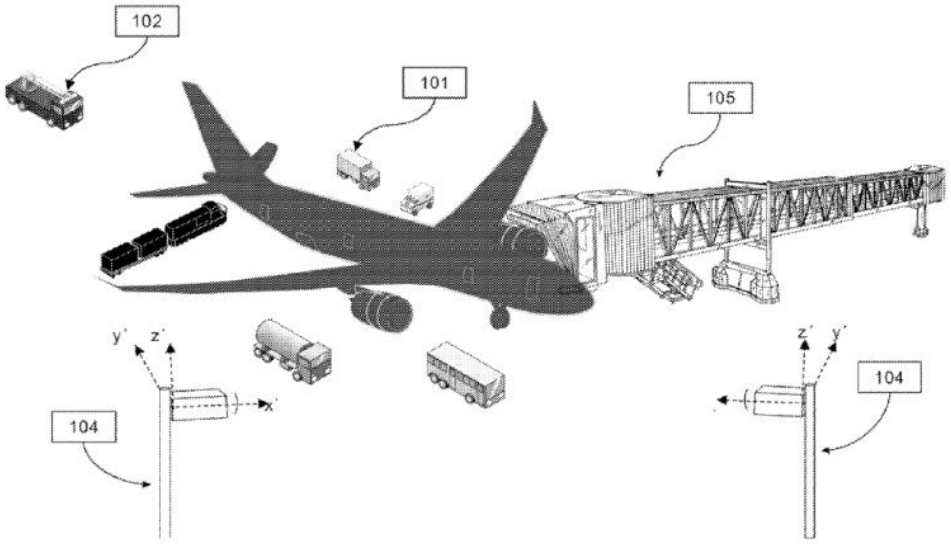
For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US404725940&_cid=P20-LLPAX6-56457-1

Reference
Pan, N. (Aug 17, 2023). System and method of 3D printing. Recovered Aug 22, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/es/detail.jsf?docId=US404725940&_cid=P20-LLPAX6-56457-1

Information source: (WIPO IP Portal, 2023)

2.5. Image labelling system and method therefor

A system for generating a labelled dataset is provided. The system comprises processor configured to: receive first data wherein the first data comprises one or more frames and wherein the first data comprises data defining an object of interest within a predetermined area; receive second data wherein the second data is associated with the object of interest within the predetermined area.



Shows an aircraft in situ on a typical airport apron, within the field of view of one or more monitoring sensors such as a camera.
Credit: Ryan, S., WIPO IP Portal

Analyse the one or more frames of the first data to identify, based on the second data, the object of interest present in the first data; label the one or more frames of the first data based on the analysis to generate a labelled dataset; and output the labelled dataset. Also provided is a method for generating a labelled dataset, a system for training a machine learning model, and a detection system for detecting one or more objects of interest.

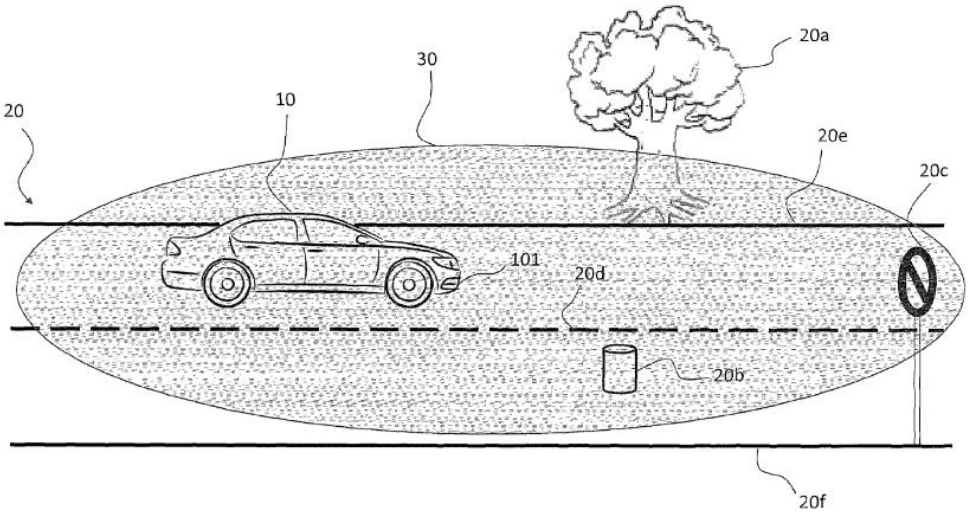
For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US404730121&_cid=P20-LLPB00-58370-1

Reference
Ryan, S. (Aug 17, 2023). Image labelling system and method therefor. Recovered Aug 23, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US404730121&_cid=P20-LLPB00-58370-1

Information source: (WIPO IP Portal, 2023)

2.6. Methods and apparatus for training a machine learning algorithm

The invention relates to a method for training a machine learning algorithm, such as a Deep Learning algorithm, for correct item identification performed by a computing unit of a vehicle, wherein the computing unit comprises a processor, a machine learning unit, a communication unit, and a memory and wherein the vehicle comprises a sensor.



Schematically represents a vehicle driving on a road and performing an identification of different objects. Credit: Larsson, D.; Cheng, S. & Filipski, D., Espacenet Patent Search

The method comprises the steps of: triggering sensor data collection and controlling the sensor to acquire sensor data, controlling the sensor to transmit the sensor data to the machine learning unit, optionally controlling the machine learning unit to transmit the data and information related to the data to a user interface and controlling the user interface unit to display, on the display of the user interface, the data and instructions to label the data, based on the information related to the data; assigning labelling information to the data; and controlling the machine learning unit to re-train a machine learning algorithm stored in the memory based on the labelling information.

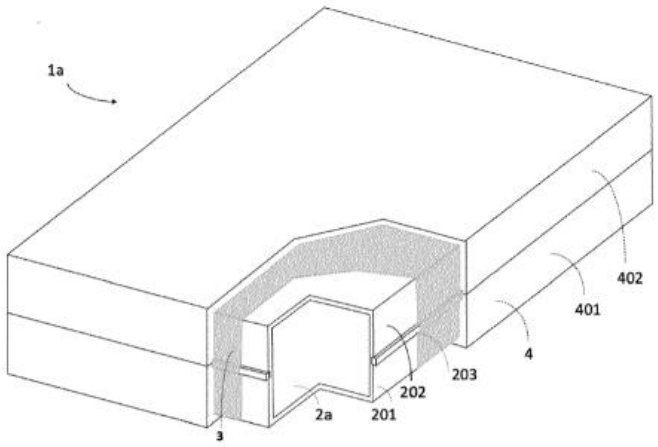
For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/080448479/publication/US2023259825A1?q=Machine%20learning

Reference
Larsson, D.; Cheng, S. & Filipski, D. (Aug 17, 2023). Methods and apparatus for training a machine learning algorithm. Recovered Aug 23, 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/080448479/publication/US2023259825A1?q=Machine%20learning

Information source: (Espacenet Patent Search, 2023)

2.7. Vacuum insulation panel with a continuous metal coated polymer core box

Certain aspects and features of this disclosure relate to virtual 3D pointing and manipulation. For example, video communication is established between a presenter client device and a viewer client device.



Is a perspective cut-away view of a vacuum insulation panel with the design "a"
Credit: Dupont, T., Espacenet Patent Search

A presenter video image is captured. A 3D image of a 3D object is rendered on the client devices and a presenter avatar is rendered on at least the viewer client device. The presenter avatar includes at least a portion of the presenter video image. When a positional input is detected at the presenter client device, the system renders, on the viewer client device, an articulated virtual appurtenance associated with the positional input, the 3D image, and the presenter avatar. A virtual interaction between the articulated virtual appurtenance and the 3D image appear to a viewer as naturally positioned for the interaction with respect to the viewer.

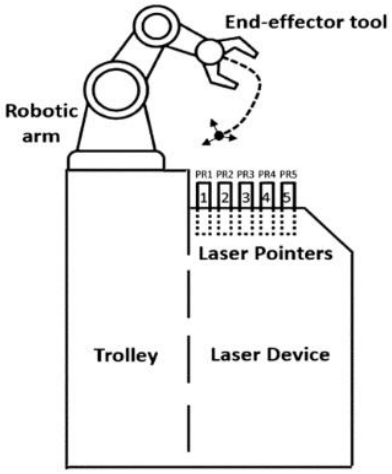
For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/081326413/publication/EP4230596A1?q=artificial%20intelligence

Reference
Dupont, T. (Aug 23, 2023). Vacuum insulation panel with a continuous metal coated polymer core box. Recovered Aug 23, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/081326413/publication/EP4230596A1?q=artificial%20intelligence

Information source: (Espacenet Patent Search, 2023)

2.8. Device for laser tattoo or scar removal and respective oncological applications

The present disclosure relates to a device and a method for operating said device for tattoo or scar removal. The device comprises an exchangeable multi-laser head having at least one laser beam target line; a robotic support; a multispectral camera for capturing a plurality of ranges of colour wavelength of the skin surface image; a mechanism configured to automatically rotate the laser head for changing between laser beams of the exchangeable multi-laser head.



Schematic representation according to an embodiment of the disclosure of an automatic laser pointer switch system. Credit: Araújo, J.; Gomes, B. & Gonçalves, P., Espacenet Patent Search

A robotic arm with fibre optics; one or more handles; a force sensor and an electronic data processor configured for carrying out the steps comprising: capturing an image of skin surface; segmenting the captured image; defining a path from said segmented captured image, said path comprising a plurality of path segments wherein each path segment corresponds to a colour wavelength range; selecting each path segment of the plurality of path segments; selecting the laser according to the colour wavelength corresponding to each path segment; removing the tattoo or scar.

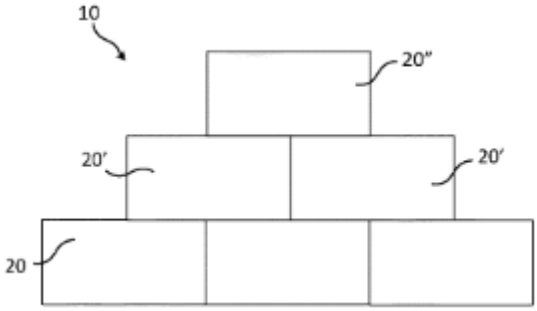
For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/087264211/publication/EP4230167A1?q=artificial%20intelligence

Reference
Araújo, J.; Gomes, B. & Gonçalves, P. (Aug 23, 2023). Device for laser tattoo or scar removal and respective oncological applications. Recovered Aug 23, 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/087264211/publication/EP4230167A1?q=artificial%20intelligence

Information source: (Espacenet Patent Search, 2023)

2.9. A 3D printed building element

A 3D printed building element comprises a 3D printed block comprising an upper wall, a front wall, a rear wall and two lateral walls, defining an inner space, lower portions of the walls defining an inner edge developing seamlessly to form a bottom edge surface.



Is a schematic frontal view of a masonry structure according to the present invention.
Credit: Fantinelli, D., Espacenet Patent Search

The block further comprises two internal ducts disposed in the inner space, each defining a first feedthrough opening provided on the upper wall, and an opposite second feedthrough opening facing the bottom edge surface. The 3D printed building element further comprises two connecting elements, each inserted in a corresponding duct of the block, so that a first portion of the connection element is exposed outside the first feedthrough opening provided on the upper wall and is suitable to be inserted in a second feedthrough opening facing the bottom edge surface of a duct of a further block superimposed to the block.

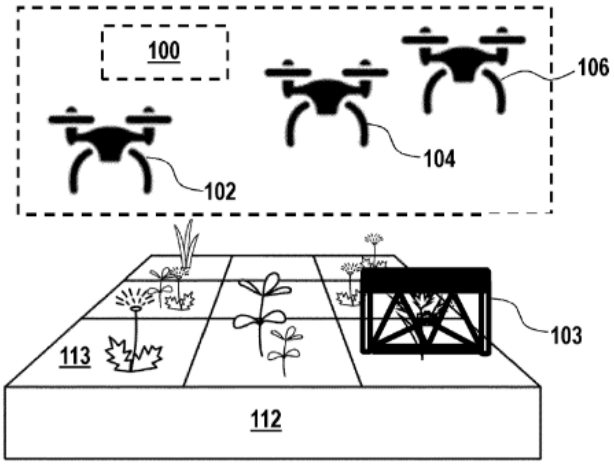
For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/080683027/publication/EP4230817A1?q=3D

Reference
Fantinelli, D. (Aug 23, 2023). A 3D printed building element. Recovered Aug 23, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/080683027/publication/EP4230817A1?q=3D

Information source: (Espacenet Patent Search, 2023)

2.10. Targeted treatment of specific weed species with multiple treatment devices

The present disclosure relates to targeted treatment of specific weed species with multiple treatment devices. Provided is a system and computer-implemented method for controlling operation of multiple treatment devices having treatment device configurations different to each other for treating an agricultural field.



Illustrates an example embodiment of a system with multiple UAVs for treatment of an agricultural field. Credit: BASF Agro Trademarks GmbH., Espacenet Patent Search

The method comprises analyzing field data, monitored as at least one of the multiple treatment devices traverses the field, to identify weed present at a certain field location of the field by weed species; and targeted instructing at least one treatment device among the multiple treatment devices that has a matching treatment device configuration for an identified weed species to treat the field at the corresponding certain field location against the identified weed species.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/081326604/publication/EP4230036A1?q=Blockchain

Reference
BASF Agro Trademarks GmbH. (Aug 23, 2023). Targeted treatment of specific weed species with multiple treatment devices. Recovered Aug 24, 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/081326604/publication/EP4230036A1?q=Blockchain

Information source: (Espacenet Patent Search, 2023)