



Weekly Newsletter
TECHNOLOGY
SURVEILLANCE

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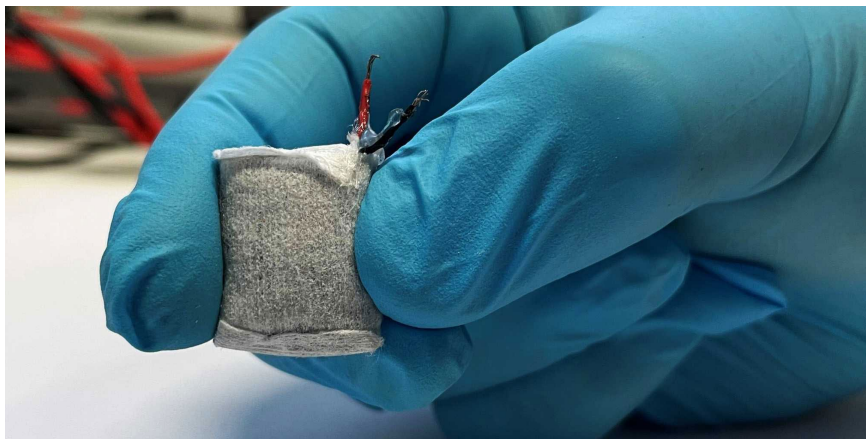


OBJECTIVE: *To provide weekly information about the latest global scientific and technological advancements, as well as the most innovative products and services entering the international market.*

I. NEWS

1.1 Generating power with blood sugar

A fuel cell under the skin that converts blood sugar from the body into electrical energy sounds like science fiction. Yet it works perfectly, as an Eidgenössische Technische Hochschule Zürich (ETH Zurich) research team led by Martin Fussenegger, Professor of Biotechnology and Bioengineering, has shown.



*The prototype fuel cell is wrapped in a fleece and is slightly larger than a thumbnail.
Credit: Fussenegger Lab, Eidgenössische Technische Hochschule Zürich,*

Now, a team of researchers led by Martin Fussenegger from the Department of Biosystems Science and Engineering at ETH Zurich in Basel have put a seemingly futuristic idea into practice. They have developed an implantable fuel cell that uses excess blood sugar (glucose) from tissue to generate electrical energy. The researchers have combined the fuel cell with artificial beta cells developed by their group several years ago. These produce insulin at the touch of a button and effectively lower blood glucose levels much like their natural role models in the pancreas. *“Many people, especially in the Western industrialised nations, consume more carbohydrates than they need in everyday life,”* Fussenegger explains. This, he adds, leads to obesity, diabetes and cardiovascular disease. *“This gave us the idea of using this excess metabolic energy to produce electricity to power biomedical devices,”* he says.

For more information, visit the following link:

<https://ethz.ch/en/news-and-events/eth-news/news/2023/03/press-release-generating-power-with-blood-sugar.html>

Reference



Rüegg, P. (March 23, 2023). Generating power with blood sugar. Recovered March 28, 2023, Eidgenössische Technische Hochschule Zürich: <https://ethz.ch/en/news-and-events/eth-news/news/2023/03/press-release-generating-power-with-blood-sugar.html>

Information source: (Eidgenössische Technische Hochschule Zürich, 2023)



1.2 Robotic system offers hidden window into collective bee behavior

École polytechnique fédérale de Lausanne (EPFL) researchers have developed a temperature-modulating robotic system that can be seamlessly integrated into notoriously sensitive honeybee hives, providing both a never-before-seen view of honeybee behavior and a means to influence it.



Credit: Celia Luterbacher, École polytechnique fédérale de Lausanne

Now, a joint research team from the Mobile Robotic Systems Group in EPFL's School of Engineering and School of Computer and Communication Sciences and the Hiveopolis project at Austria's University of Graz have developed a robotic system that can be unobtrusively built into the frame of a standard honeybee hive. Composed of an array of thermal sensors and actuators, the system measures and modulates honeybee behavior through localized temperature variations. *"Many rules of bee society – from collective and individual interactions to raising a healthy brood – are regulated by temperature, so we leveraged that for this study,"* explains EPFL PhD student Rafael Barmak, first author on a paper on the system recently published in Science Robotics. *"The thermal sensors create a snapshot of the bees' collective behavior, while the actuators allow us to influence their movement by modulating thermal fields."*

For more information, visit the following link:

<https://actu.epfl.ch/news/robotic-system-offers-hidden-window-into-collectiv/>

Reference

Luterbacher, C. (March 23, 2023). Robotic system offers hidden window into collective bee behavior. Recovered March 24, 2023, Ecole Polytechnique Fédérale de Lausanne: <https://actu.epfl.ch/news/robotic-system-offers-hidden-window-into-collectiv/>

Information source: (École polytechnique fédérale de Lausanne, 2023)



1.3 A design tool to democratize the art of color-changing mosaics

A colorful new design tool developed by Massachusetts Institute of Technology (MIT) researchers allows individuals to create polarized light mosaics that can be printed on cellophane to make data visualizations, passive light displays, mechanical animations, fashion accessories, educational science and design tools, and more.



Credit: Rachel Gordon, Massachusetts Institute of Technology

Ticha Melody Sethapakdi, a PhD student in electrical engineering and computer science and affiliate of the MIT Computer Science and Artificial Intelligence Laboratory (CSAIL), is leading the use of regenerated cellulose to make what she calls Polagons, machine-made color-changing mosaics that use polarized light to inform and delight. Such polarized light mosaics have previously been crafted by hand, and Sethapakdi was inspired by artists such as Austine Wood Comarow, whose innovative “*polage art*” is based on the same physics principles. The new computational Polagon design system, however, enables a fabrication process based on laser cutting and welding, all with minimal assembly by the user.

For more information, visit the following link:

<https://news.mit.edu/2023/design-tool-democratize-art-color-changing-mosaics-0323>

Reference

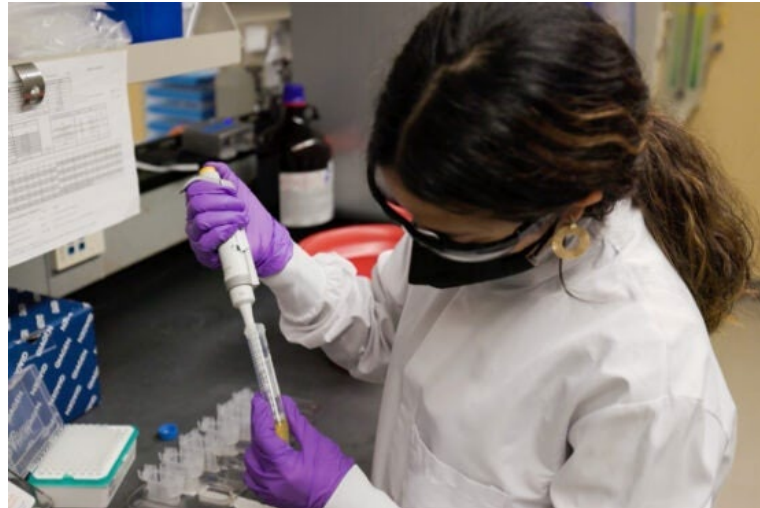
Gordon, R. (March 23, 2023). A design tool to democratize the art of color-changing mosaics. Recovered March 24, 2023, Massachusetts Institute of Technology: <https://news.mit.edu/2023/design-tool-democratize-art-color-changing-mosaics-0323>

Information source: (Massachusetts Institute of Technology, 2023)



1.4 Wastewater could be the key to tracking more viruses than just COVID-19

Researchers have developed methods for using wastewater to track the levels of various respiratory viruses in a population. This can provide real-time information about virus circulation in a community.



*Boehm lab graduate student Winnie Zambrana showing how wastewater samples are processed to test for evidence of viruses.
Credit: Harry Gregory, Stanford University*

Public health experts commonly track spikes in flu, Respiratory Syncytial Virus (RSV), and rhinovirus circulating in a population through weekly reports from sentinel laboratories. These laboratories process samples from only severely ill patients, and it can take weeks for the results to get into the database. Now, for the first time, researchers at Stanford University, in collaboration with Emory University and Verily Life Sciences, have collected fast and accurate readings of a whole suite of respiratory viruses in their local Santa Clara sewer system. Wastewater is currently the only source for accurate information about COVID-19 rates in communities. PCR testing is no longer widely available, and most people swab themselves at home where their results never reach public health agencies. Boehm envisions a future where communities could continually test wastewater for all kinds of viruses. With up-to-the-minute virus reports, calculating our risk for flu that day would be as easy as checking the local weather forecast for rain.

For more information, visit the following link:

<https://news.stanford.edu/2023/03/23/stanford-researchers-expand-disease-tracking-wastewater/>

Reference

Binns, C. (March 23, 2023). Wastewater could be the key to tracking more viruses than just COVID-19. Recovered March 24, 2023, Stanford University: <https://news.stanford.edu/2023/03/23/stanford-researchers-expand-disease-tracking-wastewater/>

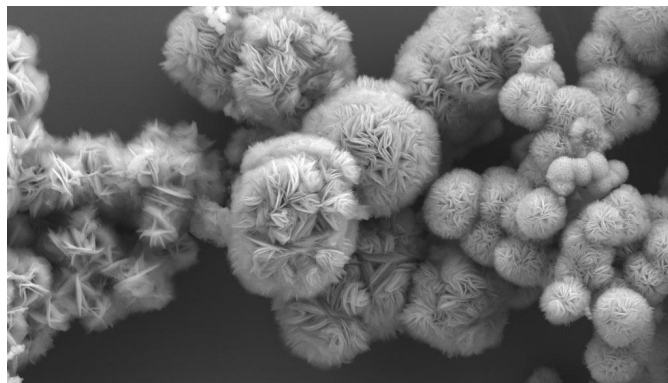


Information source: (Stanford University, 2023)



1.5 Make atomically thin metal layers for new technology

The secret to a perfect croissant is the layers—as many as possible, each one interspersed with butter. Similarly, a new material with promise for new applications is made of many extremely thin layers of metal, between which scientists can slip different ions for various purposes. This makes them potentially very useful for future high-tech electronics or energy storage. Until recently, these materials—known as MXenes, pronounced “*max-eens*”—were as labor-intensive as good croissants made in a French bakery. But a new breakthrough by scientists with the University of Chicago shows how to make these MXenes far more quickly and easily, with fewer toxic byproducts.



A scanning electron microscopy image reveals the beautiful shapes of tiny structures known as MXenes, which are of interest to scientists for new devices and electronics but were previously hard to create.

Credit: Di Wang., University of Chicago

To design a more efficient and less toxic method, the team used the principles of chemistry—in particular “*atom economy*,” which seeks to minimize the number of wasted atoms during a reaction. The University of Chicago team discovered new chemical reactions that allow scientists to make MXenes from simple and inexpensive precursors, without the use of hydrofluoric acid. It consists of just one step: mixing several chemicals with whichever metal you wish to make layers of, then heating the mixture at 1,700°F. “*Then you open it up and there they are*,” said Wang. The easier, less toxic method opens up new avenues for scientists to create and explore new varieties of MXenes for different applications—such as different metal alloys or different ion flavorings. The team tested the method with titanium and zirconium metals, but they think the technique can also be used for many other different combinations.

For more information, visit the following link:

<https://news.uchicago.edu/story/uchicago-scientists-discover-easy-way-make-atomically-thin-metal-layers-new-technology>

Reference

Lerner, L. (March 23, 2023). UChicago scientists discover easy way to make atomically thin metal layers for new technology. Recovered March 24, 2023, University of Chicago:



<https://news.uchicago.edu/story/uchicago-scientists-discover-easy-way-make-atomically-thin-metal-layers-new-technology>

Information source: (University of Chicago, 2023)



1.6 New in-home Artificial Intelligence tool monitors the health of elderly residents

Engineers are harnessing Artificial Intelligence (AI) and wireless technology to unobtrusively monitor elderly people in their living spaces and provide early detection of emerging health problems. The new system, built by researchers at the University of Waterloo, follows an individual's activities accurately and continuously as it gathers vital information without the need for a wearable device and alerts medical experts to the need to step in and provide help. *"After more than five years of working on this technology, we've demonstrated that very low-power, millimetre-wave radio systems enabled by Machine Learning and Artificial Intelligence can be reliably used in homes, hospitals and long-term care facilities,"* said Dr. George Shaker, an adjunct associate professor of electrical and computer engineering.

The new system represents a major step forward and works this way: first, a wireless transmitter sends low-power waveforms across an interior space, such as a long-term care room, apartment or home. As the waveforms bounce off different objects and the people being monitored, they're captured and processed by a receiver. That information goes into an AI engine which deciphers the processed waves for detection and monitoring applications.

For more information, visit the following link:

<https://uwaterloo.ca/news/media/new-home-ai-tool-monitors-health-elderly-residents>

Reference

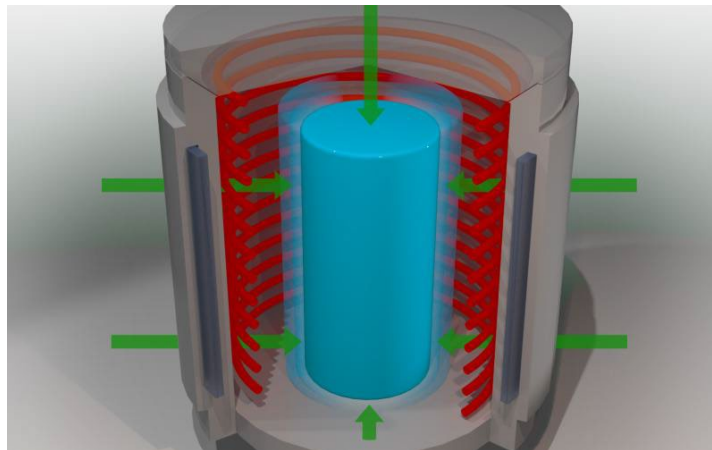
The University of Waterloo. (March 23, 2023). New in-home AI tool monitors the health of elderly residents. Recovered March 24, 2023, The University of Waterloo: <https://uwaterloo.ca/news/media/new-home-ai-tool-monitors-health-elderly-residents>

Information source: (University of Waterloo, 2023)



1.7 Isostatic pressing for solid-state battery manufacturing

Battery researchers at the Department of Energy's Oak Ridge National Laboratory (ORNL) are recommending that the solid-state battery industry focus on a technique known as isostatic pressing as it looks to commercialize next-generation batteries. Commercial-scale production of solid-state batteries is a goal for electric vehicle manufacturers because these batteries have the potential to charge faster, last longer and operate more safely than the lithium-ion batteries currently on the market.



Isostatic pressing applies consistent heat and pressure from all directions across a battery component within a chamber.

Credit: Andy Sproles, (ORNL) Oak Ridge National Laboratory

ORNL researchers recommend attention be given to the little-studied isostatic pressing approach. This process uses fluids and gases like water, oil or argon inside a machine to apply consistent pressure across a battery component, creating a highly uniform material. With the help of an industry partner that produces this pressing equipment, ORNL researchers found that isostatic pressing could make battery production easier and faster while creating better conditions for energy flow. When a battery charges or discharges, ions move through an electrolyte between its positive and negative poles, which are made of thin layers of metal. In the lithium-ion batteries that power everything from cell phones to electric vehicles, the electrolyte is a liquid through which ions travel easily. Unfortunately, this liquid can also spill or ignite if the separation between battery layers is compromised.

For more information, visit the following link:

<https://www.ornl.gov/news/research-team-supports-isostatic-pressing-solid-state-battery-manufacturing>

Reference

Dixit, M.; Amin, R.; Muralidharan, N.; Essehli, R.; Balasubramanian, M. & Belharouak, I. (March 23, 2023). Research team supports isostatic pressing for solid-state battery manufacturing. Recovered March 24, 2023, Oak Ridge National Laboratory: <https://news.epfl.ch/news/how-genome-doubling-helps-cancer-develop/>

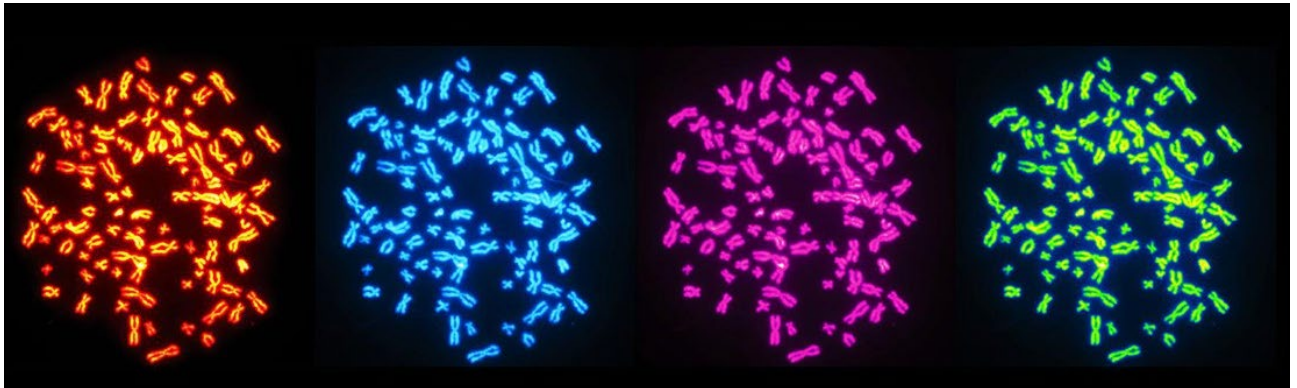


Information source: (Oak Ridge National Laboratory, 2023)



1.8 How genome doubling helps cancer develop

Researchers at École polytechnique fédérale de Lausanne (EPFL) and Université de Lausanne (UNIL) have uncovered a new way in which cancer can develop: Whole Genome Doubling (WGD) changes the way DNA is organized in the 3D space, leading to the activation of oncogenes that drive cancer growth.



Credit: Nik Papageorgiou, École Polytechnique Fédérale de Lausanne

A team of researchers led by Elisa Oricchio at EPFL and Giovanni Ciriello at UNIL, has uncovered a new clue as to how WGD drives cancer. In a study published in *Nature*, the scientists show that WGD can affect the 3D organization of the chromatin inside the cell through a phenomenon called “*loss of chromatin segregation*.” The researchers looked at cells that lack the tumor suppressor gene p53, making them prone to WGD. They found that WGD leads to a reduction in the segregation of chromatin’s structural elements, such as loops, domains, and compartments, upending its careful organization in the cell. The result is a mixing of genetic material that is normally kept separate, changing the position of genomic regions in the 3D space, known as “*sub-compartment repositioning*.” This sets the stage for the activation of oncogenes, which are genes that contribute to the development of cancer.

For more information, visit the following link:

<https://news.epfl.ch/news/how-genome-doubling-helps-cancer-develop/>

Reference

Papageorgiou, N. (March 28, 2023). How genome doubling helps cancer develop. Recovered March 28, 2023, Ecole Polytechnique Fédérale de Lausanne: <https://news.epfl.ch/news/how-genome-doubling-helps-cancer-develop/>

Information source: (École polytechnique fédérale de Lausanne, 2023)



1.9 Detecting exhaustion with smart sportswear

Researchers at Eidgenössische Technische Hochschule Zürich (ETH Zurich) have developed an electronic yarn capable of precisely measuring how a person's body moves. Integrated directly into sportswear or work clothing, the textile sensor predicts the wearer's exhaustion level during physical exertion.



*The textile sensor above the knee is connected to an antenna embedded in the waistband. Together, they form a circuit that can be used to measure movement.
Credit: Valeria Galli, ETH Zurich*

Exhaustion makes us more prone to injury when we're exercising or performing physical tasks. A group of ETH Zurich researchers led by Professor Carlo Menon, Head of the Biomedical and Mobile Health Technology Lab, have now developed a textile sensor that produces real-time measurements of how exhausted a person gets during physical exertion. To test their new sensor, they integrated it into a pair of athletic leggings. Simply by glancing at their smartphone, testers were able to see when they were reaching their limit and if they ought to take a break. This invention, for which ETH Zurich has filed a patent, could pave the way for a new generation of smart clothing: many of the products currently on the market have electronic components such as sensors, batteries or chips retrofitted to them. In addition to pushing up prices, this makes these articles difficult to manufacture and maintain.

For more information, visit the following link:

<https://ethz.ch/en/news-and-events/eth-news/news/2023/03/detecting-exhaustion-with-smart-sportswear.html>

Reference

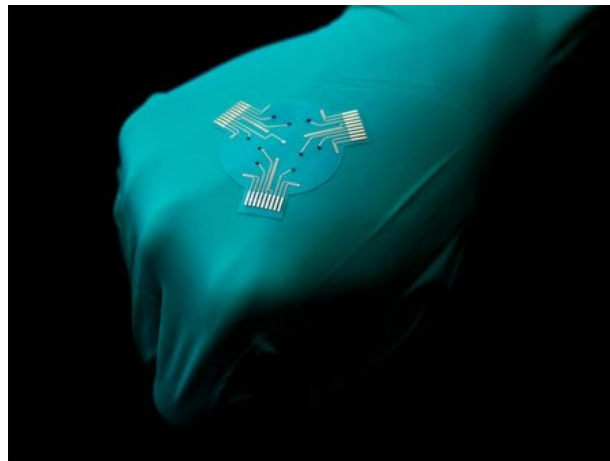
Elhardt, C. (March 24, 2023). Detecting exhaustion with smart sportswear. Recovered March 27, 2023, Eidgenössische Technische Hochschule Zürich: <https://ethz.ch/en/news-and-events/eth-news/news/2023/03/detecting-exhaustion-with-smart-sportswear.html>

Information source: (Eidgenössische Technische Hochschule Zürich, 2023)



1.10 'Smart' bandages monitor wounds and provide targeted treatment

Most of the time, when someone gets a cut, scrape, burn, or other wound, the body takes care of itself and heals on its own. But this is not always the case. Diabetes can interfere with the healing process and create wounds that will not go away and that could become infected and fester. A new kind of smart bandage developed at Caltech may make treatment of these wounds easier, more effective, and less expensive. These smart bandages were developed in the lab of Wei Gao, assistant professor of medical engineering, Heritage Medical Research Institute Investigator, and Ronald and JoAnne Willens Scholar.



*A larger version of the smart bandage.
Credit: Lance Hayashida, (Caltech) California Institute of Technology*

Unlike a typical bandage, which might only consist of layers of absorbent material, the smart bandages are made from a flexible and stretchy polymer containing embedded electronics and medication. The electronics allow the sensor to monitor for molecules like uric acid or lactate and conditions like pH level or temperature in the wound that may be indicative of inflammation or bacterial infection. The bandage can respond in one of three ways: First, it can transmit the gathered data from the wound wirelessly to a nearby computer, tablet, or smartphone for review by the patient or a medical professional. Second, it can deliver an antibiotic or other medication stored within the bandage directly to the wound site to treat the inflammation and infection. Third, it can apply a low-level electrical field to the wound to stimulate tissue growth resulting in faster healing.

For more information, visit the following link:

<https://www.caltech.edu/about/news/smart-bandages-monitor-wounds-and-provide-targeted-treatment>

Reference

Velasco, E. (March 24, 2023). "Smart" bandages monitor wounds and provide targeted treatment. Recovered March 27, 2023, California Institute of Technology:



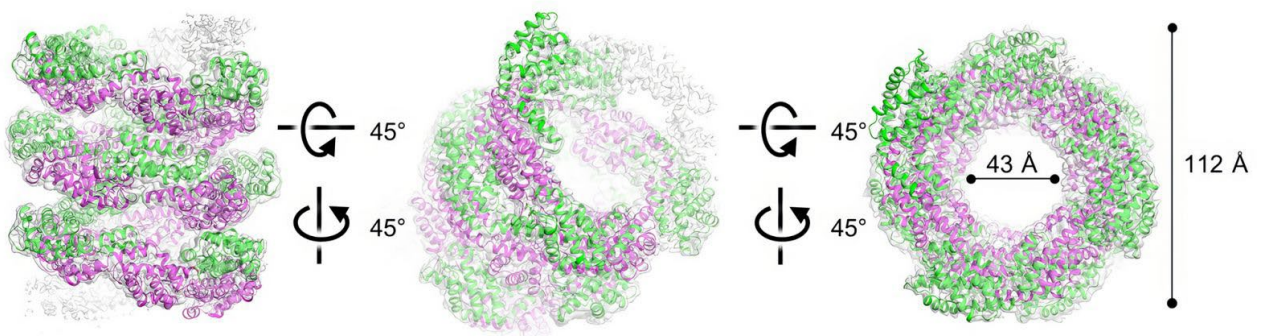
<https://www.caltech.edu/about/news/smart-bandages-monitor-wounds-and-provide-targeted-treatment>

Information source: (California Institute of Technology, 2023)



1.11 Soaking up sunlight with a microscopic molecular device

A Yale-led research team has discovered a molecular “device” found in nature that harvests a particular sliver of the sunlight spectrum in order to convert it into chemical energy. In a study led by Yale’s Gary Brudvig and Christopher Gisriel, and Donald Bryant of Pennsylvania State University, the researchers describe a helix-shaped nanotube structure that forms within photosynthetic organisms called cyanobacteria. The discovery of this structure offers new insights into how nature collects and stores light energy in challenging conditions — something researchers seek to mimic for new solar technology and more resilient crops.



*Three different views of the helical antenna complex. The right panel shows its dimensions.
Credit: C. Gisriel, Yale University*

Researchers have found that in low-light conditions, certain species of cyanobacteria activate a gene cluster that launches the production of proteins known as far-red light phycobiliproteins. These phycobiliproteins assemble themselves into helical nanotubes, distinct from previously discovered, similar proteins that produce cylindrical structures. The cylinder-shaped structures collect photons from the visible light colors in the solar spectrum, such as yellow and orange, whereas the helical nanotubes collect photons from the invisible, far-red portion of the solar spectrum, the researchers say.

For more information, visit the following link:

<https://news.yale.edu/2023/03/24/soaking-sunlight-microscopic-molecular-device>

Reference

Shelton, J. (March 24, 2023). Soaking up sunlight with a microscopic molecular device. Recovered March 27, 2023, Yale University: <https://news.yale.edu/2023/03/24/soaking-sunlight-microscopic-molecular-device>

Information source: (Yale University, 2023)



1.12 New Mining Technology uses CO₂ as tool to access critical minerals

A mining technology pioneered by researchers at The University of Texas at Austin could reduce the amount of energy needed to access critical minerals vital for modern energy technologies and capture greenhouse gases along the way. Transitioning the world's energy to technologies and sources with low-carbon emissions will take, in part, tremendous amounts of lithium, nickel, cobalt and other critical minerals that exist in low concentrations in the Earth's crust. Mining those elements takes much energy and produces waste, which can negatively affect the environment and create significant amounts of greenhouse gas emissions such as carbon dioxide (CO₂).



*Critical minerals like lithium, nickel and cobalt are vital for the energy transition.
Credit: Anton Caputo, The University of Texas at Austin*

This research could turn these emissions into a tool by using CO₂ to weaken the rock containing critical minerals, reducing the amount of energy needed for mining. The ultimate goal is to significantly reduce the emissions produced during mining by storing them safely in the rocks, and potentially even make mining carbon negative – storing more carbon than is produced – by piping in and storing CO₂ emissions from other industrial operations.

For more information, visit the following link:

<https://news.utexas.edu/2023/03/24/new-mining-technology-uses-co2-as-tool-to-access-critical-minerals/>

Reference

Caputo, A. (March 24, 2023). New mining technology uses CO₂ as tool to access critical minerals. Recovered March 27, 2023, The University of Texas at Austin: <https://news.utexas.edu/2023/03/24/new-mining-technology-uses-co2-as-tool-to-access-critical-minerals/>

Information source: (The University of Texas at Austin, 2023)



1.13 Navigating the future: the promise of autonomous boats

A The University of New South Wales (UNSW) maritime law expert says autonomous vessels are on the rise – and with them, potential legal challenges. Maritime Autonomous Vehicles (MAVs) are swiftly becoming a reality. For instance, last year, a private organisation deployed an autonomous ship named the Mayflower for oceanic research purposes. Additionally, a subsidiary of Hyundai successfully executed autonomous navigation to deliver natural gas to South Korea. These events demonstrate the capabilities of autonomous ships, however, increasing MAV use also raises important legal questions and regulatory challenges.



*Maritime Autonomous Vehicles – or MAVs – will transform how we use the oceans.
Credit: Shutterstock, The University of New South Wales, Sydney*

Professor Natalie Klein, an expert in international maritime law at UNSW Law & Justice, is widely recognised for her expertise in maritime autonomous vehicles. As a Future Fellow of the Australian Research Council, she researches the Law of the Sea and international dispute settlement. Prof. Klein says that the increasing use of MAVs will transform how we use the oceans, whether for shipping goods, boosting security, or safeguarding the environment through electric propulsion – a feature unique to MAVs. Electric propulsion produces less noise and pollution and consumes less fuel, reducing emissions while transporting equivalent cargo volumes.

For more information, visit the following link:

<https://newsroom.unsw.edu.au/news/business-law/navigating-future-promise-autonomous-boats>

Reference

Cross, R. (March 24, 2023). Navigating the future: the promise of autonomous boats. Recovered March 27, 2023, University of New South Wales: <https://newsroom.unsw.edu.au/news/business-law/navigating-future-promise-autonomous-boats>



Information source: (The University of New South Wales, Sydney, 2023)



1.14 Researchers develop electrolyte enabling high efficiency of safe, sustainable zinc batteries

Scientists led by an Oregon State University researcher have developed a new electrolyte that raises the efficiency of the zinc metal anode in zinc batteries to nearly 100%, a breakthrough on the way to an alternative to lithium-ion batteries for large-scale energy storage. The research is part of an ongoing global quest for new battery chemistries able to store renewable solar and wind energy on the electric grid for use when the sun isn't shining and the wind isn't blowing.



Credit: Xiulei David Ji, Oregon State University

“The breakthrough represents a significant advancement toward making zinc metal batteries more accessible to consumers,” Ji said. “These batteries are essential for the installation of additional solar and wind farms. In addition, they offer a secure and efficient solution for home energy storage, as well as energy storage modules for communities that are vulnerable to natural disasters.” A battery stores electricity in the form of chemical energy and through reactions converts it to electrical energy. There are many different types of batteries, but most of them work the same basic way and contain the same basic components.

For more information, visit the following link:

<https://today.oregonstate.edu/news/researchers-develop-electrolyte-enabling-high-efficiency-safe-sustainable-zinc-batteries>

Reference

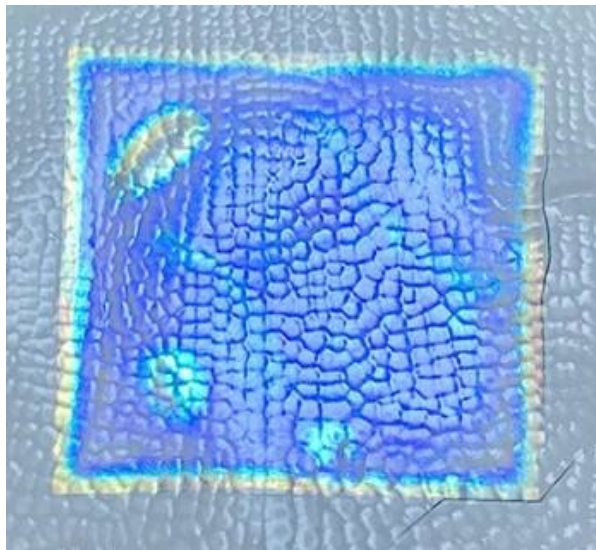
Lundeberg, S. (March 26, 2023). Researchers develop electrolyte enabling high efficiency of safe, sustainable zinc batteries. Recovered March 27, 2023, Oregon State University: <https://today.oregonstate.edu/news/researchers-develop-electrolyte-enabling-high-efficiency-safe-sustainable-zinc-batteries>

Information source: (Oregon State University, 2023)



1.15 Colorful films could help buildings, cars keep their cool

The cold blast of an air conditioner can be a welcome relief as temperatures soar, but air conditioner units require large amounts of energy and can leak potent greenhouse gases. Today, scientists report an eco-friendly alternative — a plant-based film that gets cooler when exposed to sunlight and comes in a variety of textures and bright, iridescent colors. The material could someday keep buildings, cars and other structures cool without requiring external power.



A colorful, textured bi-layer film made from plant-based materials cools down when it's in the sun.

Credit: Qingchen Shen, ACS Chemistry for Life

“To make materials that remain cooler than the air around them during the day, you need something that reflects a lot of solar light and doesn't absorb it, which would transform energy from the light into heat,” says Silvia Vignolini, Ph.D., the project's principal investigator. “There are only a few materials that have this property, and adding color pigments would typically undo their cooling effects,” Vignolini adds.

For more information, visit the following link:

<https://www.acs.org/pressroom/newsreleases/2023/march/colorful-films-could-help-buildings-cars-keep-their-cool.html>

Reference

American Chemical Society (March 26, 2023). Colorful films could help buildings, cars keep their cool. Recovered March 27, 2023, American Chemical Society for life: <https://www.acs.org/pressroom/newsreleases/2023/march/colorful-films-could-help-buildings-cars-keep-their-cool.html>

Information source: (American Chemical Society Chemistry for life, 2023)



1.16 Advanced electrode to help remediation of stubborn new 'forever chemicals'

As new environmental regulations are rolling out to mitigate the industry-retired long-chain chemicals known as perfluoroalkylated substances (PFAS) in drinking water, there are concerns regarding a new breed of “*forever chemicals*” called short-chain PFAS. Research from the University of Illinois Urbana-Champaign is helping shift the focus to include mitigation of the chemicals – which researchers say are just as persistent as, more mobile and harder to remove from the environment than their long-chain counterparts.

A study directed by chemical and biomolecular engineering professor Xiao Su uses electrosorption rather than filters and solvents and combines synthesis, separations testing and computer simulations to help design an electrode that can attract and capture a range of short-chain PFAS from environmental waters. The findings are published in the Journal of the American Chemical Society. The study details the careful selection, matching and triangulating of different copolymer materials to develop an electrode that can attract a range of short-chain PFAS and induce an electric field to help release the molecules when needed.

For more information, visit the following link:
<https://news.illinois.edu/view/6367/874332953>

Reference

Yoksoulia, L. (March 27, 2023). Advanced electrode to help remediation of stubborn new “*forever chemicals*”. Recovered March 27, 2023, University of Illinois Urbana-Champaign: <https://news.illinois.edu/view/6367/874332953>

Information source: (University of Illinois Urbana-Champaign, 2023)



1.17 An international team has found a way to detect distant subatomic particles using water

Research conducted by an international team of scientists including Joshua Klein, the Edmund J. and Louise W. Kahn Term Professor in the School of Arts & Sciences, has resulted in a significant breakthrough in detecting neutrinos. The international collaborative experiment known as Sudbury Neutrino Observation (SNO+), located in a mine in Sudbury, Ontario, roughly 240km (about 149.13 mi) from the nearest nuclear reactor, has detected subatomic particles, known as antineutrinos, using pure water. Klein notes that prior experiments have done this with a liquid scintillator, an oil-like medium that produces a lot of light when charged particles like electrons or protons pass through it.



*A view inside the SNO detector when filled with water.
Credit: SNO+ Collaboration, University of Pennsylvania*

Klein explains that neutrinos and antineutrinos are tiny subatomic particles that are the most abundant particles in the universe and considered fundamental building blocks of matter, but scientists have had difficulty detecting them due to their sparse interactions with other matter and because they cannot be shielded, meaning they can pass through any and everything. But that doesn't mean they're harmful or radioactive: Nearly 100 trillion neutrinos pass through our bodies every second without notice. These properties, however, also make these elusive particles useful for understanding a range of physical phenomena, such as the formation of the universe and the study of distant astronomical objects, and they *"have practical applications as they can be used to monitor nuclear reactors and potentially detect the clandestine nuclear activities,"* Klein says.

For more information, visit the following link:

<https://penntoday.upenn.edu/news/five-things-know-recent-breakthrough-neutrino-detection>

Reference

Magubane, N. (March 27, 2023). Five things to know: Recent breakthrough in neutrino detection. Recovered March 27, 2023, University of Pennsylvania:



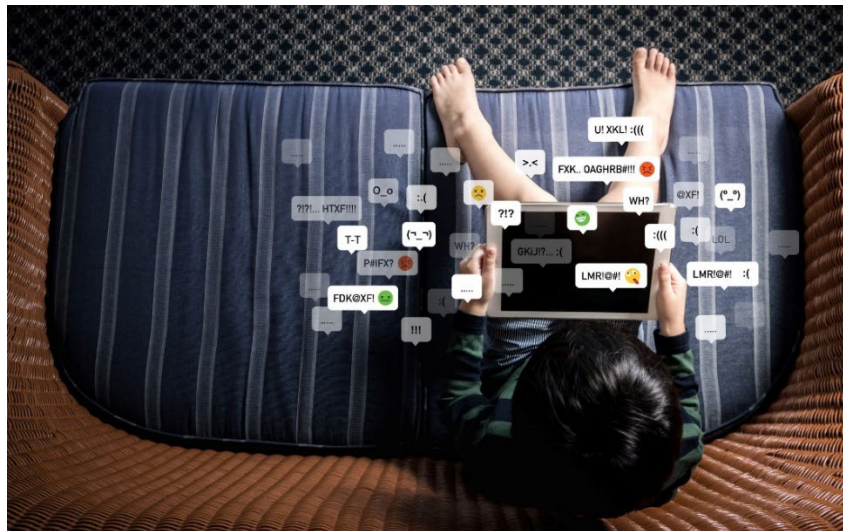
<https://penntoday.upenn.edu/news/five-things-know-recent-breakthrough-neutrino-detection>

Information source: (University of Pennsylvania, 2023)



1.18 Machine Learning to the rescue: Preventing cyberbullying in real time

Machine Learning is a powerful tool within the field of Artificial Intelligence that allows machines to learn and enhance their performance without explicit programming. Specifically, Machine Learning algorithms can be trained to detect patterns within online communication that may indicate cyberbullying behaviour. These algorithms can identify instances of cyberbullying in real time by analysing vast amounts of data gathered from social media platforms, messaging apps, and other online platforms.



Credit: Manjeevan Seera. Monash University

Conventional ways of preventing cyberbullying, such as manually monitoring online platforms, can be inefficient and time-consuming, particularly for major social media sites that have millions of users. In contrast, Machine Learning algorithms enable the recognition and response to cyberbullying incidents in a timely and effective manner. To address this issue, efforts were made to collect tweets in Malay, which were then processed to remove any tweets in related languages, such as Indonesian, that had been mixed in. While this effort began with several thousand tweets, it represents an important starting point for further research.

For more information, visit the following link:

<https://lens.monash.edu/@technology/2023/03/28/1385576/machine-learning-to-the-rescue-preventing-cyberbullying-in-real-time>

Reference

Seera, M. (March 28, 2023). Machine Learning to the rescue: Preventing cyberbullying in real time. Recovered March 28, 2023, Monash University: <https://lens.monash.edu/@technology/2023/03/28/1385576/machine-learning-to-the-rescue-preventing-cyberbullying-in-real-time>

Information source: (Monash University, 2023)



1.19 Pilot plant extracts metals from battery waste using biomass waste

The pilot battery recycling plant has the capacity to process up to 2,000 litres of spent shredded battery mixed with fruit peel derived solvents for extraction of electrode materials such as cobalt, lithium, nickel, and manganese. The scientists from the Nanyang Technological University, Singapore (NTU) Singapore-CEA Alliance for Research in Circular Economy (SCARCE), who developed the technology of using fruit peel waste to tackle battery waste, is also looking at using other types of biomass waste.

Currently, less than 5% of spent lithium-ion batteries are recycled globally and the volume of these spent batteries is projected to reach 11 million tonnes by 2030. Such technology could meet the urgent need for a recycling solution that is environmentally benign and can be easily scaled up, said the scientists from SCARCE. They will also evaluate the plant's technical performance and economic viability with the goal of commercialising the technology.

For more information, visit the following link:

<https://www.ntu.edu.sg/news/detail/pilot-plant-extracts-metals-from-battery-waste-using-biomass-waste>

Reference

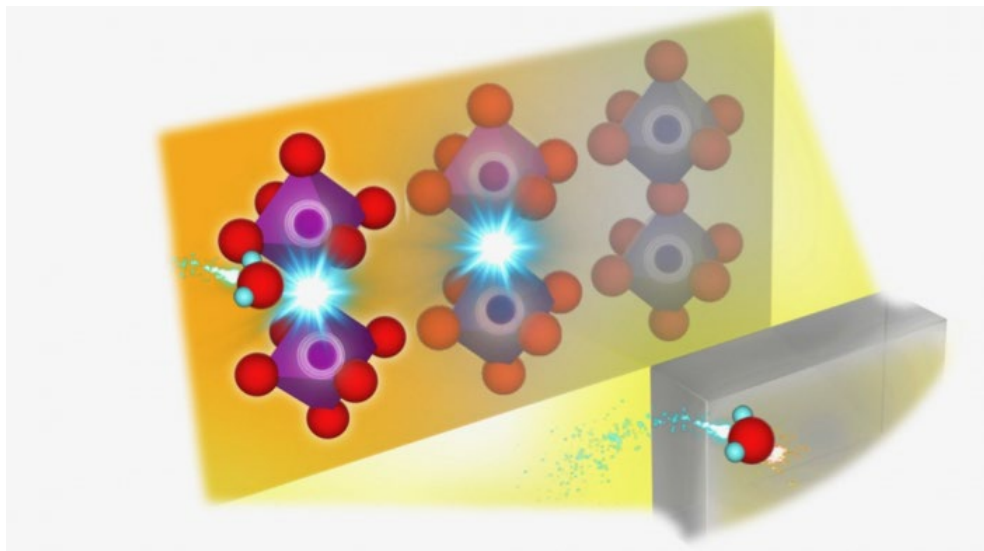
Nanyang Technological University (March 28, 2023). Pilot plant extracts metals from battery waste using biomass waste. Recovered March 28, 2023, Nanyang Technological University: <https://www.ntu.edu.sg/news/detail/pilot-plant-extracts-metals-from-battery-waste-using-biomass-waste>

Information source: (Nanyang Technological University, Singapore, 2023)



1.20 Develop better fuel cells oxide through an integration of computational data

Solid Oxide Fuel Cells (SOFC), are a type of electrochemical device that generates electricity using hydrogen as fuel, with the only 'waste' product being water. Naturally, as we strive to reduce our carbon output and mitigate the casualties of the climate crisis, both business and academia have taken major interest in the development of SOFCs.



Probing where the protons go using synchrotron radiation. A computer rendering of the experiment. Using synchrotron radiation, and simulations via supercomputers and Machine Learning on top of thermogravimetric analysis, researchers were able to observe where protons are introduced in their perovskite based SOFC electrolyte.

Credit: Yamazaki Lab, Kyushu University

In what can potentially accelerate the development of more efficient SOFCs, a research team led by Kyushu University has uncovered the chemical innerworkings of a perovskite-based electrolyte they developed for SOFCs. The team combined synchrotron radiation analysis, large-scale simulations, Machine Learning, and thermogravimetric analysis, to uncover the active site of where hydrogen atoms are introduced within the perovskite lattice in its process to produce energy.

For more information, visit the following link:

<https://www.kyushu-u.ac.jp/en/researches/view/254>

Reference

Yamazaki, Y. (March 28, 2023). Probe where the protons go to develop better fuel cells. Recovered March 28, 2023, Kyushu University: <https://www.kyushu-u.ac.jp/en/researches/view/254>



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**TECHNOLOGY
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N° 13-2023 MARCH 31 TH. 2023



Information source: (Kyushu University, 2023)



2 PATENTS

2.1 Treatment of sleep disturbances in autism spectrum disorder patients

The invention relates generally to the treatment of autism spectrum disorder (ASD) and sleep disturbances and, more particularly, to the treatment of sleep disorders and/or the improvement of daytime functioning in ASD patients using tasimelteon. Sleep disruption in individuals with ASDs has a documented prevalence of up to 80%, higher than in healthy control subjects.

However, difficulty falling asleep and restless/nighttime awakening have repeatedly emerged as primary sleep-related issues for individuals with ASD. One or more such sleep complaints may lead to reduced sleep time with attendant consequences in daytime functioning, including worsening of other ASD symptoms. Most sleep related research in ASD has focused on children, but a growing body of research seems to indicate that sleep in adults with ASD is similarly disrupted. The etiology of sleep disorders in ASD is still an active area of research, but there is evidence suggesting that circadian abnormalities may be a significant source of sleep-related symptoms in ASD. In addition to abnormal levels of melatonin detected in individuals with ASD, mutations in regulatory genes controlling the expression of melatonin receptors MTNR1A and MTNR1B are known. Taken together, these studies suggest that melatonin synthesis and signaling is aberrant in ASD and may be a causal factor in producing sleep-related symptoms.

For more information, visit the following link:

https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2023044319&_cid=P12-LFSIE5-26361-1

Reference

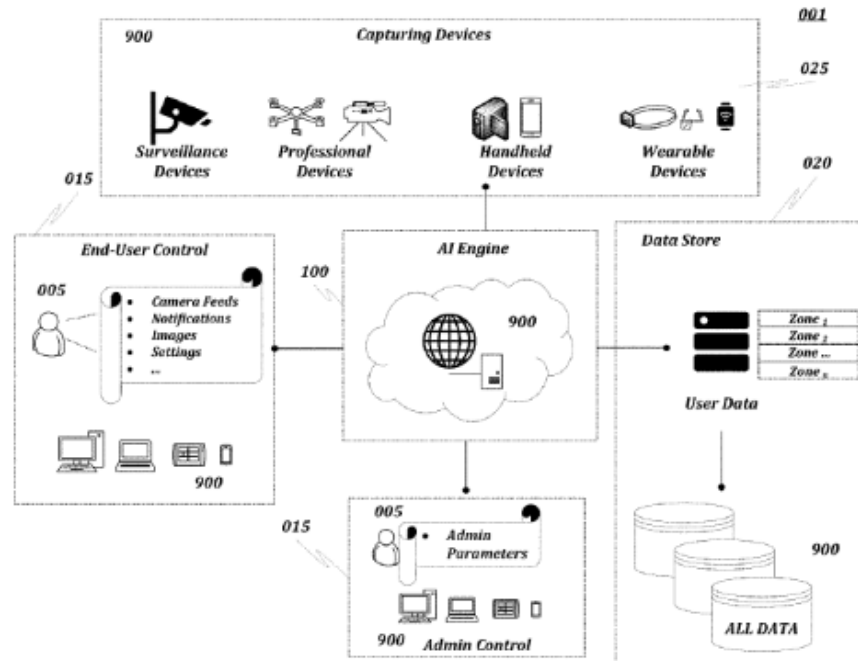
POLYMEROPOULOS, M.; POLYMEROPOULOS, C. & Smieszek, S. (March 23, 2023). Means and treatment of sleep disturbances in autism spectrum disorder patients. Recovered March 23, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2023044319&_cid=P12-LFSIE5-26361-1

Information source: (WIPO IP Portal, 2023)



2.2 Intelligent recognition and alert methods and systems

The present disclosure provides a method for target identification and scoring, the method comprising:



Illustrates a block diagram of an operating environment consistent with some embodiments of the present disclosure.

Credit: Johnathan Samples, WIPO IP Portal

Detecting an object within one or more frames of a content stream; deriving one or more images of the object from the content stream; normalizing the one or more images; processing the normalized one or more images to determine a species of the object; identifying an Artificial Intelligence (AI) module corresponding to the species of the object; virtually regenerating the object based on the following: the species of the object, the normalized one or more images, and one or more of the following: physical orientation of the object, time of object detection, and illumination of the object; providing the regenerated object to the AI module configured to perform object recognition; receiving an identification of the object from the AI module; and updating an object profile with object identification data.

For more information, visit the following link:

https://patentscope.wipo.int/search/en/detail.jsf?docId=US394063626&_cid=P10-LFSDC4-23982-1

Reference

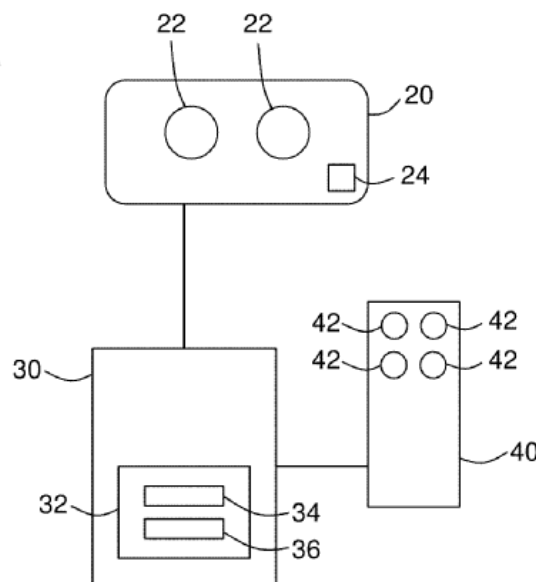
Samples, J. (March 23, 2023). Intelligent recognition and alert methods and systems. Recovered el March 23, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/en/detail.jsf?docId=US394063626&_cid=P10

Information source: (WIPO IP Portal, 2023)



2.3 Virtual Reality system and method

A method comprises displaying in virtual reality a computer-generated scene; obtaining a movement command from a real-world physical movement of a user, the movement command corresponding to a movement of a virtual body; and adjusting the movement of the virtual body in dependence on an effect of gravity in the computer-generated scene and/or in dependence on the presence of at least one object within the computer-generated scene that inhibits the movement of the virtual body, wherein the adjusting of the movement is such that the adjusted movement of the virtual body does not correspond with the real-world physical movement of the user.



*Is a schematic illustration of an apparatus in accordance with an embodiment.
Credit: Leslie Peter Benzies, WIPO IP Portal*

In a first aspect of the invention, there is provided a method comprising displaying in virtual reality a computer-generated scene representative of a structure; receiving a user input representative of a variation of a time or weather parameter; and updating the computer-generated scene in dependence on the variation of the time or weather parameter, thereby enabling the user to vary on command an appearance of at least part of the structure in the computer-generated scene to represent a change in time and/or weather conditions.

For more information, visit the following link:

https://patentscope.wipo.int/search/en/detail.jsf?docId=US394063809&_cid=P10-LFSDHW-27035-1

Reference

Peter, L. (March 23, 2023). Virtual Reality system and method. Recovered March 23, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/en/detail.jsf?docId=US394063809&_cid=P10-LFSDHW-27035-1

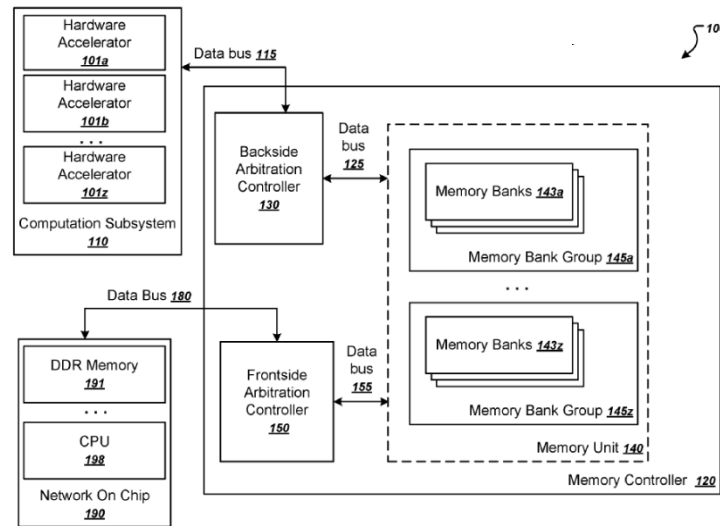


Information source: (WIPO IP Portal, 2023)



2.4 Systems and methods for programmatic quality control

Methods, systems, and apparatus, including computer programs encoded on computer storage media, for controlling, by an on-chip memory controller, a plurality of hardware components that are configured to perform computations to access a shared memory.



Illustrates an example memory controller system including an example memory controller and multiple external hardware components.

Credit: Zheng Qi, Yi Wang and Yanfeng Wang, WIPO IP Portal

One of the on-chip memory controller includes at least one backside arbitration controller communicatively coupled with a memory bank group and a first hardware component, wherein the at least one backside arbitration controller is configured to perform bus arbitrations to determine whether the first hardware component can access the memory bank group using a first memory access protocol; and a frontside arbitration controller communicatively coupled with the memory bank group and a second hardware component, wherein the frontside arbitration controller is configured to perform bus arbitrations to determine whether the second hardware component can access the memory bank group using a second memory access protocol different from the first memory access protocol.

For more information, visit the following link:

https://patentscope.wipo.int/search/en/detail.jsf?docId=US394064238&_cid=P10-LFSDMG-29348-2

Reference

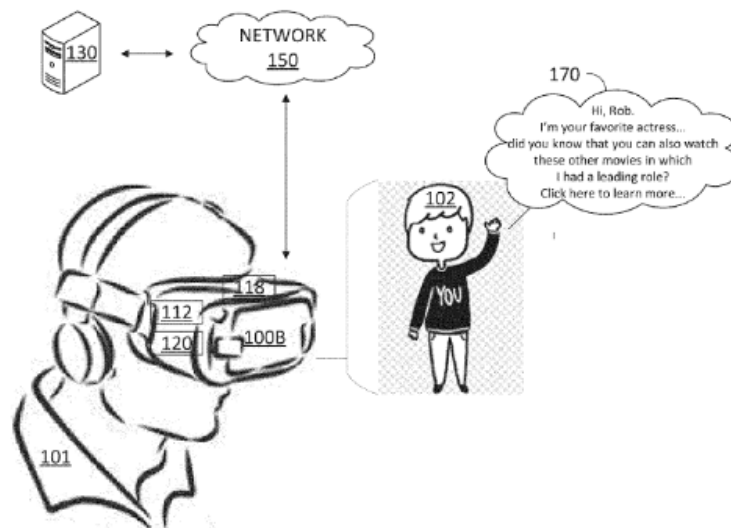
Qi, Z.; Wang, Y... & Wang, Y. (March 23, 2023). High-performance on-chip memory controller. Recovered March 23, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/en/detail.jsf?docId=US394064238&_cid=P10-LFSDMG-29348-2

Information source: (WIPO IP Portal, 2023)



2.5 Actuators, accessories and avatars for enhanced reality devices

A method for aiding users of enhanced reality headsets is provided. The method includes providing a multimedia content to a user of an enhanced reality device, adjusting a visual portion of the multimedia content for a user, based on a first user selection, adjusting an audio portion of the multimedia content for the user, and receiving a gesture input from the user in response to a query in the visual portion or the audio portion of the multimedia content.



*Illustrate users of an enhanced reality device, according to some embodiments.
Credit: Herman Wiegman, WIPO IP Portal*

A method, for including character avatars in enhanced reality applications is also provided. The method includes determining a degree of interest of a user on a character in online content, generating a virtual interaction event between the user and an avatar for the character in online content, and providing to the user, via the enhanced reality device, the virtual interaction event with the avatar for the character in the online content.

For more information, visit the following link:

https://patentscope.wipo.int/search/en/detail.jsf?docId=US394067881&_cid=P10-LFSDPY-30855-3

Reference

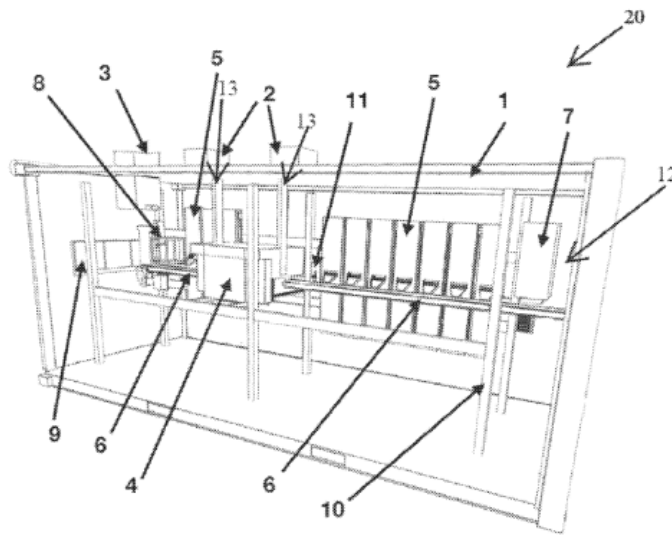
Dia, A.; Sharon, N.; Tuyet, M.; Induchoodan, A. & Kothari, S. (March 23, 2023). Actuators, accessories and avatars for enhanced reality devices. Recovered March 23, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/en/detail.jsf?docId=US394067881&_cid=P10

Information source: (WIPO IP Portal, 2023)



2.6 Autonomous food preparation and meal production machine

A configuration for an autonomous food preparation and meal production machine receives a menu order. A computer system of the machine retrieves from a database an automated recipe for fulfilment of the menu order and determines an availability of a threshold of ingredients to fulfill the menu order. The computer system transmits preparation instructions to fulfill the menu order to stations having controllers in a production line.



Is a side perspective, partial view of an example embodiment of autonomous food preparation and meal production machine.

Credit: A. Gruebele, M. Perham, Y. Kolchinski and T. Nilsson, WIPO IP Portal

The production line de-nests a vessel and moves it along a production line. The production line, in response to the controllers receiving the preparation instructions, automatically dispenses ingredients of the menu order into the vessel from dispensers, steams and heats the ingredients and places the vessel with the fulfilled menu order into a locker. The computer system transmits to a device a signal corresponding to the fulfillment of the menu order.

For more information, visit the following link:

https://patentscope.wipo.int/search/en/detail.jsf?docId=US394064252&_cid=P10-LFSDRP-31673-2

Reference

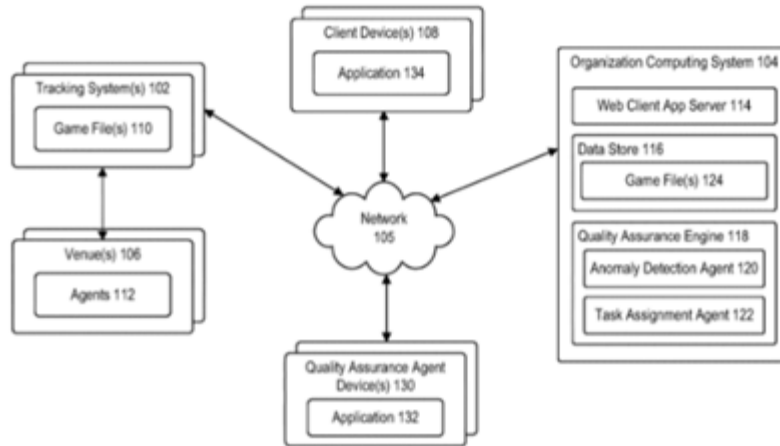
Makris, A.; Emerald, M.; Alexandrovich, Y... & Gustav, T. (March 23, 2023). Autonomous food preparation and meal production machine. Recovered March 23, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/en/detail.jsf?docId=US394064252&_cid=P10

Information source: (WIPO IP Portal, 2023)



2.7 Artificial Intelligence assisted live sports data quality assurance

A computing system receives live event data corresponding to a live game. The live event data includes events occurring within the live game.



*Is a block diagram illustrating a computing environment, according to example embodiments.
Credit: Abdelmalek F.; Ales M.; Ferk K.; Glojnaric F., Ruiz H., Marko C.; Bas C.; Bridi C. and Iobashvili D., WIPO IP Portal*

The computing system analyzes the live event data to identify a potential error in the live event data. The computing system generates a ticket corresponding to the potential error flagged in the live event data. The computing system assigns the ticket to a first quality assurance agent to resolve. The computing system receives an indication that the ticket has been reviewed by the first quality assurance agent. The computing system provides the reviewed event data to an end user.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/085572252/publication/US2023088484A1?q=ARTIFICIAL%20INTELLIGENCE>

Reference

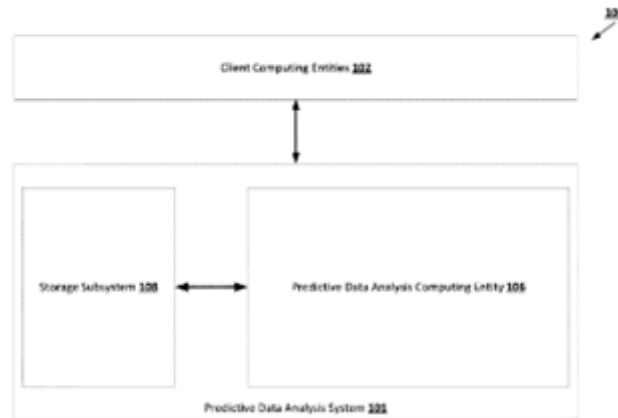
Abdelmalek, F.; Ales, M.; Ferk, K.; Glojnaric, F.; Ruiz, H.; Marko, C.; Bas, C.; Bridi, C. & Iobashvili, D. (March 23, 2023). Artificial Intelligence assisted live sports data quality assurance. Recovered March 23, 2023, Espacenet Patent Search: <https://worldwide.espacenet.com/patent/search/family/085572252/publication/US2023088484A1?q=ARTIFICIAL%20INTELLIGENCE>

Information source: (Espacenet Patent Search, 2023)



2.8 Machine Learning techniques for generating historically dynamic explanation data objects

Various embodiments of the present invention provide methods, apparatus, systems, computing devices, computing entities, and/or the like for generating a historically dynamic explanation data object for a dental image data object.



Provides an exemplary overview of an architecture that can be used to practice embodiments of the present invention.

Credit: Buckley G.; Monaghan D.; Schultz J. and Maity A., Espacenet Patent Search

Certain embodiments of the present invention utilize systems, methods, and computer program products that perform generating a historically dynamic explanation data object for a dental image data object using an encoder-decoder architecture, where the encoder Machine Learning framework of the encoder-decoder architecture comprises a current diagnosis identification Machine Learning model, a historical diagnosis identification Machine Learning model, a convolutional embedding Machine Learning model, a new diagnosis code inference Machine Learning model, and a feature vector combination Machine Learning model.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/085571499/publication/US2023090591A1?q=machine%20learning>

Reference

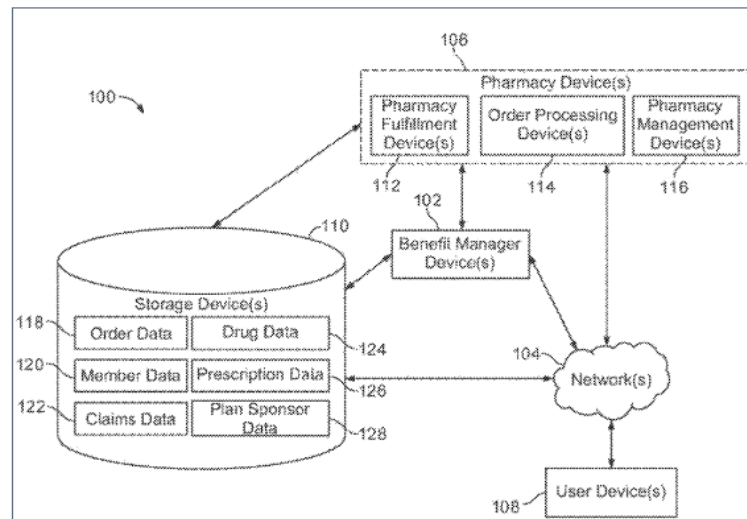
Buckley, G.; Monaghan, D.; Schultz, J.; Maity, A. (March 23, 2023). Machine Learning techniques for generating historically dynamic explanation data objects. Recovered March 23, 2023, Espacenet Patent Search: <https://worldwide.espacenet.com/patent/search/family/085571499/publication/US2023090591A1?q=machine%20learning>

Information source: (Espacenet Patent Search, 2023)



2.9 Systems and methods for patient record matching

An Artificial Intelligence (AI) record matching system may obtain patient records having different first names, compare demographic information in the records, determine whether the demographic information is linked with a common household, and identify nicknames by comparing the patient records using a first model.



*Is a functional block diagram of an example system including a high-volume pharmacy.
Credit: Sragow H.; Kreitzman E.; Russo S. and Ahmad M., Espacenet Patent Search*

The first model may include mathematical relationships that represent different relationships among a first number of instances where the patient records have the first names that do not match, a second number of instances where the patient records having the first names that do not match but share a demographic marker, a threshold proportion of households for determining that the first names are the nicknames of each other, and a required volume of the households.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/085572244/publication/US2023088474A1?q=ARTIFICIAL%20INTELLIGENCE>

Reference

Sragow, H.; Kreitzman, E.; Russo, S. & Ahmad, M. (March 23, 2023). Systems and methods for patient record matching. Recovered March 24, 2023, Espacenet Patent Search: <https://worldwide.espacenet.com/patent/search/family/085572244/publication/US2023088474A1?q=ARTIFICIAL%20INTELLIGENCE>

Information source: (Espacenet Patent Search, 2023)



2.10 Systems and methods for authoring and managing Extended Reality (XR) avatars

Systems and methods for digital avatars, specifically for fashion and consumer goods, are provided. This system is useful with an identified avatar, environment, and objects that a user may author, edit, and place. A user may deploy an avatar that resembles themselves via augmented reality, virtual reality, and other types of media. These systems include a user interface, administrative interface, economic systems and means of managing assets and protecting users' data.



Illustrate an evolution of the design of blue jeans.

Credit: Meadows M.; Le M.; Taylor M.; Kronholm C.; Polidor E.; Magalhaes T.; Ardolic I. and Jahn J., Espacenet Patent Search

The systems incorporate mechanisms of controlling the avatar, means of integrating physical sensor data that interoperates with the virtual, and means of predicting related trends, choices, and behavior. Various features are employed for increased efficiency, accuracy, and believability. These features include Machine Learning to produce avatar features, AR map directions to interact with avatars, computer vision to enable the real-time translation of physical to virtual and social structures to enable groups of people to create and license digital assets.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/085572535/publication/US2023090253A1?q=BLOCKCHAIN>

Reference

Meadows, M.; Le John, M.; Taylor, M.; Kronholm, C.; Polidor, E.; Magalhaes, T.; Ardolic, I. & Jahn, J. (March 23, 2023). Systems and methods for authoring and managing Extended Reality (XR) avatars. Recovered March 24, 2023, Espacenet Patent Search: <https://worldwide.espacenet.com/patent/search/family/085572535/publication/US2023090253A1?q=BLOCKCHAIN>

Information source: (Espacenet Patent Search, 2023)