Weekly Newsletter
TECHNOLOGY SURVEILLANCE

Nº 19-2023   MAY 12TH, 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   New source of clean from lead batteries and green hydrogen

Loughborough University and the Consortium for Battery Innovation along with eight global consortium members are working together to pair advanced lead batteries with green hydrogen to deliver a new source of clean, reliable, and sustainable energy storage for off-grid communities in Africa.

Credit: Loughborough University

Awarded through Horizon Europe, this collaborative, four-year project called LoCEL-H2, (or 'Low-cost, circular, plug and play, off-grid energy for remote locations - including hydrogen), combines the expertise of lead battery manufacturers, academics, national laboratories, component manufacturers, and companies who are focused on integration, microgrids and renewables. LoCEL-H2 aims to generate renewable energy, storage, and fuel for deployment in isolated and remote regions of Africa to support communities that cannot connect to an electricity grid. The project will also develop a battery-powered microgrid and this will be used in combination with Loughborough's battolyser to allow communities to access and store renewable energy.

For more information, visit the following link:
https://www.lboro.ac.uk/news-events/news/2023/may/locel-h2-project/

Reference
Ursache, M. (May 04, 2023). New project to help solve energy poverty for isolated communities in Africa through cooking fuel solution. Recovered May 05, 2023, Loughborough University: https://www.lboro.ac.uk/news-events/news/2023/may/locel-h2-project/

Information source: (Loughborough University, 2023)

1.2   Tool for accurately simulating complex systems

The system they developed eliminates a source of bias in simulations, leading to improved algorithms that can boost the performance of applications.
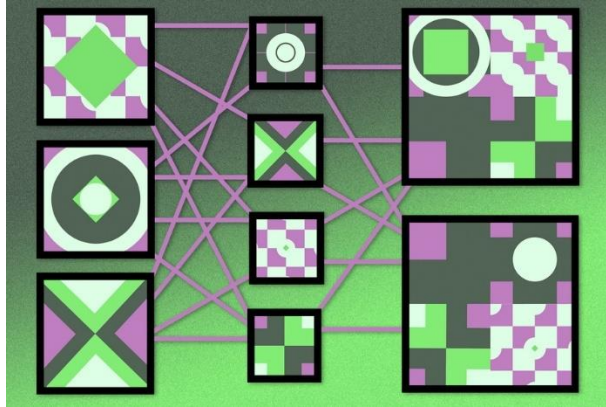
A new technique eliminates a source of bias in a popular simulation method, which could enable scientists to create new algorithms that are more accurate and boost the performance of applications and networks.
Credit: Jose-Luis Olivares, Massachusetts Institute of Technology

Massachusetts Institute of Technology (MIT) researchers have developed a new method that eliminates this source of bias in trace-driven simulation. By enabling unbiased trace-driven simulations, the new technique could help researchers design better algorithms for a variety of applications, including improving video quality on the internet and increasing the performance of data processing systems. The researcher's Machine Learning algorithm draws on the principles of causality to learn how the data traces were affected by the behavior of the system. In this way, they can replay the correct, unbiased version of the trace during the simulation.

For more information, visit the following link:
https://news.mit.edu/2023/researchers-create-tool-accurately-simulating-complex-systems-0504

Reference
Zewe, A. (May 04, 2023). Researchers create a tool for accurately simulating complex systems. Recovered May 05, 2023, Massachusetts Institute of Technology: https://news.mit.edu/2023/researchers-create-tool-accurately-simulating-complex-systems-0504

Information source: (Massachusetts Institute of Technology, 2023)

1.3   Language learning app uses Artificial Intelligence

Quazel, a spin-off from Eidgenössische Technische Hochschule Zürich (ETH Zurich), has launched a language learning app that uses Artificial Intelligence (AI) to engage users in conversations. The AI tutor adapts to the users' language skills and corrects their mistakes. Recently, however, the rapid development of large language models such as ChatGTP has, for the first time, made it possible to have fluid, natural-sounding conversations with an Artificial Intelligence (IA).
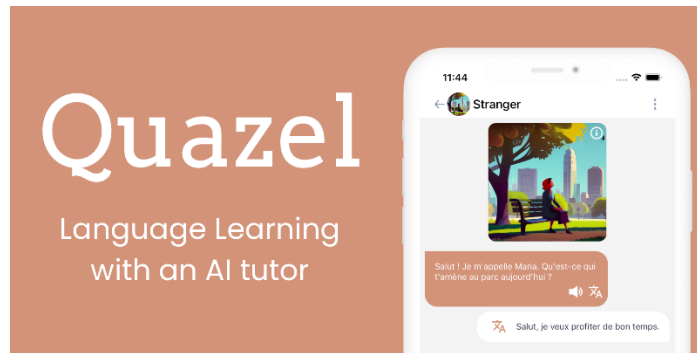
With the Quazel app, learners can speak to an AI tutor in 21 languages. If they make a mistake, the app corrects them in real-time.
Credit: Quazel, Eidgenössische Technische Hochschule Zürich

These technological advances have also been harnessed by the Quazel app: *"Learners can discuss almost anything they like with their AI tutor – from ordering at restaurants and chatting about their favourite sport to debating philosophical issues. And if they make a grammatical mistake or use the wrong word, the app corrects them in real-time,"* Hadjimina says. Conversations generally begin with the chatbot asking a question to which the learner provides a spoken response. Especially for beginners, conversations are then primarily driven by these prompts from the chatbot. As the conversation continues, however, the AI automatically adapts the complexity of its answers to the learner's level.

For more information, visit the following link:
https://ethz.ch/en/news-and-events/eth-news/news/2023/05/learn-a-language-by-chatting-with-an-ai-tutor.html

Reference
Elhardt, C. (May 04, 2023). Learn a language by chatting with an AI tutor. Recovered May 05, 2023, Eidgenössische Technische Hochschule Zürich: https://ethz.ch/en/news-and-events/eth-news/news/2023/05/learn-a-language-by-chatting-with-an-ai-tutor.html

Information source: (Eidgenössische Technische Hochschule Zürich, 2023)

1.4   New technology applicable to the production of solar panels

Scientists from a Chinese solar technology company have developed a new type of solar cell that could be a game-changer in the world's transition towards renewable energy. Advanced modelling, performed by researchers at TU Delft, played a pivotal role deep understanding and engineering of the innovation. The new solar cell is made of the same material as 95% of all current solar cells but performs much better at 26.81% efficiency. The innovation further cements the crucial role of solar cells in the energy transition.

The team optimized the design of the solar cell by using a much improved *"nanocrystalline-silicon hole contact layer."* Such a new layer has been known as a theoretical possibility for quite some time, but it was never successfully put into practice. The new layer can transfer electricity with far less resistance and results in a higher power conversion efficiency than any other type of solar cell made from crystalline silicon. Researchers at LONGi developed this new technology on standard, industry-grade silicon wafers, making the technology almost immediately applicable in the production of solar panels. The improved performance of a cell is significant when compared to previous technologies, demonstrating an absolute leap forward in conversion efficiency of 1.5%.

For more information, visit the following link:
https://www.tudelft.nl/en/2023/tu-delft/a-breakthrough-that-makes-solar-panels-better-than-ever

Reference
Delft University of Technology (May 04, 2023). A breakthrough that makes solar panels better than ever. Recovered May 05, 2023, Delft University of Technology: https://www.tudelft.nl/en/2023/tu-delft/a-breakthrough-that-makes-solar-panels-better-than-ever

Information source: (Delft University of Technology, 2023)

1.5   Additive to efficiently improve stability of perovskite solar cells

Research team from City University of Hong Kong (CityU) made a breakthrough by developing an innovative multifunctional and non-volatile additive which can improve the efficiency and stability of perovskite solar cells by modulating perovskite film growth. This simple and effective strategy has great potential for facilitating the commercialization of Perovskite solar cells (PVSCs).
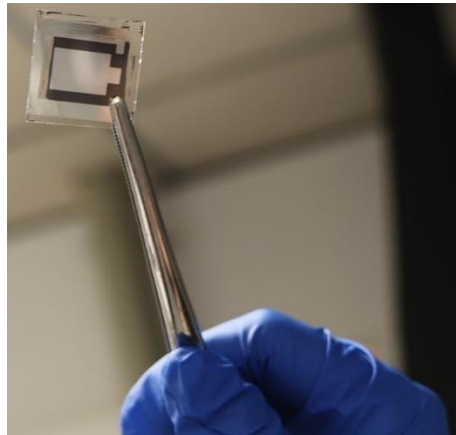
*1 cm2 perovskite solar cell with additive.
Credit: City University of Hong Kong*

"This type of multifunctional additive can be generally used to make different perovskite compositions for fabricating highly efficient and stable perovskite solar cells. The high-quality perovskite films will enable the upscaling of large-area solar panels," explained Professor Alex Jen Kwan-yue, Lee Shau Kee Chair Professor of Materials Science and Director of the Hong Kong Institute for Clean Energy at CityU, who led the study. This molecule can also serve as an effective defect passivation linker (a method to reduce the defect density of perovskite film) in the annealed perovskite film due to its non-volatility, resulting in significantly reduced non-radiative recombination loss and improved film quality.

For more information, visit the following link:
https://www.cityu.edu.hk/research/stories/2023/05/04/cityu-researchers-develop-additive-efficiently-improve-efficiency-and-stability-perovskite-solar-cells

Reference
City University of Hong Kong. (May 04, 2023). CityU researchers develop an additive to efficiently improve the efficiency and stability of perovskite solar cells. Recovered May 05, 2023, City University of Hong Kong: https://www.cityu.edu.hk/research/stories/2023/05/04/cityu-researchers-develop-additive-efficiently-improve-efficiency-and-stability-perovskite-solar-cells

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

1.6   Study of the anomalous Hall effect in antiferromagnetic planes

Professor Yao Yugui's team from the School of Physics at Beijing Institute of Technology proposed the In-Plane Anomalous Hall Effect (IPAHE) induced by in-plane magnetic fields in an antiferromagnetic system with PT symmetry (spatiotemporal inversion joint symmetry). This research achievement strictly demonstrates the minimum symmetry requirements for achieving IPAHE in PT symmetric antiferromagnetic systems, lists in detail all magnetic point groups that meet the conditions, and provides an effective method for searching and designing antiferromagnetic materials with IPAHE, which will promote their application in low-power spintronics.
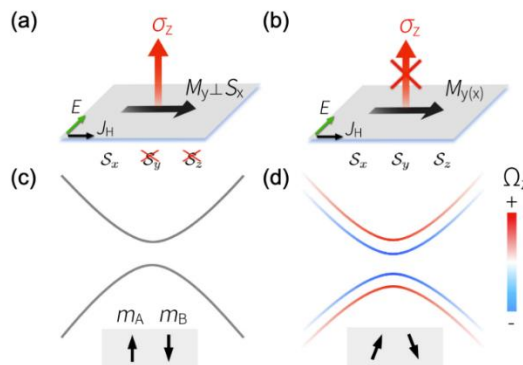
Schematic diagram of in-plane anomalous Hall effect in a PT symmetric antiferromagnetic system.
Credit: Zhao, L., Beijing Institute of Technology

Abnormal Hall effect, one of the most basic transport phenomena in magnetic materials, is not only the physical prototype of many low-power quantum effects, but also an important cornerstone of topological quantum states. Professor Yao Yugui has been dedicated to the study of this effect for twenty years and has made pioneering work in this field, such as being the first to develop a first-principles calculation method for the anomalous Hall effect; Quantitatively studied the intrinsic mechanism based on Berry curvature in the anomalous Hall effect, corrected the common view that *"external mechanisms dominate, intrinsic mechanisms are not important,"* overturned traditional understanding and confirmed by independent experiments.

For more information, visit the following link:
https://english.bit.edu.cn/news2020/focus/058671a9d31248bf880daa10b3e5f059.htm

Reference
Lin, Z. (May 04, 2023). The Beijing Institute of Technology team has made significant progress in the study of the anomalous Hall effect in antiferromagnetic planes. Recovered May 05, 2023, Beijing Institute of Technology: https://english.bit.edu.cn/news2020/focus/058671a9d31248bf880daa10b3e5f059.htm

Information source: (Beijing Institute of Technology, 2023)

1.7   Hydrogen-enhanced dislocation motion in alpha-iron

A compelling experimental evidence of hydrogen-enhanced screw dislocation motion in alpha-iron was found through quantitative in-situ Environmental transmission electron microscope (ETEM) tests. the researchers designed a fully quantitative in situ ETEM mechanical testing protocol, as illustrated in Figure, that enables the observation and comparison of bow-out motion of the same dislocation segments under a vacuum and in a hydrogen-containing environment.
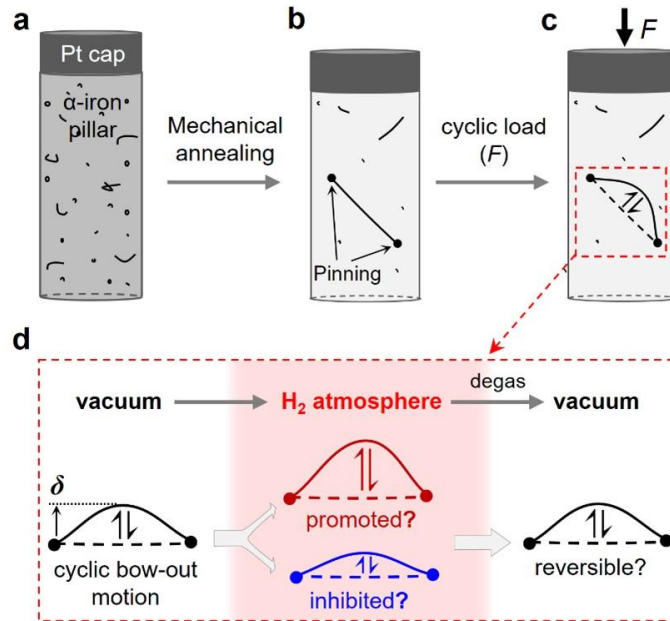
Schematic of the experimental set-up for revealing the effect of hydrogen on the dislocation motion.
Credit: Chen, Y., Shanghai Jiao Tong University

In a hydrogen-based economy, the use of steels, which consist mainly of iron and often serve vital roles in power plants, vehicles, buildings or critical infrastructures, is at risk owing to hydrogen embrittlement—a sudden and often catastrophic deterioration of the material's load-bearing capacity. Although multiple hydrogen embrittlement mechanisms have been proposed, a consensus has yet to be reached on the effects of these embrittlement modes. Also, direct experimental proof of the influence of hydrogen at the single dislocation level is missing.

For more information, visit the following link:
https://en.sjtu.edu.cn/news/3794

Reference
Jiang, Q. & Fu, Y. (May 04, 2023). Quantitative tests revealing hydrogen-enhanced dislocation motion in alpha-iron. Recovered May 05, 2023, Shanghai Jiao Tong University: https://en.sjtu.edu.cn/news/3794

Information source: (Shanghai Jiao Tong University, 2023)

1.8   Artificial neurons mimic complex brain abilities for Artificial Intelligence computing

Researchers have created atomically thin artificial neurons capable of processing both light and electric signals for computing. The material enables the simultaneous existence of separate feedforward and feedback paths within a neural network, boosting the ability to solve complex problems. A team of researchers at the University of Oxford, IBM Research Europe, and the University of Texas, have announced an important feat: the development of atomically thin artificial neurons created by stacking two-dimensional (2D) materials.

In the study, the researchers expanded the functionality of the electronic memristors by making them responsive to optical as well as electrical signals. This enabled the simultaneous existence of separate feedforward and feedback paths within the network. The advancement allowed the team to create winner-take-all neural networks: computational learning programs with the potential for solving complex problems in Machine Learning, such as unsupervised learning in clustering and combinatorial optimization problems. 2D materials are made up of just a few layers of atoms, and this fine scale gives them various exotic properties, which can be fine-tuned depending on how the materials are layered. In this study, the researchers used a stack of three 2D materials - graphene, molybdenum disulfide and tungsten disulfide- to create a device that shows a change in its conductance depending on the power and duration of light/electricity that is shone on it.

For more information, visit the following link:
https://www.ox.ac.uk/news/2023-05-05-artificial-neurons-mimic-complex-brain-abilities-next-generation-ai-computing

Reference
University of Oxford. (May 04, 2023). Artificial neurons mimic complex brain abilities for next-generation AI computing. Recovered May 05, 2023, University of Oxford: https://www.ox.ac.uk/news/2023-05-05-artificial-neurons-mimic-complex-brain-abilities-next-generation-ai-computing

Information source: (University of Oxford, 2023)

1.9   Smart surgical implant warns and preventing infection

Newly developed *"smart"* coatings for surgical orthopedic implants can monitor strain on the devices to provide early warning of implant failures while killing infection-causing bacteria, University of Illinois Urbana-Champaign researchers report. The coatings integrate flexible sensors with a nanostructured antibacterial surface inspired by the wings of dragonflies and cicadas. A multidisciplinary team of researchers found the coatings prevented infection in live mice and mapped strain in commercial implants applied to sheep spines to warn of various implant or healing failures.
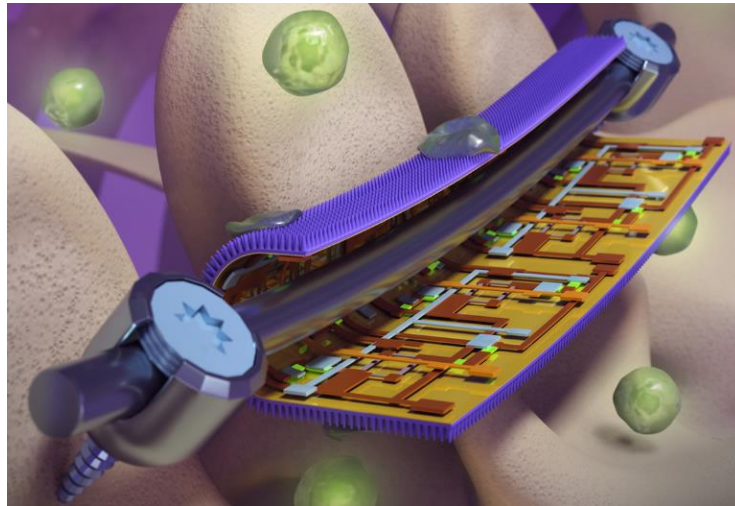
Credit: Beckman Imaging Technology Group, University of Illinois

"This is a combination of bio-inspired nanomaterial design with flexible electronics to battle a complicated, long-term biomedical problem," said study leader Qing Cao, a U. of I. professor of materials science and engineering. Taking inspiration from the naturally antibacterial wings of cicadas and dragonflies, the Illinois team created a thin foil patterned with nanoscale pillars like those found on the insects' wings. When a bacterial cell attempts to bind to the foil, the pillars puncture the cell wall, killing it.

For more information, visit the following link:
https://news.illinois.edu/view/6367/1302743207

Reference
Ahlberg, L. (May 05, 2023). Smart surgical implant coatings provide early failure warning while preventing infection. Recovered May 05, 2023, University of Illinois Urbana-Champaign: https://news.illinois.edu/view/6367/1302743207

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

1.10   New inspection drone uses wind to lengthen flight times

Elythor, an École Polytechnique Fédérale de Lausanne (EPFL) spin-off, has developed a new drone whose wing shape can adapt to wind conditions and flight position in real time, reducing the drone's energy consumption. What is more, the position of the wings can change, allowing the drone to fly vertically or horizontally. These features make it a perfect candidate for inspecting power plants.

Credit: Carron, C., École Polytechnique Fédérale de Lausanne

The new inspection drone developed by Elythor. Part winged drone, part quadcopter, Morpho is a hybrid unmanned aerial vehicle (UAV) that can change shape according to the task at hand. Its adaptive wings extend the drone's flight time and give it greater maneuverability. Combined with embedded sensors and cameras, these features let it fly just as well in enclosed spaces as in the open air, making it ideal for inspecting power plants and other infrastructure like high-voltage power lines, wind turbines, gas pipelines and offshore oil platforms. The system includes sensors linked to a software program for monitoring wind direction and speed.

For more information, visit the following link:
https://actu.epfl.ch/news/new-inspection-drone-uses-wind-to-lengthen-flight-/

Reference
Carron, C. (May 04, 2023). New inspection drone uses wind to lengthen flight times. Recovered May 05, 2023, École Polytechnique Fédérale de Lausanne: https://actu.epfl.ch/news/new-inspection-drone-uses-wind-to-lengthen-flight-/

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

1.11   New material could enable more efficient magnet-based computer memory

Engineers have found a metallic compound that could bring more efficient forms of computer memory closer to commercialization, reducing computing's carbon footprint, enabling faster processing, and allowing Artificial Intelligence (AI) training to happen on individual devices instead of remote servers.
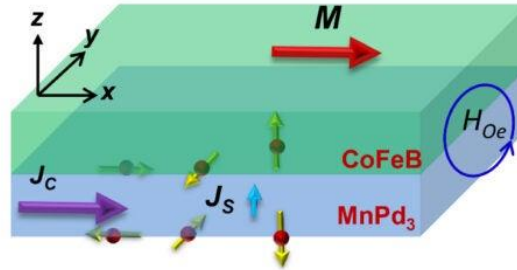
Unconventional z-spin polarization in MnPd3 material.
Credit: The Wang Group, Stanford University

Wang and his colleagues recently found a material that could bring a new type of memory closer to commercialization. The researchers demonstrated that a thin layer of a metallic compound called manganese palladium three had the necessary properties to facilitate a form of working memory that stores data in electron spin directions. This method of memory storage, known as spin orbit torque magneto resistive random access memory or SOT-MRAM, has the potential to store data more quickly and efficiently than current methods, which store data using electric charge and require a continuous power input to maintain that data.

For more information, visit the following link:
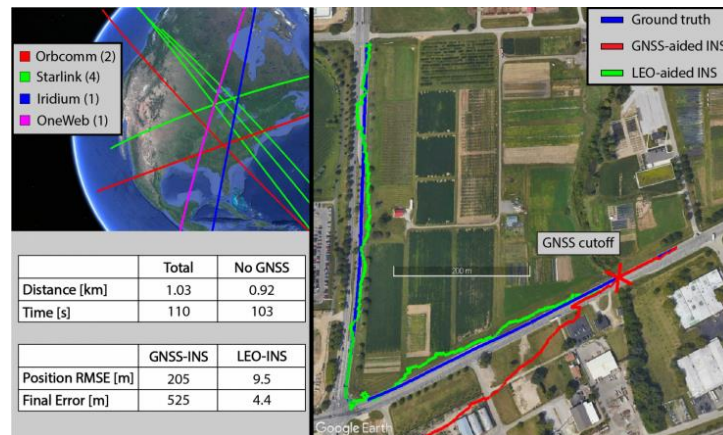https://news.stanford.edu/2023/05/05/new-material-opens-door-energy-efficient-computing/

Reference
Wu, J. (May 04, 2023). A new material could enable more efficient magnet-based computer memory. Recovered May 08, 2023, Stanford University: https://news.stanford.edu/2023/05/05/new-material-opens-door-energy-efficient-computing/

Information source: (Stanford University, 2023)

1.12   Algorithm make satellite signals act like GPS

Researchers have developed an algorithm that can *"eavesdrop"* on any signal from a satellite and use it to locate any point on Earth, much like GPS. The study represents the first time an algorithm was able to exploit signals broadcast by multi-constellation low Earth orbit satellite (LEO) satellites, namely Starlink, OneWeb, Orbcomm and Iridium. Researchers found that by listening to the signals of eight LEO satellites for about 10 minutes, their algorithm could achieve unprecedented accuracy in locating a stationary receiver on the ground and was able to converge on it with an error of only about 5.8 meters.

	Total	No GNSS
Distance [km]	1.03	0.92
Time [s]	110	103

	GNSS-INS	LEO-INS
Position RMSE [m]	205	9.5
Final Error [m]	525	4.4

Credit: The Ohio State University

The researchers did not need assistance from the satellite operators to use the signals, and they emphasized that they had no access to the actual data being sent through the satellites – only to publicly available information related to the satellites' downlink transmission frequency and a rough estimate of the satellites' location. His work suggests utilizing signals from LEO satellites as an alternative for humans' positioning, navigation and timing needs, as they reside about 20 times closer to Earth compared to Global Navigation Satellite System (GNSS), which reside in medium Earth orbit – a little more than 20,000 kilometers above the planet.

For more information, visit the following link:
https://news.osu.edu/this-algorithm-can-make-satellite-signals-act-like-gps/

Reference
Woodall, T. (May 04, 2023). This algorithm can make satellite signals act like GPS. Recovered May 08, 2023, The Ohio State University: https://news.osu.edu/this-algorithm-can-make-satellite-signals-act-like-gps/

Information source: (The Ohio State University, 2023)

1.13   Low-temperature plasma technology shows promise in treating antibiotics

A research team led by Prof. HUANG Qing from the Hefei Institutes of Physical Science of the Chinese Academy of Sciences proposed a novel approach to treat antibiotics by using low-temperature plasma technology. The development of the economy has led to an increase in the production and use of antibiotics. Treatment of antibiotics in wastewater has become an urgent practical problem that requires immediate attention. The development of effective methods to remove antibiotics from wastewater is crucial to protect both the environment and human health.
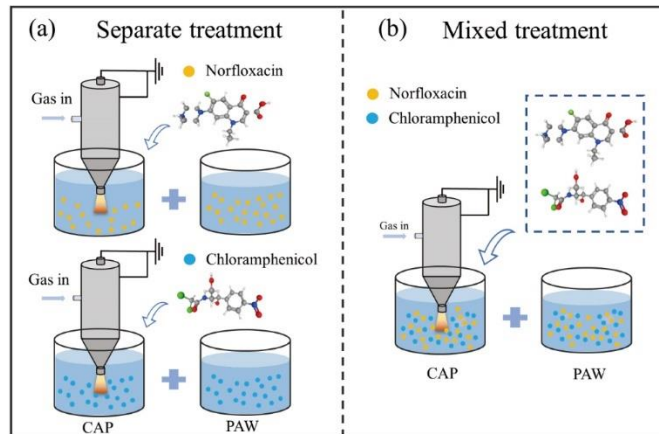
Schematic diagram of the experimental set-ups for treatment of norfloxacin/ chloramphenicol in water.
Credit: Fang Cao, Chinese Academy of Sciences

In this study, the researchers treated antibiotic mixtures using cold atmospheric plasma jet (CAPJ) in combination with plasma-activated water. Using this method, the efficiency of treating mixed antibiotics was found to be higher than that of treating single antibiotics under appropriate conditions. For example, when plasma was used to decompose chloramphenicol, active chlorine was produced, which increased the treatment efficiency of norfloxacin.

For more information, visit the following link:
https://english.cas.cn/newsroom/research_news/phys/202305/t20230506_330313.shtml

Reference
Zhang, N. (May 04, 2023). Low-temperature plasma technology shows promise in treating antibiotics. Recovered May 08, 2023, Chinese Academy of Sciences: https://english.cas.cn/newsroom/research_news/phys/202305/t20230506_330313.shtml

Information source: (Chinese Academy of Sciences, 2023)

1.14   Unprecedented view of gene regulation

Much of the human genome is made of regulatory regions that control which genes are expressed at a given time within a cell. Those regulatory elements can be located near a target gene or up to 2 million base pairs away from the target. Massachusetts Institute of Technology (MIT) engineers' new technique analyzes the 3D organization of the genome at a resolution 100 times higher than before.

"Using this method, we generate the highest-resolution maps of the 3D genome that have ever been generated, and what we see are a lot of interactions between enhancers and promoters that haven't been seen previously"
Credit: Melanie Gonick, Massachusetts Institute of Technology

"Using this method, we generate the highest-resolution maps of the 3D genome that have ever been generated, and what we see are a lot of interactions between enhancers and promoters that haven't been seen previously," says Anders Sejr Hansen, the Underwood-Prescott Career Development Assistant Professor of Biological Engineering at MIT and the senior author of the study. *"We are excited to be able to reveal a new layer of 3D structure with our high resolution."*

For more information, visit the following link:
https://news.mit.edu/2023/unprecedented-view-3d-genome-0508

Reference
Trafton, A. (May 04, 2023). An unprecedented view of gene regulation. Recovered May 08, 2023, Massachusetts Institute of Technology: https://news.mit.edu/2023/unprecedented-view-3d-genome-0508

Information source: (Massachusetts Institute of Technology, 2023)

1.15   Complex model to improve how quickly of arrival

Researchers at North Carolina State University have developed a complex model to improve how quickly first responders – such as police and EMTs – reach the scene of vehicle accidents. In computational testing, the model outperformed the existing techniques for getting first responders to accident sites quickly.

Credit: Yassine Khalfalli, North Carolina State University

To that end, the researchers developed a model that both maximizes the coverage area, so response units can respond to as many possible accident sites as possible, and minimizes the amount of time it would take respondents to reach accident sites. The model also accounts for *"hot spots,"* prioritizing the efficiency of response times to locations where accidents are most likely to happen based on historical data. To test the model, the researchers drew on data collected by the North Carolina Department of Transportation regarding 10,983 traffic incidents that occurred in 10,672 different locations in Raleigh, N.C. The researchers used the data to test how efficiently the model performed as compared to the two current state-of-the-art techniques used to allocate incident response resources.

For more information, visit the following link:
https://news.ncsu.edu/2023/05/helping-first-responders

Reference
Shipman, M. (May 08, 2023). Model aims to help first responders reach accident sites faster. Recovered May 08, 2023, North Carolina State University: https://news.ncsu.edu/2023/05/helping-first-responders/

Information source: (North Carolina State University, 2023)

1.16   Electrical signals used to benchmark piezoelectric materials

Piezoelectric materials are solid materials – like crystals, bone or proteins – that produce an electric current when they are placed under mechanical stress. Materials that harvest energy from their surroundings (through light, heat and motion) are finding their way into solar cells, wearable and implantable electronics and even onto spacecraft. They let us keep devices charged for longer, maybe even forever, without the need to connect them to a power supply.

Electrical signals used to benchmark piezoelectric materials include electro-static (or phantom) energy.
Credit: Getty, The University of Melbourne

Now, for the first time, using a simple signal processing technique, our team has shown that electrical signals used to benchmark piezoelectric materials include electro-static (or phantom) energy. Research, published in the journal Nano Energy, found that more electricity is produced than we expected – particularly when we harvest energy from motion. This research team has discovered a simple way to identify if this phantom energy is present – just by looking at the electrical signal produced by a material exposed to motion.

For more information, visit the following link:
https://pursuit.unimelb.edu.au/articles/why-you-don-t-want-phantom-energy-on-a-spacecraft

Reference
León, R.; Sherrell, P. & Ellis, A. (May 08, 2023). Why you don't want "phantom energy" on a spacecraft. Recovered May 08, 2023 2023, The University of Melbourne: https://pursuit.unimelb.edu.au/articles/why-you-don-t-want-phantom-energy-on-a-spacecraft

Information source: (The University of Melbourne, 2023)

1.17   Feedback from an Artificial Intelligence-driven tool improves teaching

The first study of its kind shows that a tool providing automated feedback improves instructors' communication practices and student satisfaction. Artificial Intelligence (AI) is rapidly transforming education, in both worrisome and beneficial ways. On the positive side of the ledger, new research shows how AI can help improve the way instructors engage with their students, by way of a cutting-edge tool that provides feedback on their interactions in class.

A new Stanford-led study, found that an automated feedback tool improved instructors' use of a practice known as uptake, where teachers acknowledge, reiterate, and build on students' contributions. The findings also provided evidence that, among students, the tool improved their rate of completing assignments and their overall satisfaction with the course. For instructors looking to improve their practice, the tool offers a low-cost complement to conventional classroom observation – one that doesn't require an instructional coach or other expert to watch the teacher in action and compile a set of recommendations. The researchers found that, on average, instructors who reviewed their feedback subsequently increased their use of uptake and questioning, with the most significant changes taking place in the third week of the course.

For more information, visit the following link:
https://news.stanford.edu/2023/05/08/ai-feedback-tool-improves-teaching-practices/

Reference
Spector, C. (08 de mayo de 2023). Feedback from an AI-driven tool improves teaching, Stanford-led research finds. Recovered May 08, 2023, Stanford University: https://news.stanford.edu/2023/05/08/ai-feedback-tool-improves-teaching-practices/

Information source: (Stanford University, 2023)

1.18   Exploring novel monkfish peptides with anti-fatigue and immunological effect

Research team led by Prof. LI Pengcheng from the Institute of Oceanology of the Chinese Academy of Sciences (IOCAS) obtained the special sequence of peptides from monkfish (Lophius litulon) protein, and proved that monkfish peptides had anti-fatigue and immunity-enhancing effect. They also found that monkfish peptides could regulate immune function by regulating receptors involved in inflammatory responses.

The researchers used a series of separation and purification techniques, including ultrafiltration, gel filtration chromatography and reverse high-performance liquid chromatography, to obtain specific sequences of peptides. They found the peptides could significantly increase antioxidant enzyme activities, hepatic glycogen and lactate dehydrogenase contents, and decrease blood urea nitrogen and blood lactic acid contents in exercise-induced fatigue mice. What's more, they found the monkfish peptides could enhance spleen lymphocytes proliferation and natural killer cells activity in mice. Transcriptomics analysis showed that there were 205 genes up-regulated and 1,040 genes down-regulated after the mice were fed with monkfish peptides. The peptides could inhibit inflammatory cytokines activation by down-regulating the chemokine and Nucleotide Oligomerization Domain (NOD)-like receptor signaling pathways, thereby modulating the mice immune response.

For more information, visit the following link:
https://english.cas.cn/newsroom/research_news/life/202305/t20230509_330384.shtml

Reference
Yuan, L. (May 09, 2023). Exploring novel monkfish peptides with anti-fatigue and immunological effect. Recovered May 09, 2023, Chinese Academy of Sciences: https://english.cas.cn/newsroom/research_news/life/202305/t20230509_330384.shtml

Information source: (Chinese Academy of Sciences, 2023)

1.19   Real time anomalies detection system using Artificial Intelligence

The research team uses Artificial Intelligence and Deep Learning to develop an anomaly detection algorithm to detect skeleton joint points for estimations of movements and poses. The system can identify in real time from about seven to eight moving frames in a video, i.e., about one quarter of a second, possible abnormal situations and raise alarm. In addition, the system performs with the same accuracy and effectiveness for thermal images. It can accurately detect body movements in thermal images without other details, hence protecting personal privacy while detecting anomalies.

The team has established partnerships with relevant organisations for applications of the new technology, e.g., in children and elderly care facilities, and in swimming pools for drowning alerts. Supported by the Smart Traffic Fund, the team is exploring the feasibility of using thermal images to analyse pedestrian movements and postures at traffic light junctions, to allow for smart extension of the time for those in need such as elderly, children, or people on wheelchair to finish crossing the road. The team also plans to apply the technology at bus terminals to warn against possible dangerous situations involving pedestrians and road users. *"This new technology can save lives. When we developed this technology, we focused on emergency situations and urgent applications in daily life, hoping to provide a more convenient and safe living environment for the general public,"* said Dr Wilton Fok, Director of the Sports AI Laboratory.

For more information, visit the following link:
https://hku.hk/press/news_detail_26086.html

Reference
Wan, M.; Ng, J. & Choi, K. (May 10, 2023). HKU Engineering team develops real time anomalies detection system using AI. Recovered May 10, 2023, The University of Hong Kong: https://hku.hk/press/news_detail_26086.html

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

1.20 Method involves applying an electric field to a two-dimensional (2D) semiconducting material.

Electronic devices have become an essential feature of just about all aspects of modern society. Yet, due in part to the growing use of the internet, they are bumping up against their limits in terms of processing speed and miniaturization. What is more, they consume vast amounts of energy in transporting and storing information, losing some of that energy as they go. École Polytechnique Fédérale de Lausanne (EPFL) engineers have found a way to control the interactions between excitons – quasiparticles that may one day transport data and replace the electrons in electronic devices. The engineers' method involves applying an electric field to a two-dimensional (2D) semiconducting material.
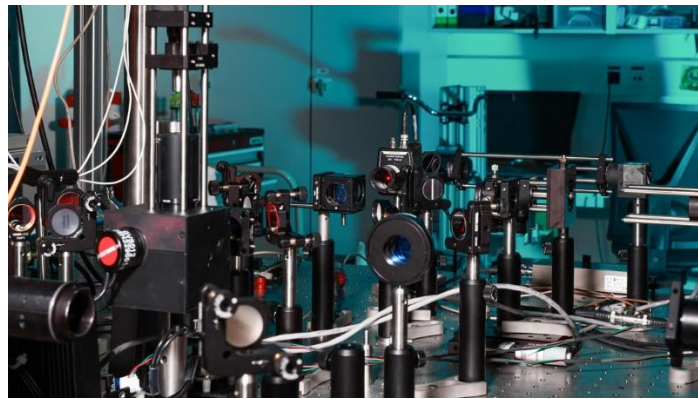
Credit: Clara Marc, École Polytechnique Fédérale de Lausanne

The engineers applied an electric field to their device and found they could control the excitons' repulsive interactions. For the engineers' method to work, the excitons should not be directly subjected to an electric current but rather be able to *"sense"* an electric field – hence the outer metal layers and inner insulating layer to protect the semiconducting 2D material. The engineers' experiments were run at the extremely low temperature of 4 Kelvin.

For more information, visit the following link:
https://actu.epfl.ch/news/epfl-discovery-brings-us-closer-to-next-generation/

Reference
Marc, C. (May 09, 2023). EPFL discovery brings us closer to next-generation electronics. Recovered May 09, 2023, École Polytechnique Fédérale de Lausanne: https://actu.epfl.ch/news/epfl-discovery-brings-us-closer-to-next-generation/

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

2   PATENTS

2.1   Pliant members for receiving and aiding in the deployment of vascular prostheses

Furthermore, though specific examples herein may refer to deployment of vascular prostheses such as stents, deployment of a wide variety of medical appliances are within the scope of this disclosure, including stents, stent-grafts, shunts, grafts, and so forth. As used herein, delivery of a medical appliance generally refers to placement of a medical appliance in the body, including displacement of the appliance along a bodily lumen to a treatment site.
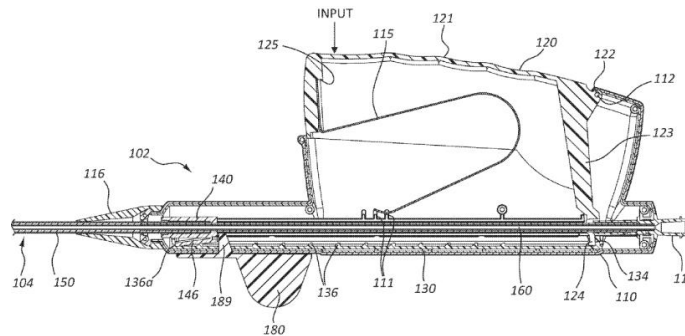
Is a cross-sectional view of a portion of the deployment device.
Credit: Adams, M.; Cindrich, C.; Eller, Z.; Hall, J. & Mower, W., WIPO IP Portal

Deployment devices within the scope of this disclosure may be configured to incrementally deploy a medical appliance. The incremental deployment may facilitate desired placement of the medical appliance due to the degree of control afforded a practitioner during deployment. A practitioner may, for example, desire to deploy a portion of a stent, make adjustments to placement within the vasculature or confirm the location of the stent, prior to deploying the remaining portion of the stent. Such processes may be iterative, with a practitioner deploying a portion of a stent, confirming placement, deploying an additional portion, again confirming placement, and so forth until the stent is fully deployed.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=AU396946761&_cid=P22-LHGRO9-27658-1

Reference
Adams, M.; Cindrich, C.; Eller, Z.; Hall, J. & Mower, W. (May 04, 2023). Pliant members for receiving and aiding in the deployment of vascular prostheses. Recovered May 04, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/es/detail.jsf?docId=AU396946761&_cid=P22-LHGRO9-27658-1

Information source: (WIPO IP Portal, 2023)

2.2   Evaluating effects of an Artificial Intelligence model on enterprise performance objectives

Systems, computer-implemented methods, and/or computer program products facilitating a process to monitor and evaluate the effects of an Artificial Intelligence (AI) model on enterprise performance metrics are provided.
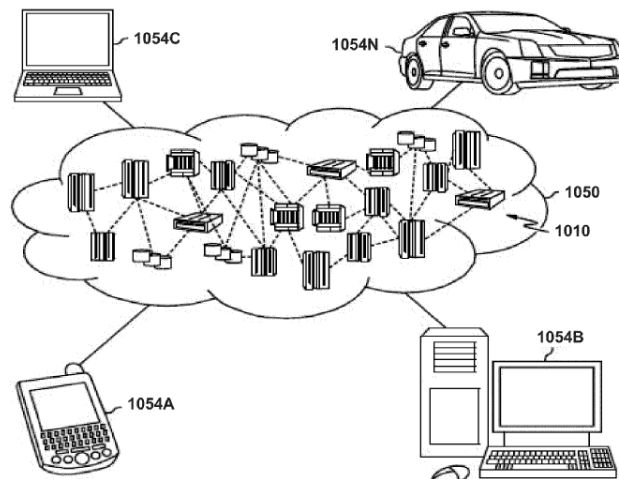
Illustrates a block diagram of an example, non-limiting cloud computing environment in accordance with one or more embodiments described herein.
Credit: Mahindru, R., Rosu, D., & Kumar, A.., WIPO IP Portal

According to an embodiment, a computer implemented method can comprise determining a technical issue of candidate technical issues associated with an Artificial Intelligence model that correlates to a change associated with a performance metric, wherein the determination is based on using a first data model that defines first relationships between the key performance metrics and candidate technical issues and second relationships between the candidate technical issues and candidate solutions. The method further comprises determining a solution for the technical issue using the data model and recommending or automatically implementing the solution. The method further provides for updating/refining the data model over time using continuous learning based on evaluating whether and how implemented solutions impact the relevant performance metrics.

For more information, visit the following link:
https://patentscope.wipo.int/search/en/detail.jsf?docId=US396912879&_cid=P10-LHEVFN-49861-1

Reference
Mahindru, R., Rosu, D., & Kumar, A., (May 04, 2023). Evaluating effects of an Artificial Intelligence model on enterprise performance objectives. Recovered May 04, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/en/detail.jsf?docId=US396907997&_cid=P10-LHEWF2-68549-1

Information source: (WIPO IP Portal, 2023)

2.3   Augmented Reality enhanced interactive robotic animation

A system includes a computing platform having processing hardware, one or more sensor(s), and a memory storing perception software and animation software, as well as an Augmented Reality (AR) headset including another processing hardware.
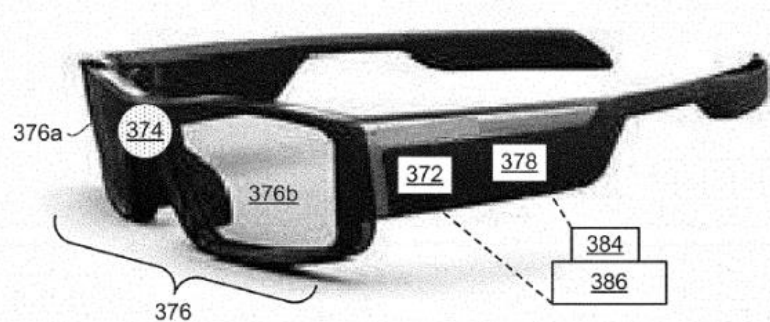
Shows an exemplary AR headset suitable for use as a component of the system, according to one implementation.
Credit: Papon, J., Hopkins, M., Cesare, K., & Wiedebach, G., WIPO IP Portal

The computing platform is configured to obtain an environmental data using the sensor(s), determine the location and orientation of the AR headset using the perception software and the environmental data, identify an action for execution by the computing platform, using the animation software, and transmit performative data corresponding to the identified action to the AR headset. The AR headset is configured to receive, from the computing platform, the performative data, and to render at least one AR effect corresponding to the identified action using the performative data.

For more information, visit the following link:
https://patentscope.wipo.int/search/en/detail.jsf?docId=US396907997&_cid=P10-LHEWF2-68549-1

Reference
Papon, J., Hopkins, M., Cesare, K., & Wiedebach, G. (May 04, 2023). Augmented Reality enhanced interactive robotic animation. Recovered May 04, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/en/detail.jsf?docId=US396907997&_cid=P10-LHEWF2-68549-1

Information source: (WIPO IP Portal, 2023)

2.4   Systems and methods for personalized patient body modeling

A three-dimensional (3D) model of a person may be obtained using a pre-trained neural network based on one or more images of the person. Such a model may be subject to estimation bias and/or other types of defects or errors.
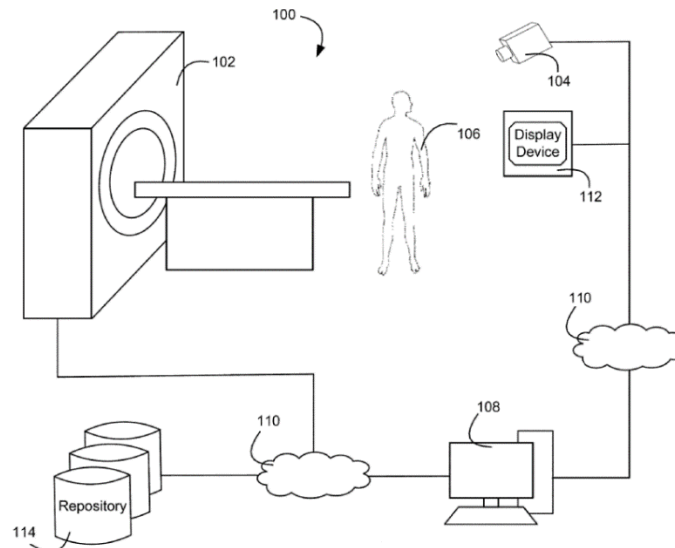
Is a diagram illustrating an example environment in which the systems, methods, and instrumentalities disclosed herein may be applied.
Credit: Karanam, S., Zheng, M., & Wu, Z., WIPO IP Portal

Described herein are systems, methods, and instrumentalities for refining the 3D model and/or the neural network used to generate the 3D model. The proposed techniques may extract information such as key body locations and/or a body shape from the images and refine the 3D model and/or the neural network using the extracted information. In examples, the 3D model and/or the neural network may be refined by minimizing a difference between the key body locations and/or body shape extracted from the images and corresponding key body locations and/or body shape determined from the 3D model. The refinement may be performed in an iterative and alternating manner.

For more information, visit the following link:
https://patentscope.wipo.int/search/en/detail.jsf?docId=US396911938&_cid=P10-LHEY0L-99131-1

Reference
Karanam, S.; Zheng, M. & Wu, Z. (May 04, 2023). Systems and methods for personalized patient body modeling. Recovered May 04, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/en/detail.jsf?docId=US396911938&_cid=P10-LHEY0L-99131-1

Information source: (WIPO IP Portal, 2023)

2.5   Computing system for training, deploying, executing, and updating Machine Learning models

A server computing device generates training data based upon an identifier for a device, a timestamp, and a label received from a developer computing device.

The server computing device trains a computer-implemented Machine Learning (ML) model based upon the training data. The server computing device also generates client configuration data for the ML model that specifies transformations that are to be applied to values in order to generate input values for the ML model. The server computing device deploys ML assets to client computing devices, the ML assets comprising the ML model and the client configuration data. The client computing devices execute the ML model using input values derived via transformations of (local) values produced by the client computing devices and transmit telemetry data to the server computing device. The server computing device updates the ML assets based upon the telemetry data.

For more information, visit the following link:
https://patentscope.wipo.int/search/en/detail.jsf?docId=US396909077&_cid=P10-LHEZ0E-16282-1

Reference
Li, P.; Chung, H.; Chai, X.; Niculescu, I.; Kang, M.; Paddock, B.; Liao, J.; Abburu, N.; Dooley, J. & Campbell, F. (May 04, 2023). Computing system for training, deploying, executing, and updating Machine Learning models. Recovered May 04, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/en/detail.jsf?docId=US396909077&_cid=P10-LHEZ0E-16282-1

Information source: (WIPO IP Portal, 2023)

2.6   System and method for identifying the educational content using Artificial Intelligence

The present disclosure provides a system and a method for authoring and automatically digitizing the printed and well as handwritten educational content inside an input image with a plurality of input characters.
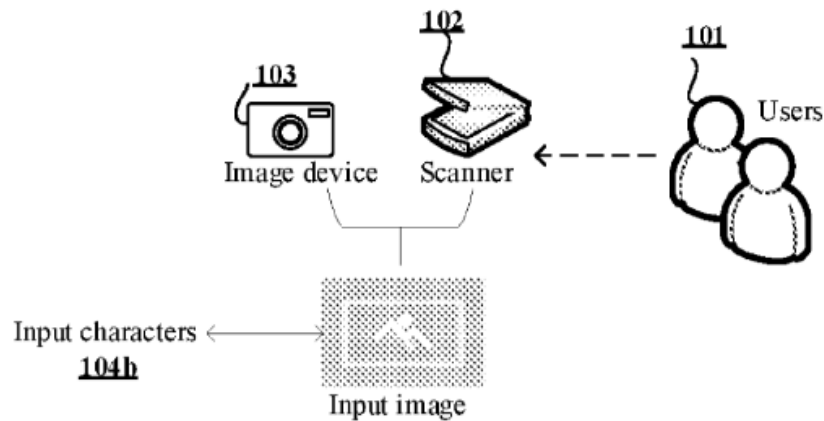
Depicts a system for identifying the educational content using Artificial Intelligence.
Credit: Kulshrestha, R., Karve, T., Dwivedi, D., Das, A., Gadhawal, S., Tripathi, V., & Sharma, G., Espacenet Patent Search

The method comprises the steps of receiving and processing an input image by a pre-processing module to identify and obtain a plurality of input characters from the input image, digitizing the plurality of input characters into the output string representations by a digitizing module, combining the plurality of output string representations using a post-processing module which is outputted in a computer-readable format, delineative text, and a markup language. Further, the system is based on the Convolution Neural Network (CNN) that may provide an embedded editing module allowing one or more users to make corrections and create new content.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086157538/publication/WO2023073407A1?q=artificial%20intelligence

Reference
Kulshrestha, R., Karve, T., Dwivedi, D., Das, A., Gadhawal, S., Tripathi, V., & Sharma, G. (May 04, 2023). System and method for identifying the educational content using artificial intelligence. Recovered May 04, 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/086157538/publication/WO2023073407A1?q=artificial%20intelligence

Information source: (Espacenet Patent Search, 2023)

2.7 Storage device for a Blockchain network based on proof of space and system including the same

Storage devices and systems implementing Blockchain networks based on Proof of Space (PoS) are described. A PoS module may be configured to perform PoS processing of PoS data transferred through an interface circuit to generate operation data.
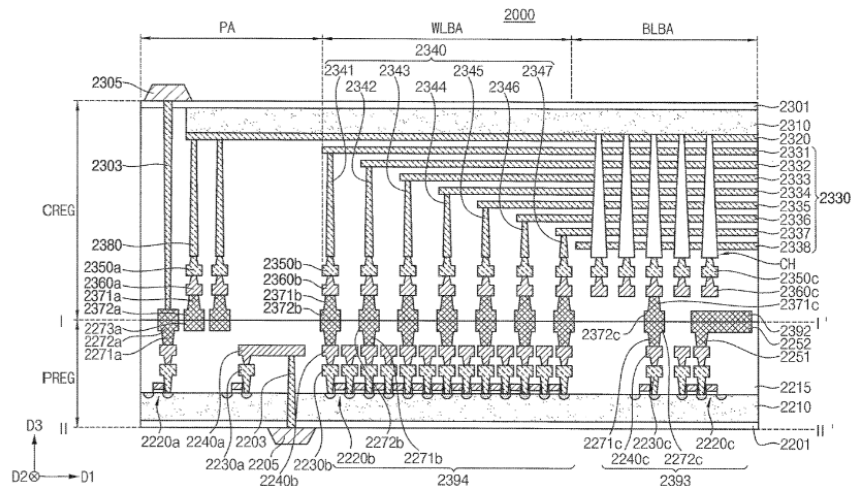
Is a cross-sectional diagram illustrating one or more aspects of a nonvolatile memory device according to example embodiments of the present disclosure.
Credit: Lee, W.; Moon, D.; Lee, S. & Lee, J., Espacenet Patent Search

A security module may be configured to perform encryption of user data (to generate first encrypted data) and encryption of the operation data (to generate second encrypted data) using different encryption algorithms. A nonvolatile memory device may then store the first encrypted data and the second encrypted data in different namespaces. Accordingly, interference and/or malicious effect between the user data and the PoS data may be reduced (e.g., blocked) and stability of the PoS algorithm may be enhanced.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086112000/publication/US2023139330A1?q=blockchain

Reference
Lee, W.; Moon, D.; Lee, S. & Lee, J. (May 04, 2023). Storage device for a blockchain network based on proof of space and system including the same. Recovered May 04, 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/086112000/publication/US2023139330A1?q=blockchain

Information source: (Espacenet Patent Search, 2023)

2.8   Method for producing carbonized or graphitized 3d objects

The invention relates to a method for producing carbonised or graphitised 3D objects which aims to realise such 3D objects particularly simply, and by means of which more complex 3D objects can also be produced without faults in the structure.

This is achieved by mixing a carbonisable or graphitisable material with a free-flowing organic adhesive or a free-flowing thermoplastic organic substance to produce a kneadable, largely dimensionally stable compound and shaping the compound into a 3D blank, and by a subsequent drying and degassing process at an increased temperature over a predetermined period of time and subsequent carbonising or graphitising of the 3D blank in a furnace in a protective gas atmosphere to produce a 3D object, the temperature necessary for carbonising or graphitising being approached with a low heating gradient.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/084358515/publication/WO2023072613A1?q=3D

Reference
Kornmeyer, T. & Klein, D. (May 04, 2023). Method for producing carbonised or graphitised 3d objects. Recovered May 04, 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/084358515/publication/WO2023072613A1?q=3D

Information source: (Espacenet Patent Search, 2023)

2.9   Tying a virtual speaker to a physical space

A method for tying a virtual speaker to a physical space. A first user with a first wearable extended reality appliance enters an area associated with a virtual speaker.
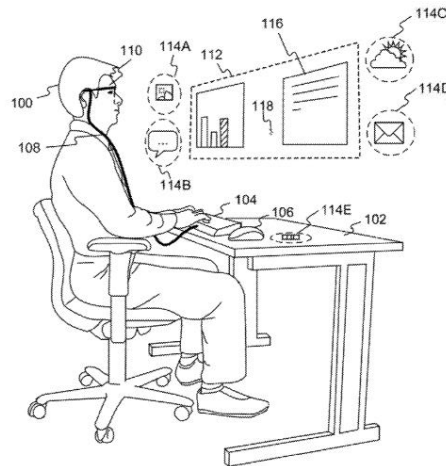
Is a schematic illustration of a user, using an example extended reality system, consistent with some embodiments of the present disclosure.
Credit: Berliner, T., & Kahan, T., Espacenet Patent Search

First sounds are transmitted from the virtual speaker to the first wearable extended reality appliance. The first user hears the first sounds at first settings of the virtual speaker. The first user changes the settings of the virtual speaker to second settings. Second sounds are transmitted from the virtual speaker to the first wearable extended reality appliance, such that the first user hears the second sounds at the second settings. After the first user leaves the area, a second user with a second wearable extended reality appliance enters the area. Third sounds are transmitted from the virtual speaker to the second wearable extended reality appliance, such that the second user hears the third sounds at the second settings.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086145903/publication/US2023139626A1?q=reality%20virtual

Reference
Berliner, T., & Kahan, T. (May 04, 2023). Tying a virtual speaker to a physical space. Recovered May 04, 2023,   Espacenet   Patent   Search:
https://worldwide.espacenet.com/patent/search/family/086145903/publication/US2023139626A1?q=reality%20virtual

Information source: (Espacenet Patent Search, 2023)

2.10   Electronic device for improving image quality

An electronic device may include:

Is a front perspective view illustrating and electronic device having a bar-type housing structure according to an embodiment.
Credit: DO, W., CHOI, W., & CHOI, J., Espacenet Patent Search

a camera; a display positioned between an object to be photographed by the camera and the camera; a processor connected to the camera and the display; and a memory operatively connected to the processor, wherein the memory stores instructions that, when executed, cause the processor to: receive an original image from the camera; input the original image as an input value to an Artificial Intelligence model trained for improving image quality, and obtain a correction image from a result value output from the Artificial Intelligent model; detect a saturated area in which a light source is depicted in the correction image; and obtain a compensation image by blurring a boundary between the saturated area and a periphery thereof in the correction image by using the original image.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086147171/publication/US2023137831A1?q=artificial%20intelligence

Reference
Do, W., Choi, W., & Choi, J. (May 04, 2023). Electronic device for improving image quality. Recovered May 04, 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/086147171/publication/US2023137831A1?q=artificial%20intelligence

Information source: (Espacenet Patent Search, 2023)