Weekly Newsletter

TECHNOLOGY SURVEILLANCE

Nº 39-2023   SEP 29TH, 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   Artificial Intelligence for supporting students with developmental disabilities

Developmental disabilities affect one in every six children, including conditions such as autism and attention-deficit/hyperactivity disorder, or ADHD. These disabilities can cause individuals to struggle to maintain social interactions, resulting in fewer friendships, feelings of isolation and increased risk of depression. Michigan State University researchers are using AI to help improve peer engagement for children with developmental disabilities and providing feedback to educators to improve outcomes for these students.

This image demonstrates how the Wearable Human Interaction Tracker, or WHIT technology, will be used to infer peer interactions in classrooms. The smaller image offers a close up view of how the sensors appear. Credit: courtesy of Subir Biswas, Michigan State University

When two people each wearing the name label-sized tag interact, the engagement is tracked by the WHIT sensors and wirelessly uploaded. *"The technology of collecting behavioral data and applying modern AI techniques to infer a child's mood is the key enabler of the project,"* said Biswas. *"We are developing an end-to-end full cycle system that starts at collecting data from children's bodies via wearables and ends with machine-interpreted algorithmic observations and interventions."*

For more information, visit the following link:
https://msutoday.msu.edu/news/2023/msu-researchers-using-ai-for-students-with-developmental-disabilities

Reference
Harrison, J. (Sep 27, 2023). MSU researchers receive grant to use AI for supporting students with developmental disabilities. Recovered Sep 27, 2023, Michigan State University:
https://msutoday.msu.edu/news/2023/msu-researchers-using-ai-for-students-with-developmental-disabilities

Information source: (Michigan State University, 2023)

1.2   Material would allow users to *"tune"* windows to block targeted wavelengths of light

Researchers have demonstrated a material for next generation dynamic windows, which would allow building occupants to switch their windows between three modes: transparent, or "normal" windows; windows that block infrared light, helping to keep a building cool; and tinted windows that control glare while maintaining the view. Dynamic windows based on electrochromism – meaning their opacity changes in response to electric stimulus – are not a new concept. But, to this point, most dynamic windows were either clear or dark.

Credit: Michael, North Carolina State University

"Our work demonstrates that there are more options available," says Veronica Augustyn, co-corresponding author of a paper on the work and the Jake and Jennifer Hooks Distinguished Scholar in Materials Science and Engineering at North Carolina State University. *"Specifically, we've shown that you can allow light to pass through the windows while still helping to keep buildings cooler and thus more energy efficient."*

For more information, visit the following link:
https://news.ncsu.edu/2023/09/new-material-for-dynamic-windows/

Reference
Shipman, M. (Sep 21, 2023). Material would allow users to *"tune"* windows to block targeted wavelengths of light. Recovered Sep 25, 2023, North Carolina State University:
https://news.ncsu.edu/2023/09/new-material-for-dynamic-windows/

Information source: (North Carolina State University, 2023)

1.3   Computational agents exhibit believable humanlike behavior

The little animated humans scurrying around in a fictional landscape of homes and workplaces may seem like just another group of non-player characters (NPCs) in a video game akin to the well-known SIMS franchise. But unlike traditional NPCs, these characters' behavior isn't programmed by a coder. Instead, Stanford researchers gave them a short biography consisting of a name, age, job, family, interests, and a few habits, and let them loose. The agents then relied on a large language model (not unlike the one behind ChatGPT) to generate their actions in accordance with their prescribed biographies.

Credit: Stanford University

The result: simulated characters dubbed *"generative agents"* that behave in ways that are believably humanlike. They wake up, make breakfast, head to work, grab lunch, and chat with other agents they meet. They also remember things that happen, reflect on them, and make plans. For example, when the researchers in charge of this landscape suggested to one character that she plan a Valentine's party, she invited friends and acquaintances, many of whom showed up at the correct time and place.

For more information, visit the following link:
https://hai.stanford.edu/news/computational-agents-exhibit-believable-humanlike-behavior

Reference
Miller, C. (Sep 21, 2023). Computational agents exhibit believable humanlike behavior. Recovered Sep 25, 2023, Stanford University:
https://hai.stanford.edu/news/computational-agents-exhibit-believable-humanlike-behavior

Information source: (Stanford University, 2023)

1.4   Benefit breakdown, 3D printed vs. wood molds

Oak Ridge National Laboratory researchers have conducted a comprehensive life cycle, cost and carbon emissions analysis on 3D-printed molds for precast concrete and determined the method is economically beneficial compared to conventional wood molds.

ORNL's 3D-printed polymer composite mold was used to produce precast concrete parts for a New York City building. Researchers conducted a techno-economic analysis that highlights the benefits over wood molds.
Credit: Oak Ridge National Laboratory

Precast concrete is used in building construction and produced by pouring the material into a reusable mold. For decades, these molds have been made from wood — a technique that requires a highly specialized skillset. As an alternative, molds made from fiber-reinforced polymer composites can be 3D printed. *"We developed a techno-economic model that compared costs associated with each method, evaluating materials, equipment, energy and labor,"* ORNL's Kristina Armstrong said. *"3D printing can make complex molds faster, and the composites can be recycled, leading to more economical molds when used many times for precast concrete parts."*

For more information, visit the following link:
https://www.ornl.gov/news/benefit-breakdown-3d-printed-vs-wood-molds

Reference
Armstrong, K.; Kamath, D.; Zhao, X.; Tekinalp, H.; Korey, M. & Hun, D. (Sep 21, 2023). Combustion powers bug-sized robots to leap, lift and race. Recovered Sep 25, 2023, Oak Ridge National Laboratory: https://www.ornl.gov/news/benefit-breakdown-3d-printed-vs-wood-molds

Information source: (Oak Ridge National Laboratory, 2023)

1.5   New imaging technique *"sees"* virus move in unprecedented detail

A team of scientists led by Professor Ulrich Lorenz at EPFL, has used a novel imaging technique that pushes the time-resolution of cryo-electron microscopy (cryo-EM) down to microseconds, to observe the fast dynamics of a virus in real-time.
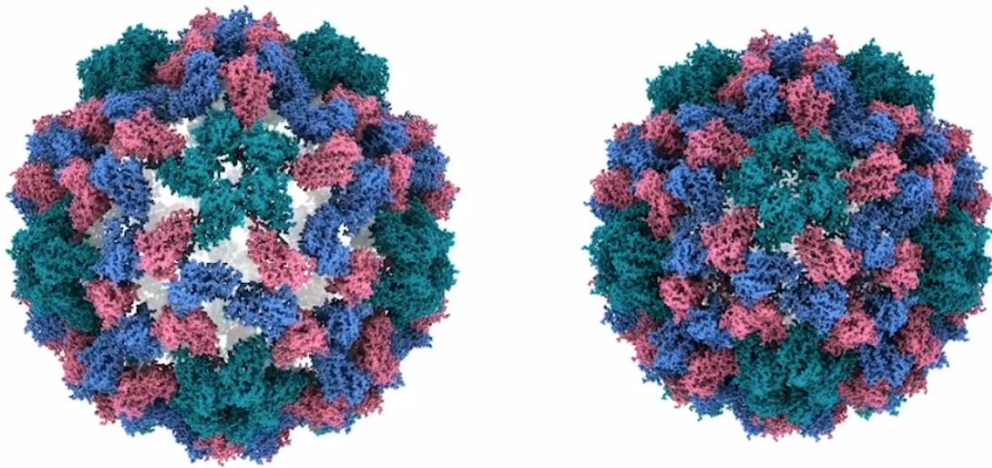
EPFL scientists have developed a novel imaging technique to capture rapid protein dynamics. The technique, a microsecond, time-resolved version of cryogenic electron microscopy, allowed them to observe the behavior of a virus in unprecedented detail.
Credit: Petersen, T., Ecole Polytechnique Fédérale de Lausanne

The researchers have now used their technique to capture rapid viral movements with unparalleled precision. The team focused on the cowpea chlorotic mottle virus (CCMV), a plant virus known for its large-amplitude motions crucial to its infection cycle. It is known that a change in pH causes the virus's capsid (a protective shell) to expand rapidly, and using the new technique, the team was able to observe the actual mechanics of this process. Beyond the virus, the new microsecond time-resolved cryo-EM technique addresses the broader challenge of observing proteins as they function. *"We show, for the first time, that our method can be used to observe a process that actually occurs in nature,"* says Lorenz.

For more information, visit the following link:
https://news.epfl.ch/news/new-imaging-technique-sees-virus-move-in-unprecede/

Reference
Papageorgiou, N. (Sep 21, 2023). New imaging technique *"sees"* virus move in unprecedented detail. Recovered Sep 25, 2023, Ecole Polytechnique Fédérale de Lausanne:
https://news.epfl.ch/news/new-imaging-technique-sees-virus-move-in-unprecede/

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

1.6   New method for purifying drinking water could be used in disaster zones

Scientists have developed a new method that converts seawater into drinking water that could be useful in disaster zones where there is limited electrical power. The most popular method for removing salt (sodium chloride) from sea water is reverse osmosis, which uses a porous membrane that allows water molecules through but not salt.

The team hopes this new desalination method could be used to provide drinking water on a small scale in disaster hit areas.
Credit: witthaya, University of Bath

However, this method requires a high pressure and substantial amounts of electricity. The membrane often clogs up, reducing the efficiency of the process. The new technique, developed by a team of scientists from the Universities of Bath, Swansea and Edinburgh, doesn't use any external pressure but instead uses a small amount of electrical energy to pull chloride ions through the membrane towards a positively charged electrode.

For more information, visit the following link:
https://www.bath.ac.uk/announcements/new-method-for-purifying-drinking-water-could-be-used-in-disaster-zones/

Reference
Just, V. (Sep 21, 2023). New method for purifying drinking water could be used in disaster zones. Recovered Sep 26, 2023, University of Bath:
https://www.bath.ac.uk/announcements/new-method-for-purifying-drinking-water-could-be-used-in-disaster-zones/

Information source: (University of Bath, 2023)

1.7   Small, implantable device could sense and treat cancer

Measuring just 1 centimeter in diameter, the small implant will house living engineered cells that both synthesize and deliver therapies when needed. During the first four years, the researchers will develop the technology and test it on small and large animal models. In the fourth year, the researchers will begin human clinical trials, starting with patients who have recurring ovarian cancer.
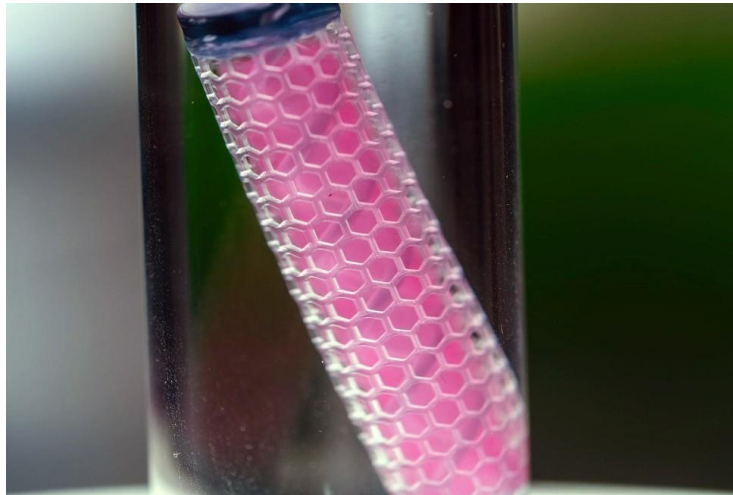
A prototype of the drug-producing implant, which is smaller than a human finger
Credit: Brandon Martin/Rice University, Northwestern University

The end goal is to develop a device to provide personalized therapy, tailored to individual cancer patients. *"From a clinical perspective, this could be a game-changing approach to cancer therapy,"* said Northwestern's Jonathan Rivnay, a co-principal investigator on the project who leads device development. *"It's personalized, multi-modal and could improve access to care. This concept of a regulated cell-based therapy also is exciting for other areas of medicine, and this project allows us to develop the toolbox of components needed to make it a reality."*

For more information, visit the following link:
https://news.northwestern.edu/stories/2023/09/small-implantable-device-could-sense-and-treat-cancer/

Reference
Morris, A. (Sep 25, 2023). Small, implantable device could sense and treat cancer. Recovered Sep 26, 2023, Northwestern University:
https://news.northwestern.edu/stories/2023/09/small-implantable-device-could-sense-and-treat-cancer/

Information source: (Northwestern University, 2023)

1.8   Nanofluidic design generates power with saltwater

A team of researchers at the University of Illinois Urbana-Champaign has reported a design for a nanofluidic device capable of converting ionic flow into usable electric power. The team believes that their device could be used to extract power from the natural ionic flows at seawater-freshwater boundaries.
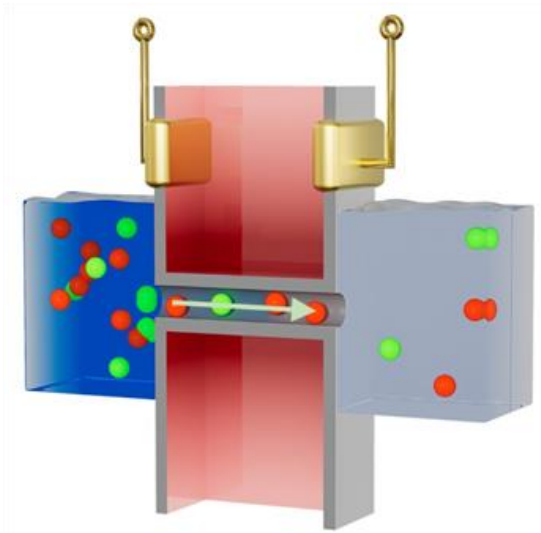
The device designed by Leburton's group. When salt ions flow from the higher concentration to lower concentration through the device channel, charges are dragged from one end to the other, creating voltage and electric current.
Credit: University of Illinois Urbana-Champaign

Leburton's group designed a nanoscale semiconductor device that takes advantage of a phenomenon called *"Coulomb drag"* between flowing ions and electric charges in the device. When the ions flow through a narrow channel in the device, electric forces cause the device charges to move from one side to the other creating voltage and electric current. The researchers found two surprising behaviors when they simulated their device. First, while they expected that Coulomb drag would primarily occur through the attractive force between opposite electric charges, the simulations indicated that the device works equally well if the electric forces are repulsive. Both positively and negatively charged ions contribute to drag.

For more information, visit the following link:
https://hmntl.illinois.edu/news/59291

Reference
University of Illinois Urbana-Champaign. (Sep 22, 2023). Nanofluidic design from Leburton group generates power with saltwater. Recovered Sep 26, 2023, University of Illinois Urbana-Champaign: https://hmntl.illinois.edu/news/59291

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

1.9   New qubit circuit enables quantum operations with higher accuracy

MIT researchers demonstrated a novel superconducting qubit architecture that can perform operations between qubits — the building blocks of a quantum computer — with much greater accuracy than scientists have previously been able to achieve. They utilize a relatively new type of superconducting qubit, known as fluxonium, which can have a lifespan that is much longer than more commonly used superconducting qubits.
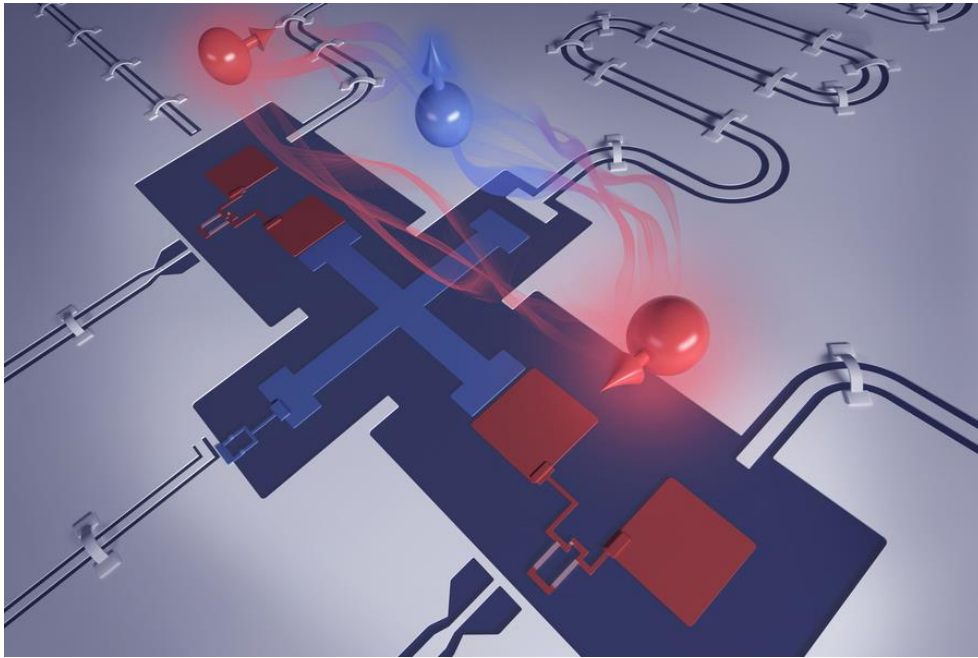
This artist rendering shows the researchers' superconducting qubit architecture, with the fluxonium qubits in red and the blue, transmon coupler in between them.
Credit: Krantz Nanoart, Massachusetts Institute of Technology

Their architecture involves a special coupling element between two fluxonium qubits that enables them to perform logical operations, known as gates, in a highly accurate manner. It suppresses a type of unwanted background interaction that can introduce errors into quantum operations. This approach enabled two-qubit gates that exceeded 99.9 percent accuracy and single-qubit gates with 99.99 percent accuracy. In addition, the researchers implemented this architecture on a chip using an extensible fabrication process.

For more information, visit the following link:
https://news.mit.edu/2023/new-qubit-circuit-enables-quantum-operations-higher-accuracy-0925

Reference
Zewe, A. (Sep 25, 2023). New qubit circuit enables quantum operations with higher accuracy. Recovered Sep 26, 2023, Massachusetts Institute of Technology:
https://news.mit.edu/2023/new-qubit-circuit-enables-quantum-operations-higher-accuracy-0925

Information source: (Massachusetts Institute of Technology, 2023)

1.10 A sustainable alternative to air conditioning

Researchers from McGill University, UCLA and Princeton have found in a new study an inexpensive, sustainable alternative to mechanical cooling with refrigerants in hot and arid climates, and a way to mitigate dangerous heat waves during electricity blackouts.

Credit: McGill University

The researchers set out to answer how to achieve a new benchmark in passive cooling inside naturally conditioned buildings in hot climates such as Southern California. They examined the use of roof materials that radiate heat into the cold universe, even under direct sunlight, and how to combine them with temperature-driven ventilation. These cool radiator materials and coatings are often used to stop roofs overheating. Researchers have also used them to improve heat rejection from chillers. But there is untapped potential for integrating them into architectural design more fully, so they can not only reject indoor heat to outer space in a passive way, but also drive regular and healthy air changes.

For more information, visit the following link:
https://www.mcgill.ca/mymcgill/channels/news/sustainable-alternative-air-conditioning-351321

Reference
Loewen, C. (Sep 25, 2023). A sustainable alternative to air conditioning. Recovered Sep 26, 2023, McGill University:
https://www.mcgill.ca/mymcgill/channels/news/sustainable-alternative-air-conditioning-351321

Information source: (McGill University, 2023)

1.11   How organic solar cells could become significantly more efficient

The sun sends enormous amounts of energy to the earth. Nevertheless, some of it is lost in solar cells. This is an obstacle in the use of organic solar cells, especially for those viable in innovative applications. A key factor in increasing their performance: Improved transport of the solar energy stored within the material. Now a research group at the Technical University of Munich (TUM) has shown that certain organic dyes can help build virtual highways for the energy.
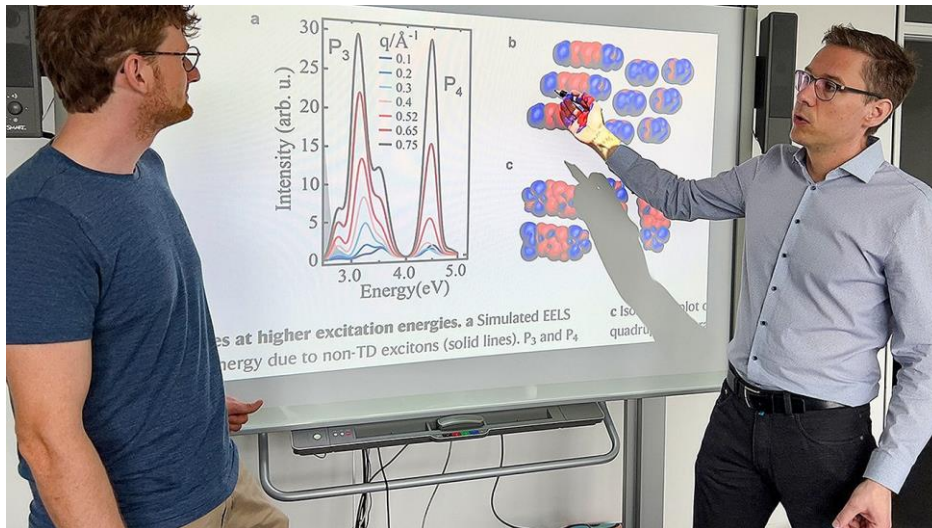
How specific molecules can increase the efficiency of organic solar cells.
Credit: Technical University of Munich

Organic solar cells are light, extremely thin energy collectors and as a flexible coating are a perfect fit on almost any surface: Solar cells based on organic semiconductors open up a range of application possibilities, for example, as solar panels and films which can be rolled up, or for use on smart devices. But one disadvantage in many applications is the comparatively poor transport of the energy collected within the material. Researchers are investigating the elementary transport processes of organic solar cells in order to find ways to improve this transport.

For more information, visit the following link:
https://www.tum.de/en/news-and-events/all-news/press-releases/details/how-organic-solar-cells-could-become-significantly-more-efficient

Reference
Ortmann, F. (Sep 26, 2023). How organic solar cells could become significantly more efficient. Recovered Sep 26, 2023, Technical University of Munich:
https://www.tum.de/en/news-and-events/all-news/press-releases/details/how-organic-solar-cells-could-become-significantly-more-efficient

Information source: (Technical University of Munich, 2023)

1.12   New method helps Artificial Intelligence navigate 3D space using 2D images

Photos are two-dimensional (2D), but autonomous vehicles and other technologies have to navigate the three-dimensional (3D) world. Researchers have developed a new method to help Artificial Intelligence (AI) extract 3D information from 2D images, making cameras more useful tools for these emerging technologies.

Credit: North Carolina State University

New MonoXiver method uses each bounding box as a starting point, or anchor, and has the AI perform a second analysis of the area surrounding each bounding box. This second analysis results in the program producing many additional bounding boxes surrounding the anchor. To determine which of these secondary boxes has best captured any *"missing"* parts of the object, the AI does two comparisons. One comparison looks at the "geometry" of each secondary box to see if it contains shapes that are consistent with the shapes in the anchor box. The other comparison looks at the *"appearance"* of each secondary box to see if it contains colors or other visual characteristics that are similar to the visual characteristics of what is within the anchor box.

For more information, visit the following link:
https://news.ncsu.edu/2023/09/monoxiver-3d-space.

Reference
Shipman, M. (Sep 25, 2023). New method helps AI navigate 3D space using 2D images. Recovered Sep 27, 2023, North Carolina State University:
https://news.ncsu.edu/2023/09/monoxiver-3d-space

Information source: (North Carolina State University, 2023)

1.13   Making a femtosecond laser out of glass

The Galatea laboratory is at the crossroads between optics, mechanics and materials science, and femtosecond lasers is a crucial element of Bellouard's work. Femtosecond lasers produce extremely short and regular bursts of laser light and have many applications such as laser eye surgery, non-linear microscopy, spectroscopy, laser material processing and recently, sustainable data storage.
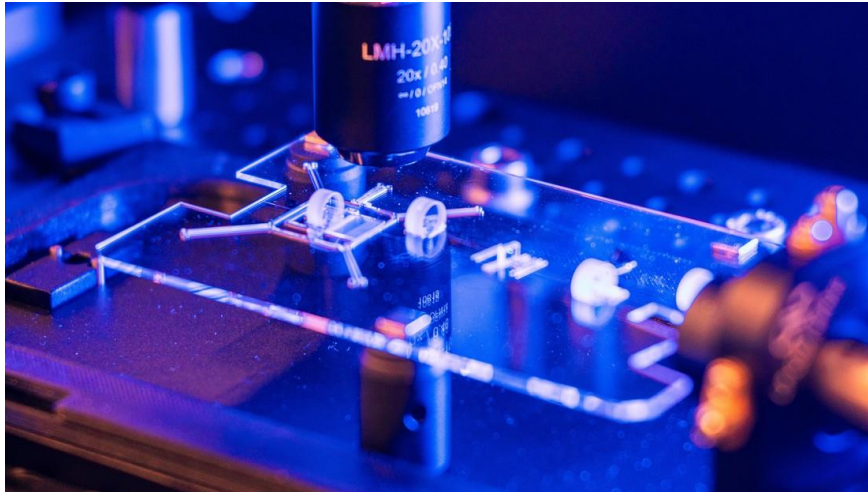
EPFL scientists show that it is possible to make a femtosecond laser that fits in the palm of one's hand using a glass substrate.
Credit: Ecole Polytechnique Fédérale de Lausanne

Commercial femtosecond lasers are made by putting optical components and their mounts on a substrate, typically optical breadboards, which requires fastidious alignment of the optics. *"We use femtosecond lasers for our research on the non-linear properties of materials and how materials can be modified in their volume,"* explains Bellouard, head of EPFL's Galatea Laboratory. *"Going through the exercise of painful complex optical alignments makes you dream of simpler and more reliable ways to align complex optics."*

For more information, visit the following link:
https://news.epfl.ch/news/making-a-femtosecond-laser-out-of-glass/

Reference
Sanctuary, H. (Sep 26, 2023). Making a femtosecond laser out of glass. Recovered Sep 27, 2023, Ecole Polytechnique Fédérale de Lausanne:
https://news.epfl.ch/news/making-a-femtosecond-laser-out-of-glass/

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

1.14   Visual analogies for Artificial Intelligence

The field of Artificial Intelligence has long been stymied by the lack of an answer to its most fundamental question: What is intelligence, anyway? AIs such as GPT-4 have highlighted this uncertainty: some researchers believe that GPT models are showing glimmers of genuine intelligence but others disagree.
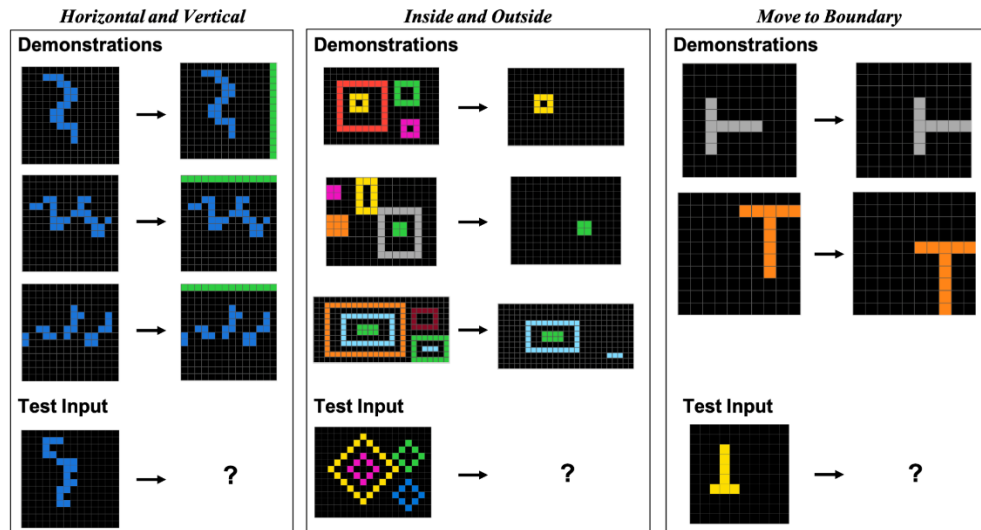
Examples of some of the visual tasks the authors of a recent study posed in testing intelligence.
Credit: Santa Fe Institute

To address these arguments, we need concrete tasks to pin down and test the notion of intelligence, argue SFI researchers Arseny Moskvichev, Melanie Mitchell, and Victor Vikram Odouard in a new paper in Transactions on Machine Learning Research. The authors provide just that — and find that even the most advanced AIs still lag far behind humans in their ability to abstract and generalize concepts. The team created evaluation puzzles — based on a domain developed by Google researcher François Chollet — that focus on visual analogy-making, capturing basic concepts such as above, below, center, inside, and outside. Human- and AI test-takers were shown several patterns demonstrating a concept and then asked to apply that concept to a different image.

For more information, visit the following link:
https://www.santafe.edu/news-center/news/study-visual-analogies-ai

Reference
Santa Fe Institute. (Sep 25, 2023). Visual analogies for Artificial Intelligence. Recovered Sep 27, 2023, Santa Fe Institute:
https://www.santafe.edu/news-center/news/study-visual-analogies-ai

Information source: (Santa Fe Institute, 2023)

1.15   New wearable sensor makes continuous analysis of sweat possible

Continuous monitoring of sweat can reveal valuable information about human health, such as the body's glucose levels. However, wearable sensors previously developed for this purpose have been lacking, unable to withstand the rigors or achieve the specificity needed for continuous monitoring, according to Penn State researchers. Now, the research team has created a novel wearable patch that may be up to the task.

Penn State researchers developed a new wearable sensor to monitor glucose levels in sweat over multiple weeks.
Credit: Kate Myers, Penn State. All Rights Reserved.

Made with a laser-modified graphene nanocomposite material, the device can detect specific glucose levels in sweat for three weeks while simultaneously monitoring body temperature and pH levels, the researchers reported. *"Sweat is ideal for real-time, continuous and noninvasive biomarker detection,"* said principal investigator Huanyu *"Larry"* Cheng, the James L. Henderson, Jr. Memorial Associate Professor of Engineering Science and Mechanics (ESM) at Penn State. *"But low biomarker concentration levels in sweat and variability of other factors such as pH, salinity and temperature have pushed previous sweat biosensors past the limits of their detection and accuracy. This device is able to account for this variability while measuring glucose with needed specificity for weeks at a time."*

For more information, visit the following link:
https://www.psu.edu/news/engineering/story/new-wearable-sensor-makes-continuous-analysis-sweat-possible-researchers-say/.

Reference
Krebs, A. (Sep 27, 2023). New wearable sensor makes continuous analysis of sweat possible, researchers say. Recovered Sep 27, 2023, The Pennsylvania State University:
https://www.psu.edu/news/engineering/story/new-wearable-sensor-makes-continuous-analysis-sweat-possible-researchers-say/

Information source: (The Pennsylvania State University, 2023)

1.16   Desalination system could produce freshwater that is cheaper than tap water

Engineers at MIT and in China are aiming to turn seawater into drinking water with a completely passive device that is inspired by the ocean, and powered by the sun. In a paper appearing today in the journal Joule, the team outlines the design for a new solar desalination system that takes in saltwater and heats it with natural sunlight. The configuration of the device allows water to circulate in swirling eddies, in a manner similar to the much larger *"thermohaline"* circulation of the ocean. This circulation, combined with the sun's heat, drives water to evaporate, leaving salt behind.

A tilted ten-stage prototype is located into a "boat-like" reservoir.
Credit: Jintong Gao and Zhenyuan Xu, Massachusetts Institute of Technology

The resulting water vapor can then be condensed and collected as pure, drinkable water. In the meantime, the leftover salt continues to circulate through and out of the device, rather than accumulating and clogging the system. The new system has a higher water-production rate and a higher salt-rejection rate than all other passive solar desalination concepts currently being tested. The researchers estimate that if the system is scaled up to the size of a small suitcase, it could produce about 4 to 6 liters of drinking water per hour and last several years before requiring replacement parts. At this scale and performance, the system could produce drinking water at a rate and price that is cheaper than tap water.

For more information, visit the following link:
https://news.mit.edu/2023/desalination-system-could-produce-freshwater-cheaper-0927

Reference
Chu, J. (Sep 27, 2023). Desalination system could produce freshwater that is cheaper than tap water. Recovered Sep 27, 2023, Massachusetts Institute of Technology:
https://news.mit.edu/2023/desalination-system-could-produce-freshwater-cheaper-0927

Information source: (Massachusetts Institute of Technology, 2023)

1.17   How self-cleaning cicadas could help us have cleaner cars

Self-cleaning cicadas could help design new tech which will make our cars cleaner, scientists say. A type of large insect known as a cicada is able to keep its wings clean of dust and dirt through a remarkable process which could be applied in modern technology. The texture of the cicada wing is unusually repellent to water – known as being *"super hydrophobic"*. This means that morning dew is able to collect on the wing surface, forming small water droplets

Credit: Dr Sreehari Perumanath, University of Warwick

As the droplets combine with each other, they collect dust particles and microorganisms – taking them with them as the water drops off the wings. This is due to both the water-repelling nature of the wings and their special wax-coated cones, which help the droplets move across the surface. This stops the droplets collecting in one spot and simply staying there – such as when a cup of coffee is spilt on a table. This fascinating process could provide a solution to the seemingly never-ending task of cleaning your windscreen – inspiring the scientists at the Universities of Warwick and Edinburgh to investigate this type of *"natural engineering"*. The team are excited about the prospect of potentially self-cleaning skyscraper windows, solar panels, camera lenses and more.

For more information, visit the following link:
https://warwick.ac.uk/newsandevents/pressreleases/?newsItem=8a1785d88aad47f7018ad756a09a51e6

Reference
Slinn, A. (Sep 27, 2023). Wing-screen wipers: how self-cleaning cicadas could help us have cleaner cars. Recovered Sep 27, 2023, University of Warwick:
https://warwick.ac.uk/newsandevents/pressreleases/?newsItem=8a1785d88aad47f7018ad756a09a51e6

Information source: (University of Warwick, 2023)

1.18   It's easier to get valuable metals from battery waste if you *"flash"* it

A battery recycling process developed by Rice University scientists can remove the inert layer on battery metals and lower their oxidation state, making them soluble in low-concentration acid. Using its signature Joule-heating technique to bring the combined cathode and anode waste to temperatures above 2100 degrees Kelvin in seconds, the lab of Rice chemist James Tour achieved a metal recovery yield exceeding 98% from various types of mixed battery waste.
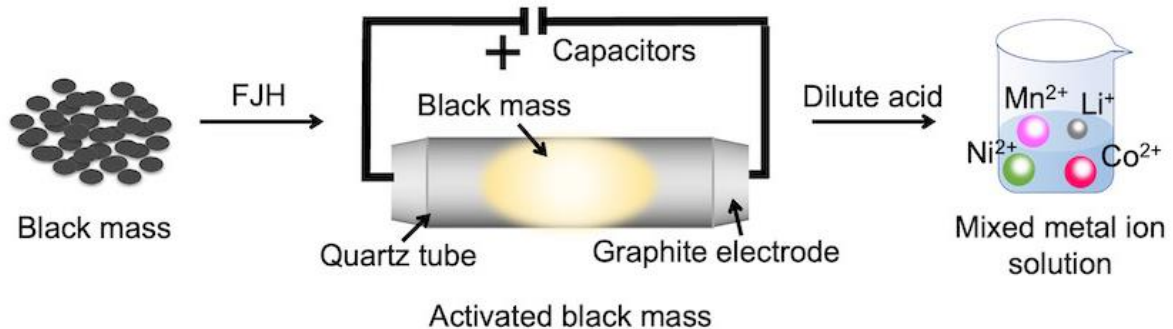
Schematic of the battery recycling process developed by Rice University scientists that uses their signature Joule-heating technique to remove the inert layer on battery metals and lower their oxidation state, making them soluble in low-concentration acid.
Credit: courtesy of the Tour lab, Rice University

Not only does the new method significantly reduce secondary waste streams from the contaminated, acidic leaching solutions, but it also cuts the duration of the recycling process by almost 100-fold. The process could help supercharge the battery recycling business − a market that's expected to grow rapidly as the batteries powering electrical vehicles and other electronics expire.

For more information, visit the following link:
https://news.rice.edu/news/2023/its-easier-get-valuable-metals-battery-waste-if-you-flash-it

Reference
Cernea, S. (Sep 27, 2023). It's easier to get valuable metals from battery waste if you *"flash"* it. Recovered Sep 28, 2023, Rice University:
https://news.rice.edu/news/2023/its-easier-get-valuable-metals-battery-waste-if-you-flash-it

Information source: (Rice University, 2023)

1.19   MilliMobile is a tiny, self-driving robot powered only by light and radio waves

Small mobile robots carrying sensors could perform tasks like catching gas leaks or tracking warehouse inventory. But moving robots demands a lot of energy, and batteries, the typical power source, limit lifetime and raise environmental concerns. Researchers have explored various alternatives: affixing sensors to insects, keeping charging mats nearby, or powering the robots with lasers. Each has drawbacks. Insects roam. Chargers limit range. Lasers can burn people's eyes.
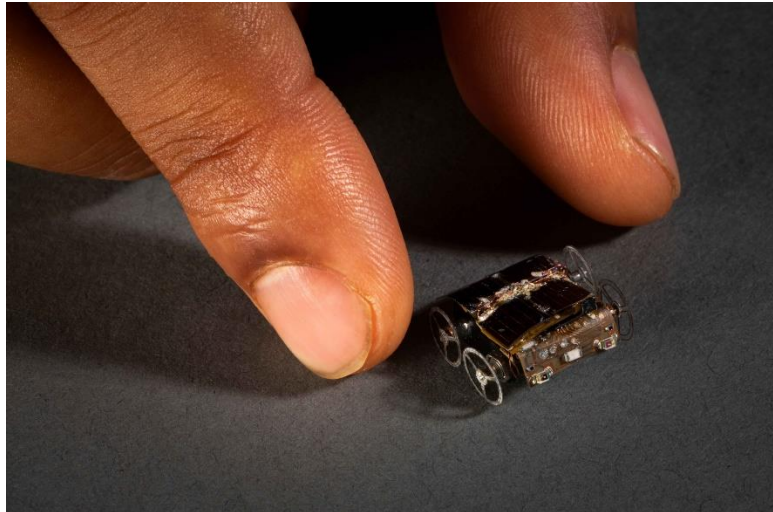
esearchers at the University of Washington have now created MilliMobile, a tiny, self-driving robot powered only by surrounding light or radio waves. It's about the size of a penny and can run indefinitely on harvested energy
Credit: Mark Stone, University of Washington

Researchers at the University of Washington have now created MilliMobile, a tiny, self-driving robot powered only by surrounding light or radio waves. Equipped with a solar panel–like energy harvester and four wheels, MilliMobile is about the size of a penny, weighs as much as a raisin and can move about the length of a bus (30 feet, or 10 meters) in an hour even on a cloudy day. The robot can drive on surfaces such as concrete or packed soil and carry nearly three times its own weight in equipment like a camera or sensors. It uses a light sensor to move automatically toward light sources so it can run indefinitely on harvested power.

For more information, visit the following link:
https://www.washington.edu/news/2023/09/27/millimobile-battery-free-autonomous-self-driving-robot-solar/

Reference
Milne, S. (Sep 27, 2023). MilliMobile is a tiny, self-driving robot powered only by light and radio waves. Recovered Sep 28, 2023, University of Washington:
https://www.washington.edu/news/2023/09/27/millimobile-battery-free-autonomous-self-driving-robot-solar/

Information source: (University of Washington, 2023)

1.20   Fire-safe fuel

Universidad de California Riverside chemical engineers have designed a fuel that ignites only with the application of electric current. Since it doesn't react to flames and cannot start accidental fires during storage or transport, it is a *"safe"* liquid fuel.

Credit: University of California Riverside

"The fuel we're normally using is not very safe. It evaporates and could ignite, and it's difficult to stop that," said Yujie Wang, UCR chemical engineering doctoral student and co-author of a new paper about the fuel. *"It is much easier to control the flammability of our fuel and stop it from burning when we remove voltage."* The base of the new fuel is an ionic liquid, which is a form of liquified salt. *"It is similar to the salt we use to flavor food, which is sodium chloride,"* Wang said. *"The one we used for this project has a lower melting point than table salt, low vapor pressure, and is organic."*

For more information, visit the following link:
https://news.ucr.edu/articles/2023/09/28/scientists-unveil-fire-safe-fuel

Reference
Bernstein, J. (Sep 28 2023). Scientists unveil fire-safe fuel. Recovered Sep 28, 2023, University of California Riverside:
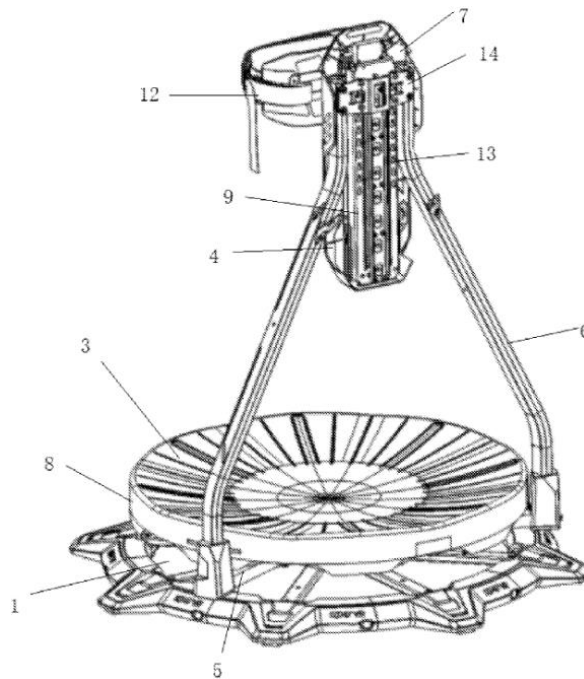https://news.ucr.edu/articles/2023/09/28/scientists-unveil-fire-safe-fuel

Information source: (University of California Riverside, 2023)

II. PATENTS

2.1.   Device and method for virtual walking

A device for visual walking includes an omnidirectional exercise machine and foot wearable devices. A method for visual walking is applied to the device for visual walking.

Is a structural schematic diagram of an omnidirectional exercise machine of the present disclosure.
Credit: Wang, B., WIPO IP Portal

When a user wears the omnidirectional exercise machine and uses the loading frame to adjust a height of the omnidirectional exercise machine, and wears the foot wearable devices to stand and run on a running plate, human body posture data is obtained by tracking a human body torso. Then displacement data of left and right feet is obtained by tracking the feet. A virtual position and a movement speed of the feet are respectively obtained according to the displacement data, the leg posture is inferred by the IK algorithm according to the virtual position and the walking action of the virtual character is controlled according to the human body posture data, the movement speed of the feet, and the leg posture.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US407843918&_cid=P21-LMV0MH-30735-1

Reference
Wang, B. (Sep 21, 2023). Device and method for virtual walking. Recovered Sep 22, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/es/detail.jsf?docId=US407843918&_cid=P21-LMV0MH-30735-1

Information source: (WIPO IP Portal, 2023)

2.2.   Systems and methods for digital surface model reconstruction from images using Artificial Intelligence

Systems and methods for creating digital surface models (DSMs) are disclosed, including a method comprising generating, with Machine Learning algorithm(s), a candidate DSM of a first geographic area with first image(s) from a set of first images depicting a first characteristic.
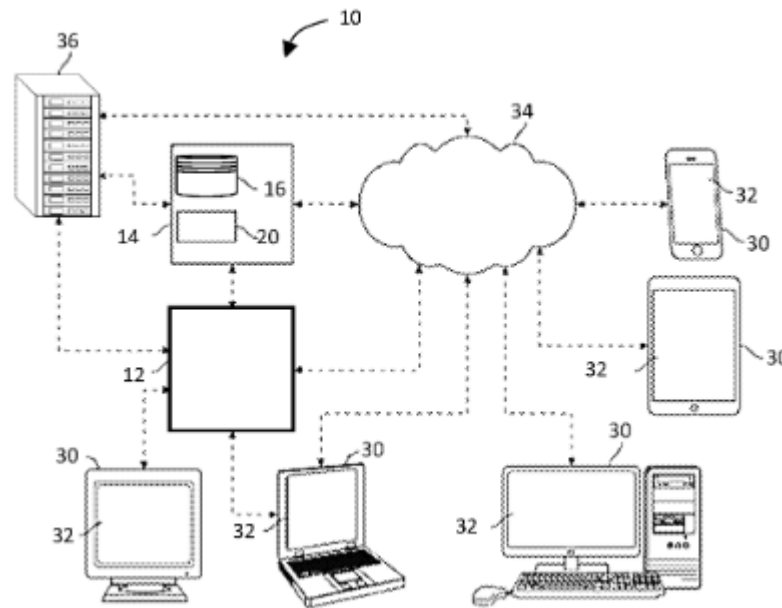
Schematic of an exemplary system for creating Digital Surface Models, in accordance with the present disclosure. Credit: Bhattacharjee, B.; Reddy, B.; Narasimhan, H.; Kumar, S.; Kulkarni, R.; Goyal, S. & Agaarwal, N., WIPO IP Portal

The candidate DSM having voxels identifying a location within the first geographic area and having an elevation value; comparing elevation values for voxels of the candidate DSM to corresponding elevation values for voxels of a predetermined DSM, created with a set of second images of the first geographic area having a second characteristic including features beyond that provided with the set of first images, to determine error; adjusting, via back-propagation, the Machine Learning algorithm(s) based on the determined error; and generating with the trained Machine Learning algorithm(s), a DSM using a set of third images depicting a second geographic area.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023178162&_cid=P21-LMV0CZ-27253-1

Reference
Bhattacharjee, B.; Reddy, B.; Narasimhan, H.; Kumar, S.; Kulkarni, R.; Goyal, S. & Agaarwal, N. (Sep 21, 2023). Systems and methods for digital surface model reconstruction from images using Artificial Intelligence. Recovered Sep 22, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023178162&_cid=P21-LMV0CZ-27253-1

Information source: (WIPO IP Portal, 2023)

2.3.   Clothing standardization detection method and apparatus

This disclosure relates to a clothing standardization detection method. In an example method, a clothing standardization detection apparatus obtains a video frame sub-image and a reference sub-image.
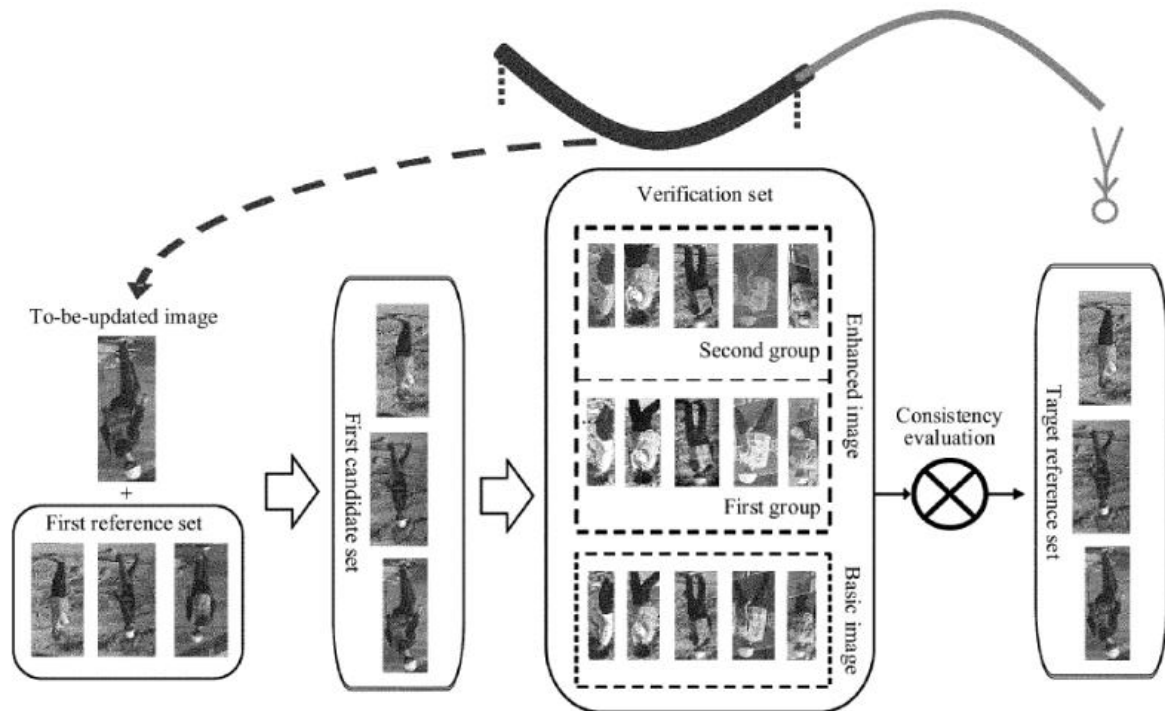
Schematic flowchart of another clothing standardization detection method according to an embodiment of this application;
Credit: Lu, R.; Xie, Y.; Yu, X. & Chen, P., WIPO IP Portal

The video frame sub-image includes an image of a first wear style of a target part of the target object in the first scenario, and the reference includes an image of a standard wear style of a target part of the reference object in the first scenario. Then, the video frame sub-image and the reference sub-image are processed by using a target model, to obtain a first processing result. The target model is a trained Artificial Intelligence AI model, and the first processing result indicates a similarity between the first wear style of the target part of the target object and the standard wear style of the target part of the reference object.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US407848750

Reference
Lu, R.; Xie, Y.; Yu, X. & Chen, P. (Sep 21, 2023). Clothing standardization detection method and apparatus. Recovered Sep 22, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US407848750

Information source: (WIPO IP Portal, 2023)

2.4. Systems and methods of providing rewards to users based on activities performed by the users using applications

The present disclosure provides a method of providing rewards to users based on activities performed by the users using applications. Moreover, the method may include receiving, using a communication device, a request from a user device associated with a user.
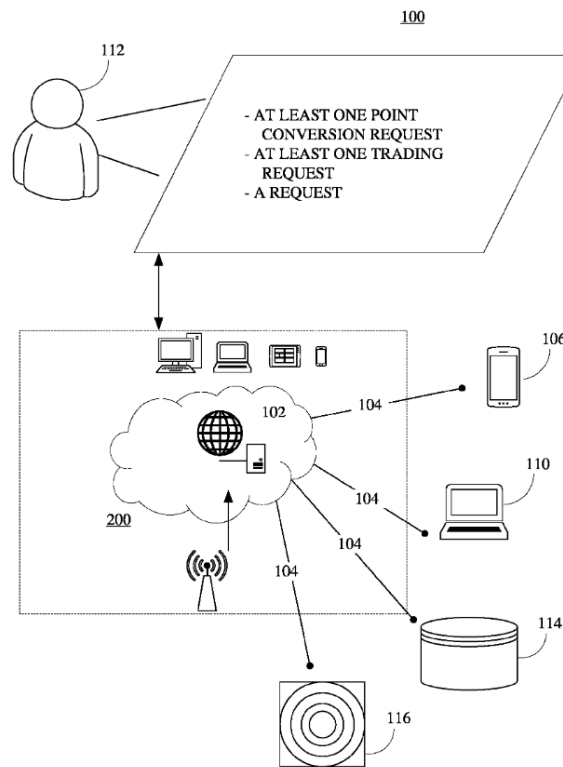
Illustration of an online platform 100 consistent with various embodiments of the present disclosure.
Credit: Bhoopsingh, J., WIPO IP Portal

Accordingly, the method may include analyzing, using the processing device, the one or more activity data using one or more Machine Learning models. Furthermore, the method may include determining, using the processing device, a number of points for the one or more activities based on the sweat equity of the one or more activities using one or more criteria. Moreover, the method may include retrieving, using a storage device, a user account associated with the user. Accordingly, the method may include updating, using the processing device, the user account based on the determining of the number of points.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023177924&_cid=P21-LMZBF3-60537-1

Reference
Bhoopsingh, J. (Sep 21, 2023). Systems and methods of providing rewards to users based on activities performed by the users using applications. Recovered Sep 22, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023177924&_cid=P21-LMZBF3-60537-1

Information source: (WIPO IP Portal, 2023)

2.5.   Method for generating instructions for fabricating a garment

An improved method for fabricating a user-generated garment.
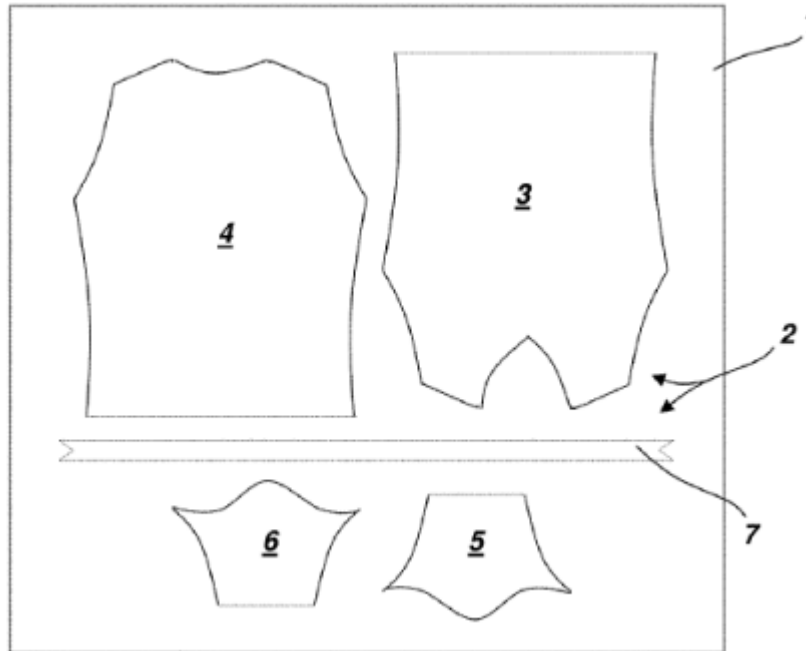
Shows an exemplary first document or at least a part of a third document.
Credit: Wilcox, W., WIPO IP Portal

In one embodiment, garment data related to a predefined or default garment is received, shape and finish pieces of the garment are separated, a template for each shape piece is selected that comprises information about a position and orientation relative to a human body, the shape pieces are assembled in 3D, a finish macro for each finish piece is selected that comprises assembling instructions for assembling the finish piece to the assembled shape pieces, a preliminary 3D garment is visualized on an avatar in a graphical user interface, a garment adjustment process is performed using the graphical user interface to generate a user-generated garment, and fabrication instructions for fabricating the user-generated garment are generated.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US407848667&_cid=P21-LN0G4D-73347-1

Reference
Wilcox, W. (Sep 21, 2023). Method for generating instructions for fabricating a garment. Recovered Sep 22, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US407848667&_cid=P21-LN0G4D-73347-1

Information source: (WIPO IP Portal, 2023)

2.6. Trunk-and-branch Blockchain ledger architecture for validation of claims

Systems, devices, and methods are provided for trunk and branch Blockchain ledger architecture for validation of real-world claims. Claims may relate to objective claims, such as an individual's work history or whether an organization has insurance coverage.
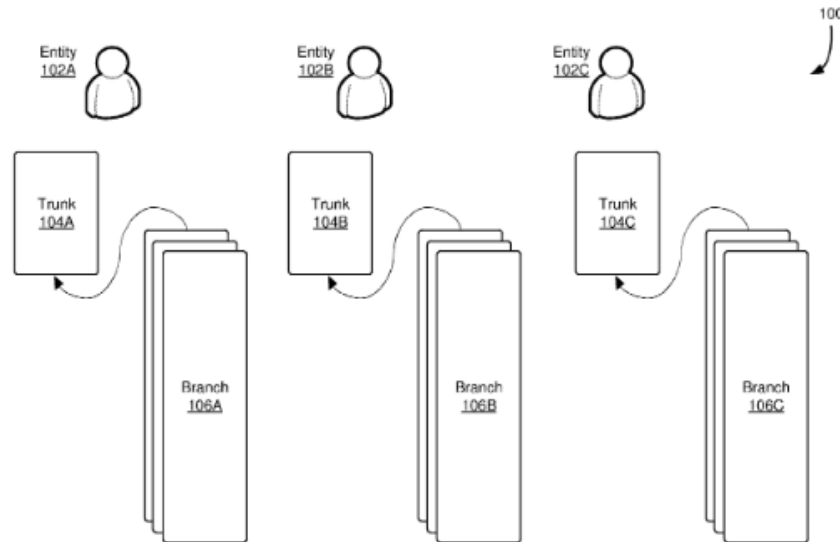
Illustrates a trunk-and-branch model for utilizing Blockchain technologies, in accordance with one or more example embodiments of the present disclosure. A trunk-and-branch architecture may be used to implement endorsed resumes and other applications involving verifiable claims.
Credit: Tothill, K. & Brothers, J., Espacenet Patent Search

Trunks and branches may be used to implement a network of cross-ledger claims and endorsements. A first entity (e.g., endorser) may make a claim on a first branch Blockchain ledger that is controlled by the first entity. A second entity (e.g., endorser) may review the claim, determine whether it is true, and then produce an endorsement on a second Blockchain ledger that is controlled by the second entity. The endorsement may be an encoded version of the claim that cannot be used to reverse-engineer the claim. An endorsement pointer may be recorded to the first branch Blockchain ledger that references the endorsement recorded by the second entity to the second Blockchain ledger.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086051914/publication/WO2023177574A1?q=Blockchain

Reference
Tothill, K. & Brothers, J. (Sep 21, 2023). Trunk-and-branch Blockchain ledger architecture for validation of claims. Recovered Sep 22, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/086051914/publication/WO2023177574A1?q=Blockchain

Information source: (Espacenet Patent Search, 2023)

2.7.   Generating synthetic interior room scene data for training Arificial Intelligence-based modules.

A computer-implemented method of generating synthetic training data for training an Artificial Intelligence-based module for modelling, reconstructing and/or visualizing an interior room is described.
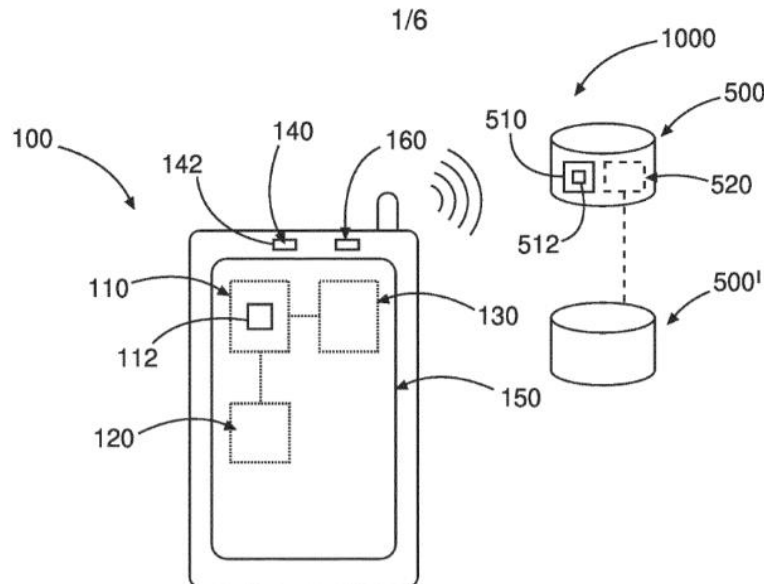
Shows a computing system for modeling and/or reconstructing an interior room according to an examplaru embodment.
Credit: Kurz, M.; Schoosleitner, M. & Gadermayr, M., Espacenet Patent Search

The method comprises providing and/or generating one or more parametric models representative of one or more interior rooms, each parametric model being adjustable in one or more parameters associated with one or more of an angle between two boundaries of the interior room, a number of boundaries of the interior room, a geometrical shape of the interior room, a floor plan of the interior room, and one or more dimensions of one or more boundaries of the interior room. The method further comprises varying parameters of the parametric models provided for the interior room, thereby generating a plurality of representations of the one or more interior room. Further, synthetic training data usable for training an Artificial Intelligence-based module is generated, the synthetic training data being descriptive of at least a subset of the generated representations of the at least one interior room.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/081326876/publication/WO2023174561A1?q=artificial%20intelligence

Reference
Kurz, M.; Schoosleitner, M. & Gadermayr, M. (Sep 21, 2023). Generating synthetic interior room scene data for training AI-based modules. Recovered Sep 22 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/081326876/publication/WO2023174561A1?q=artificial%20intelligence

Information source: (Espacenet Patent Search, 2023)

2.8.   Intra oral scanner and computer implemented method for updating a digital 3D scan

According to an embodiment, a computer implemented method and a scanner system are disclosed. The computer implemented method for updating a current digital 3D scan representing the surface of a physical object with an at least one new 3D scan, where the updating of the current digital 3D scan provides an updated digital 3D scan representation of the surface of the physical object is disclosed.
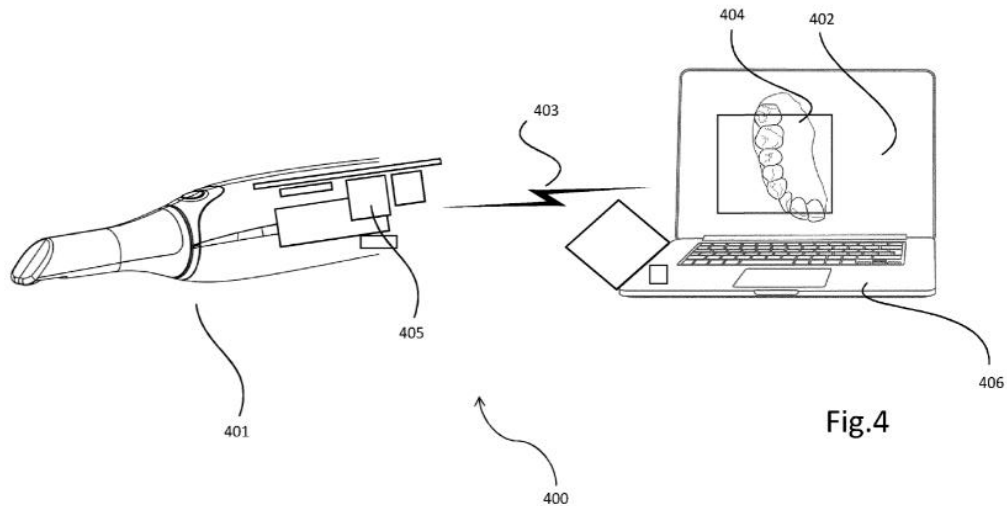
Illustrates an embodiment of a scanner system as disclosed herein.
Credit: Hoedt, A., Espacenet Patent Search

The computer implemented method may comprise obtaining the current digital 3D scan, obtaining the at least one new digital 3D scan, determining an inconsistent digital 3D scan, where at least a part of the new digital 3D scan does not overlap with at least a part of the current digital 3D scan, and creating the updated digital 3D scan, which represent the physical object by applying the inconsistent digital 3D scan to the current digital 3D scan.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/080787087/publication/WO2023175003A1?q=3D

Reference
Hoedt, A. (Sep 21, 2023). Intra oral scanner and computer implemented method for updating a digital 3D scan. Recovered Sep 25, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/080787087/publication/WO2023175003A1?q=3D

Information source: (Espacenet Patent Search, 2023)

2.9.   Sharing received objects with co-located users

Users of electronic eyewear devices can interact with each other by sharing 3D objects (e.g., 2D or 3D augmented reality (AR) objects or scanned 2D or 3D images of real-world objects) with each other via local objects (real or virtual) in each user's environment established as personalized anchor points for social connection.
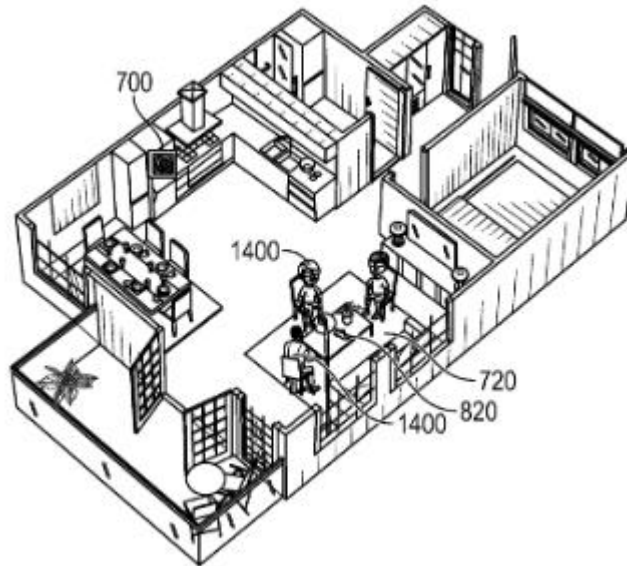
Is an illustration depicting the sharing of the received 3D scanned show with co-located users.
Credit: Tham, Y.; Vaish, R. & Kratz, S., Espacenet Patent Search

When a user receives an object from another user, the user has the option to generate a connected session with other users that are co-located (physically or virtually at the same location) with the user. The co-located group of users in this new connected session may view the received object either on their personal electronic devices (e.g., smartphones) or on their electronic eyewear devices and can modify and annotate the shared object using collaboration software and AR display tools that enable modification and manipulation of the shared object.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/088024050/publication/WO2023177521A1?q=virtual%20reality

Reference
Tham, Y.; Vaish, R. & Kratz, S. (Sep 21, 2023). Sharing received objects with co-located users. Recovered Sep 25, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/088024050/publication/WO2023177521A1?q=virtual%20reality

Information source: (Espacenet Patent Search, 2023)

2.10.   Machine Learning model for fraud reduction

Using a Machine Learning model(s) for fraud reduction is described. A payment service computing platform may receive, from an electronic device, user data associated with a user, and dynamically determine an incentive(s) associated with the user based on the user data.
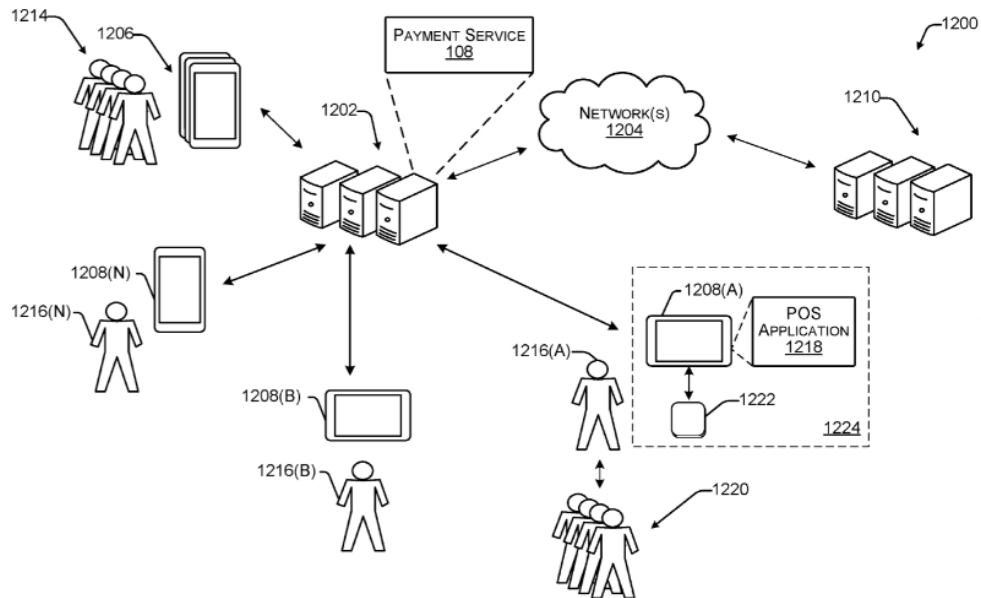
Is an example data store used for performing techniques described herein
Credit: Sardari, M.; Monteux, A.; Woods, M.; Boates, B.; Stolp, D.; Chhabra, M. & Cole, S., Espacenet Patent Search

The incentive(s) may be determined using a trained Machine Learning model(s) that is trained based on previously collected user data. The payment service computing platform can then cause a user interface to be displayed via a payment application executing on the electronic device, wherein the user interface presents an interactive element(s) for receiving the incentive(s) in exchange for the user referring at least one other user to a payment service.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/085601539/publication/EP4246120A1?q=machine%20learning

Reference
Sardari, M.; Monteux, A.; Woods, M.; Boates, B.; Stolp, D.; Chhabra, M. & Cole, S. (Sep 21, 2023). Machine Learning model for fraud reduction. Recovered Sep 25, 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/085601539/publication/EP4246120A1?q=machine%20learning

Information source: (Espacenet Patent Search, 2023)