

Technology Scan

Focus: Digital Innovations for Sustainable Development

ASIA-PACIFIC

AUSTRALIA

Digital tool for water management

Southeast Water's Environmental Sensitivity Map, is a tool created to proactively protect the environment within Melbourne's south-east in the event of a sewer spill. This initiative is just one of the multiple projects that are helping the organization protect its environment and deliver for its customers. This tool will help to better understand the biodiversity in the region and to act faster and more responsibly to protect it if there's a risk to the health of the environment.

Southeast Water has also embarked on a significant digital transformation and is progressing with a substantial expansion of its recycled water network. To date, its digital metering program has saved customers close to one billion liters of water and more than \$4.4 million by detecting household leaks. The next phase of the digital metering program will see it supporting businesses and industry to save water through the installation of next-generation digital data loggers.

In recent years, the organization has embarked on multiple innovative projects to rise to the challenges of this critical decade for water in the face of changing weather patterns and evolving customer expectations.

<https://utilitymagazine.com.au>

BHUTAN

Digital Dzongkha Braille Board

A group of former students of the College of Science and Technology have created Bhutan's first-ever prototype of electronic Dzongkha Braille. The device developed by former college students

is called as Digital Dzongkha Braille Board. Initially, it was a college project, however, the innovation has evolved into a passion to help the visually impaired in reading and writing Dzongkha, according to *The Bhutan Live* report.

The group of young people - Mani Kumar Basnet, 24, Ugyen Tshering, 25, Sonam Wangmo, 24, and Garab Gyeltshen, 23 decided to have Digital Dzongkha Braille Board as a project for the final year of their bachelor's in electronic and communication engineering course at the College of Science and Technology. However, the college project turned into a passion. The aim of young people was fueled by the lack of accessible Dzongkha electronic Braille machines and the high price of Braille devices available in other nations. The device developed by young people features six buttons that enable users to effortlessly write Braille alphabets. The device converts the input into an audible sound or tactile pop-up that can be read by touch, providing multiple ways for the visually impaired to interact with the text.

The aim of the founders was to work on assistive technology to help those in need. They decided to help the visually impaired. While researching, they found that there are lots of devices to help the visually impaired, but they were also very expensive. Less than Nu 15,000 have been used to develop the prototype. The team has planned to further reduce the price to less than Nu 10,000 to make it accessible to more people.

The team is currently focused on writing, reading, and saving files. Saving happens over SD cards right now but eventually, it will be through cloud storage in the future. In the future, the team wants to design it so that it can interface with our mobile phones through Bluetooth or Wi-Fi connections.

<https://www.freepressjournal.in>

CHINA

AI-based satellite

China's Taiyuan Satellite Launch Centre launched the world's first in-orbit artificial intelligence (AI) commercial hypersatellite from waters off the coast of Yangjiang City in south China's Guangdong Province. A Smart Dragon-3 (SD-3) carrier rocket blasted off from the launch site, sending a group of nine satellites, including the AI commercial hypersatellite and a distant retrograde orbit (DRO) satellite, into planned orbit. In addition, the SD-03 sent the Egyptian NExSat-1 satellite into orbit this time as well, marking its first international payload launch.

Developed by Guoxing Aerospace Technology Co., Ltd. in Chengdu City of southwest China's Sichuan Province, the AI commercial hypersatellite, named "Rongpiao" or "Xingshidai-18," is a new integrated sensing network satellite equipped with the company's sixth generation "satellite brain" system.

The AI satellite is designed to carry out on-orbit verification of the synaesthesia fusion AI algorithm once entering the orbit and will have remote integrated platform capability for future communication networks.

<https://news.cgtn.com>

Superconducting quantum chip

The third-generation superconducting quantum computer, "Origin Wukong," was launched at Origin Quantum Computing Technology in Hefei. According to the news outlets, the "Origin Wukong" is powered by a 72-qubit superconducting quantum chip, known as the "Wukong chip." This development marks a new milestone in China's quantum computing journey as it's the most advanced programmable and deliverable superconducting quantum computer in China, as per a joint statement

from the Anhui Quantum Computing Engineering Research Centre and the Anhui Provincial Key Laboratory of Quantum Computing Chips, shared with the Global Times.

Superconducting quantum computers, such as the “Origin Wukong,” rely on an approach being investigated by several other quantum computer makers, including IBM and Google quantum devices.

The “Origin Wukong” is equipped with Origin Quantum’s third-generation quantum computing measurement and control system, according to the media. This system has enabled China’s first automated batch testing of quantum chips, significantly increasing the efficiency of quantum computing operations. “Wukong chip” comprises a total of 198 qubits, including 72 working qubits and 126 coupler qubits. As its name suggests, a coupler qubit is used to facilitate interactions between other qubits, sometimes referred to as working qubits.

<https://thequantuminsider.com>

INDIA

Robots for logistics

Addverb, a global robotics company based in India, revolutionizes intralogistics operations with advanced technology, combining in-house hardware and software for optimal automation efficiency. Their team focuses on innovation to lead in warehouse and supply chain solutions. With manufacturing capabilities, they offer flexible solutions across Robotics, AS/RS, Picking, and Software verticals.

Addverb’s participation in INDIA is not just a display of automation capabilities; it represents a commitment to contributing to India’s ongoing discussion on technological trends. It is entering the Indian market through this platform solidifies its dedication to the growing logistics sector.

Addverb Technologies is set to exhibit a range of innovative products that represent efficiency, precision, and advancements in the logistics and intralogistics sector. The Zippy family, including the highspeed robotic sorter Zippy, autonomously navigates using

grid markers and obstacle detection, handling various payloads and achieving up to 30,000 sorts per hour.

Veloce, Addverb’s Multi-Carton Picking Robot, offers adaptable storage solutions for cartons, crates, and totes, utilizing grid-based navigation for precise movement in narrow aisles and enabling efficient double-deep storage and recovery.

Quadron, the versatile carton shuttle, automates the storage and recovery of goods weighing up to 50 kg, enhancing productivity with double-deep storage, high output, and up to 25 units per aisle, reaching 20m in height.

The Dynamo family introduces the intelligent mobile robot Dynamo, navigating complex environments using LiDARs and SLAM algorithms. With a durable design sticking to safety standards, Dynamo supports material movement of up to 1500 kg, showcasing advanced AI capabilities.

Addverb’s Autonomous Forklift integrates SLAM navigation, dynamic pallet detection, and obstacle avoidance for efficient material handling. With a payload capacity of 1500 kg and variants offering up to 3000 mm lifting height, it provides flexibility and safety in logistics operations.

<https://themachinemaker.com>

AI-enabled smart energy management system

Tata Power has initiated a trial of an AI-enabled smart energy management system. In the pilot, they will be testing this system on 55,000 residential and 6,000 commercial and industrial consumers of Mumbai. As a part of this pilot project, when power-guzzling air conditioners are switched on in the coming days, Tata Power expects its ‘Demand Response Program’ to help its consumers optimize electricity demand. A message will be sent to these consumers, who are part of the pilot project, about the peak hour, probable market rate, and time when the peak hour might end. These consumers also include big office spaces, commercial complexes, and government agencies.

The customers can defer the use of AC and switch it off during the peak

hours and cool the room before the peak hour hits. By doing this, the load will come down. Also, it will be able to monitor these customers on how they optimized their use of electricity.

The company proposed to provide a one-time incentive of ₹25 and ₹1 per unit saved by all residential consumers who have participated in this pilot project. At present, Mumbai’s electricity demand is cruising at around 2,800-2,900 Mw, which is expected to increase in the coming days. This system would be helpful, especially with the rising temperatures and demand for electricity expected to go up. The power distributing companies of Mumbai have long-term power purchase agreements but still have to buy from the open market owing to the swelling demand.

In the initial period, Tata Power expects to prevent the use of 75 Mw in six months and aims to touch 200 Mw by the summer of 2025. During peak hours, the power distribution companies buy electricity from the open market. At present, the open market rate per unit of electricity is around ₹3-3.50 or so, which zooms upwards to even ₹6-8 per unit during summers. Incidentally, last year when there was a coal shortage all around the country, per unit cost in the open market had touched even ₹16-18.

<https://www.hindustantimes.com>

INDONESIA

Parcel sorting robots

PT Pos Indonesia has introduced robotic parcel sorting technology at its processing center in Surabaya, a port city on the island of Java, as part of its move toward full automation. The t-Sort system from Libiao Robotics has been integrated with Pos Indonesia’s existing IT system along with RFID parcel scanning software; to enable parcels and letters to be tracked from the moment they leave the sender until they arrive at the delivery address. “Everything is connected,” explained Faizal Rohmat, a director of Pos Indonesia. “This means we will be able to ensure the fast and safe parcel and letter delivery that our customers expect.”

The t-Sort system consists of sorting robots, an easy-to-assemble operating platform, and control software. Its modular design means it is quick and easy to relocate, so Pos Indonesia can reconfigure the sorting process with minimal disruption to the business. Robots can be added or removed in line with parcel volumes to ensure optimum throughput speeds and maximum energy efficiency. The switch from manual to automated parcel sorting at the Surabaya processing facility means Pos Indonesia has been able to reassign 80% of its staff to more profitable tasks within the business.

<https://www.parcelandpostaltechnologyinternational.com>

JAPAN

Digital technology for sustainable farming

Japan's dairy farming industry has been struggling in recent years. Demand for milk dropped during the pandemic, leading to concerns that huge volumes of milk would go to waste in 2021 and again in 2022. The rising prices of imported feed and soaring fuel and energy costs only added to the pressure on dairy farmers. A July 2023 survey by the Japan Dairy Council found that 85 percent of Japanese dairy farmers were operating at a loss, and roughly 60 percent of them were considering leaving the dairy farming industry.

In response to these challenges, both the government and the industry have implemented a range of initiatives; but as Shinya Kobayashi — president and CEO of Farmnote Holdings Inc. — points out, "It's vital that dairy farmers understand management practices and aim to enhance productivity." Kobayashi founded an IT startup in 2004 and learned of the difficulties dairy farmers face in keeping tabs on each individual dairy cow through conversations with a dairy farming client.

Aiming to help tackle these challenges, Kobayashi established Farmnote Holdings in 2013; and in 2014, the company launched a smartphone app for dairy and beef cattle farmers called Farmnote Cloud. The company then

introduced wearable sensors for cows called Farmnote Color. By attaching these devices to the cows' necks, the system enables 24-hour monitoring of their activities and heat cycles, signs of calving, and changes to their health. The system uses artificial intelligence to learn and analyze individual differences, allowing for remote cattle management — thereby helping dairy farmers to enhance productivity and utilize their time more effectively.

Increasing per-cow productivity leads not only to reduced water and energy use and the lowering of cattle stress levels, but it also enables greenhouse gas emissions reductions. By centrally managing a variety of data sets and automatically identifying individual cows requiring attention, our system can also make the work of dairy farmers easier.

In 2019, the Farmnote Group established Farmnote Dairy Platform Inc. and set up a farm in the town of Nishibetsu in Hokkaido. Through dairy-farming digital transformation initiatives based on systems they have developed in-house; they are working to create a framework that combines high profitability with sustainability.

The team has made significant progress with automation and mechanization — including installing cow-milking robots that enable up to 120 cows to be milked per day, and curtains and ventilation fans that operate in response to sunlight and temperature conditions. This reduction in human intervention also helps to alleviate stress among the cattle, and it is common to see the cows in the barn calmly resting and eating.

To enhance dairy-farming productivity, analyzing cows' genetics to increase the number of high-productivity cows is crucial. To achieve this, Farmnote conducts genetic testing and provides services such as Farmnote Gene — which presents test results in an easily understandable manner and provides guidance on the next steps to take, as well as a genetics service distributing frozen fertilized eggs nationwide. These wide-ranging services are all aimed at the core goal of providing dairy farmers with visualization tools and support for decision-making.

In addition, the company has begun developing solutions aimed at reducing dairy farming greenhouse gas emissions — including sensors that measure the emissions of each cow — and has also become the first in Japan's dairy industry to be registered in a carbon credit scheme (the J-Credit Scheme) for its slurry-processing method. In August 2023, Farmnote Holdings entered into a capital and business partnership with Meiji Holdings Co., Ltd. Leveraging both companies' expertise and technologies for gathering data on individual cows, they aim to work together to support dairy farmers in reducing their greenhouse gas emissions and help make the dairy-farming industry more sustainable.

<https://sustainablebrands.com>

Flood and traffic management

Hexagon's Safety, Infrastructure & Geospatial division and Fujitsu Limited announced the joint development of digital twin applications for predicting and mitigating natural disasters and traffic accidents. The solutions reflect the two companies' ongoing efforts to realize resilient, disaster-resistant cities based on an alliance formed in June 2022.

To support disaster mitigation, the two companies are developing a prediction model that calculates the extent and impact of flooding from precipitation data, visualizes the extent of flooding, and performs damage prediction analysis. Based on the analysis, cities can develop disaster response plans.

To support traffic safety, the companies have focused on an application that identifies areas where heavy traffic and road design heighten the risk of accidents and proposes measures for improvement. The application would allow city planners and road administrators to develop safer, more resilient transportation networks.

Going forward, Fujitsu and Hexagon will continue conducting field trials with customers in the administrative, municipal, and transportation sectors to support decision-making for urban environmental optimization, with an

aim to develop solutions globally by the end of fiscal 2023 ending March 2024.

Coordinating and visualizing data across multiple areas, including medicine, transportation, energy, and the environment is vital to protect people and social infrastructure from the various threats posed by natural disasters and other dangers in an increasingly unpredictable world. Leveraging Fujitsu's Computing as a Service (CaaS) platform, which offers users a powerful suite of easy-to-use services based on Fujitsu's advanced computing and software technologies, alongside Hexagon's M.App Enterprise real-time geospatial application, the two companies will use Fujitsu's 'digital rehearsal' technology to analyze and verify disaster threats and optimal disaster preparedness in advance on a digital twin that replicates real-world conditions with incredible detail.

The combined solution uses flood forecasting models and precipitation data to perform sophisticated calculations and visualize flooding, as well as to address challenges and use cases in the medical, financial, public, and distribution industries, such as infrastructure damage forecasting, formulation of disaster response plans, and estimation of damage amounts. In addition, it aims to secure safe evacuation routes and support infrastructure protection in the event of abnormal weather and natural disasters by leveraging weather IoT sensors and weather forecast services that monitor temperature and rainfall.

Through a combination of Hexagon's geospatial visualization tool M. App Enterprise and Fujitsu's infrastructure services, the companies have developed an application that visualizes areas with high levels of traffic accidents; analyses traffic volumes, road design, signs, and other factors; and provides recommendations for reducing traffic accidents in accordance with the Road Safety Toolkit of the International Road Assessment Program (IRAP).

For example, in a spot where traffic volume is low but accidents frequently occur, several improvement measures, such as speed control, installation of warning signs, and separation of traffic routes between pedestrians and vehicles by guardrails, are presented

together for a cost-effective solution. These proposals for city planners, road administrators, local governments, and consulting services contribute to the reduction of traffic accidents and the creation of safe and secure communities.

<https://www.fujitsu.com>

Quantum computing with qubits

For a quantum computer to work, it is necessary to establish and manipulate subtle quantum interactions among multiple qubits — a state known as entanglement. However, for this to work, the qubits themselves need to remain stable or "coherent", which means keeping them in a well-defined quantum state. The problem is, that coherence is difficult to maintain as it easily crumbles when qubits interact with their surroundings — even radiation from space can throw them.

To solve this, a team of Japanese researchers led by Nobuhiro Yanai, associate professor at Kyushu University, has engineered a stable qubit using a special structure called a metal-organic framework. This structure involves combining pentacene molecules (made up of five connected benzene rings) with zirconium ions and organic dicarboxylate ligands. The pentacene molecules act like bridges, linking the ligands and ions together into a framework made up of both organic molecules and metal ions—hence the name.

The role of the qubit was played by a pair of neighboring pentacene molecules, which were coupled and exist within five different quantum states achieved by irradiating the metal-organic framework with various wavelengths of microwave radiation. The metal-organic framework's nanoscale voids offer the pentacene molecules a degree of freedom but ultimately restrict their full movement under the radiation's influence, ensuring they form a desired quantum state and remain trapped in it for a significant amount of time. The metal-organic framework in this work is a unique system that can densely accumulate [pentacene molecules]," said Yanai in a press release. Additionally, the nanopores inside the crystal enable [them] to rotate, but at a very restrained angle."

The most important result of the study was that the team could maintain coherence for more than a hundred nanoseconds at room temperature, whereas previously this could only be achieved in similar systems at incredibly cold temperatures of about -200 degrees Celsius. At such temperatures, it was possible to maintain coherence only in photonic qubits, but in addition to needing such extreme conditions to operate, quantum computers using these photon qubits suffer from photon leakage.

Maintaining cryogenic temperatures is not only expensive but complicates the entire computing setup. Thus, creating a stable qubit that operates at room temperature is an impressive and practical achievement. Looking ahead, the scientists are optimistic about extending coherence for even longer periods. They believe that by designing improved metal-organic frameworks and identifying more suitable molecules for qubits, they can push the boundaries further.

THE REPUBLIC OF KOREA

AI-based phone interpreting

The Republic of Korea's top mobile carrier SK Telecom Co. has launched an artificial intelligence-based telephone interpreting service in real-time for the first time in the country. SK Telecom introduced the A. Call Translator for its subscribers using the iPhone series through the A. app, which allows users of Apple smartphones to record calls based on AI.

The interpretation service, which is currently available in Korean, English, Chinese, and Japanese, is activated when an SK Telecom customer makes a call on the A. app and presses the service icon at the bottom of the dial pad. The recipient does not need to be an SK Telecom subscriber nor use an iPhone or the A. app.

When a caller uses the service, the recipient will be informed that the call will be interpreted. The company aims to increase the number of languages available for the real-time interpreting service and extend it for users of Android smartphones such as the Sam-

ung Galaxy series. When a Korean speaker calls a hotel in the US for a reservation using the A. Call Translator, the AI-based service will interpret the hotel employee's English responses into Korean, for example.

The service will be useful to foreign residents in the Republic of Korea, SK Telecom said. Foreigners living in the country who cannot speak Korean will be able to access services at government offices or make reservations for hotels and call hospitals in their own language.

<https://www.kedglobal.com>

<https://www.advancedsciencenews.com>

SAUDI ARABIA

AI-powered eye care solution

A consortium, consisting Saudi Authority for Data and Artificial Intelligence (SDAIA), King Khalid Eye Specialist Hospital (KKESH), Lean Business Services, and Saudi Company for Artificial Intelligence (SCAI) announced the unveiling of "Eyenai," the first AI-powered ophthalmic solution developed locally by Saudi AI engineers and experts in the field. This groundbreaking advancement in the realm of medical diagnostics in the region represents a significant milestone in the field.

Eyenai is set to become Saudi Arabia's pioneering eye screening solution that harnesses the power of artificial intelligence to precisely detect and diagnose diabetic retinopathy. By leveraging advanced analytics and intelligent algorithms, the solution is designed to simplify and expedite the screening process, addressing the challenges posed by limited resources, time-consuming examinations, and high costs.

Commenting on this launch, Dr. Adi Alowaifeer, Consultant and Assistant Professor of Ophthalmology, Chairman of Eyenai Management Committee, said: "The launch of Eyenai embodies the spirit of ingenuity and cooperation that defines Saudi Arabia's healthcare ecosystem. This solution has the potential to revolutionize diabetic reti-

nopathy screening by making it more accessible, affordable, and accurate. Our collective mission is to safeguard the vision of countless people and improve the overall quality of healthcare in the Kingdom."

The launch of Eyenai marks a significant milestone in the journey towards enhancing the nation's healthcare landscape. By leveraging cutting-edge AI and computer vision technologies, the new solution is setting benchmarks for early detection and intervention in diabetic retinopathy. Eyenai screening stations are currently available in multiple locations in Riyadh to be expanded across the Kingdom shortly. To learn more about Eyenai and where to find it, visit www.eyenai.

<https://www.zawya.com>

SINGAPORE

Transportable WiFi for disaster relief

CommsBox Ultra provides instant connectivity to quickly re-establish communications for civil defense and aid agencies in Asia-Pacific. In response to escalating natural disasters impacting remote communities across the Asia-Pacific region, Kacific introduces the new and enhanced CommsBox – CommsBox Ultra, a game-changing advancement in disaster communication technology aimed at redefining emergency preparedness and response capabilities in high-risk areas. This introduction expands Kacific's range of disaster communication products, offering an enhanced version alongside the existing and trusted CommsBox.

Building upon the success of CommsBox, CommsBox Ultra emerges in response to invaluable feedback from communities in disaster-prone regions. CommsBox Ultra brings forth a suite of unique features designed to fortify disaster response efforts:

Crafted with durable materials and advanced engineering, CommsBox Ultra features a reinforced structure, ensuring resilience in disaster zones and physical impacts during transportation across challenging terrains.

CommsBox Ultra sets a new standard in adaptability with three innovative detachable modules, including the antenna module, the electrical component module, and a dedicated wheel component. This user-friendly design harmonizes efficiency and flexibility by simplifying transportation, equipment compartmentalization, and rapid access to components. The integration of the wheel component significantly improves portability, enabling effortless deployment and repositioning in dynamic disaster scenarios.

<https://www.scoop.co.nz>

Climate data centre for tropical climate

The Sustainable Tropical Data Centre Testbed (STDCT) – the first of its kind for the tropical environment – hosted by the National University of Singapore's College of Design and Engineering (NUS CDE) is up and running, marking a significant milestone in data center (DC) innovation in Singapore. The initiative, led by NUS and the Nanyang Technological University, Singapore (NTU Singapore), is funded by the National Research Foundation in line with the Research, Innovation, and Enterprise (RIE) 2025 plan to position Singapore as a leading center for green services and solutions to transform sustainable industries.

Bridging the gap between research and practical applications, this pioneering initiative brings together academia and industry partners to fast-track the adoption of innovative and sustainable DC cooling solutions tailored for the tropical climate. These collaborative efforts will set new sustainability standards for DC operations in the tropics.

The Sustainable Tropical Data Centre Testbed brings together researchers and companies to drive innovations in cooling technologies and improve the sustainability of data centers in the region. The STDCT programme, jointly led by NUS and NTU in close partnership with the industry, has been fostering a thriving ecosystem for innovative cooling ideas to flourish. The opening of the testbed facility today will accelerate the creation and translation of game-changing DC cooling technol-

ogies that are well-suited for tropical urban settings like Singapore, further advancing the sustainability efforts of the DC sector locally and beyond.

The STDCT is an infrastructure that supports a comprehensive research programme to develop cooling solutions for the sustainable operation of DCs in the tropics which was initiated in June 2021. Since the programme's inception, 20 industry collaborators have contributed state-of-the-art technologies and are actively engaged in technology co-development. The test-bed facility provides a platform for co-innovation, capitalizing on the synergy between academia and industry to generate important discoveries and transformative advancements that would benefit the tropical DC sector.

The STDCT stands as a flexible, full-scale live facility that combines cutting-edge research and real-world application. Occupying a floor area of 770 m², this is a living lab for scientists to experiment and validate innovative cooling ideas, and it also serves as a de-risking platform for companies to test and optimize new technologies in a realistic, tropical setting.

Ultimately, the STDCT programme aims to demonstrate the following outcomes in a tropical setting by mid-2024:

- Reduce energy consumption by up to 40 percent
- Reduce water usage by 30 to 40 percent
- Reduce carbon dioxide emissions by about 40 percent to less than 0.54 million tons per year

Achieve Power Usage Effectiveness (PUE) of less than 1.2 for a combination of air and liquid cooling (This is below the current requirement of 1.3 set by the Singapore government, and the global average of 1.5 in 2022.)

A whitepaper will also be developed to provide recommendations on optimum DC design and operations, and this is expected to be released in the fourth quarter of 2024. Liquid-cooled heat sink with air-cooled fin array to mitigate the risk of single-point failure associated with liquid cooling.

The STDCT will support five research projects.

Three projects will focus on the development of cutting-edge cooling technologies. A research team led by NUS is designing a unique heat sink coupled with immersion cooling for enhanced cooling performance. Another NUS team is pioneering the world's first direct chip hybrid cooling system, which consists of a high-performance hybrid sink design with two modes of cooling – air and liquid cooling. The third NUS team is validating the potential of a novel cooling solution that uses a high-performance hygroscopic material to significantly improve cooling efficiency.

In tandem, scientists from NTU are leading two research projects: one project aims to establish the optimum temperature and humidity setpoints for air-cooling of data centers in the tropics, and the second project will develop a digital replica, i.e., a digital twin, for multiple innovative cooling technologies of the testbed facility, to enable real-time performance modelling and prediction, and empower AI-based optimization toward energy efficiency and sustainability.

The STDCT programme not only addresses the immediate demand for sustainable DC operation practices in the tropics but also nurtures talents to prepare the industry for future growth.

<https://indiaeducationdiary.in/>

EUROPE

GERMANY

Digital infrastructure for ocean cleanup

CleanHub, a German company stopping plastic from entering our oceans, addresses the waste management gap in developing countries and the funding shortfalls for efficient waste infrastructure. Two billion people in coastal regions worldwide do not have access to proper waste management. It establishes waste management connections in coastal regions previously underserved and offers plastic credits to eco-conscious businesses in alignment with the growing consumer

demand for sustainable products and practices. In the process, this offers brands an opportunity to enhance their sustainability credentials and gain a competitive edge in the market.

With heightened scrutiny on greenwashing, brands are increasingly seeking transparency in their climate initiatives. CleanHub has developed a track and trace system, with each bag of waste weighed, photographed, and monitored through AI and manual checks, ensuring accountability. CleanHub became the first plastic credit system verified by TÜV SÜD under the ISO 14064-3 standard, adapted for plastic credit verification, setting a new benchmark for transparency and rigor within the plastic credit market.

Founded in 2020, CleanHub collaborates with partners to drive the circular economy, assuring the efficient collection, processing, and reintroduction of plastic waste. As recycling rates are expected to rise from 9% to 30% by 2030, the market for recycled material feedstock is projected to increase more than fivefold to \$170 billion during the same period. This growth emphasizes the sizable potential and importance of CleanHub's work in this sector.

<https://www.eu-startups.com>

AI-powered exoskeletons

Bavaria, Germany-based German Bionic, a robotics firm that develops and manufactures smart power suits and other wearable technologies. Their manufactured exoskeletons automatically apply self-learning and artificial intelligence to support lifting movements and prevent poor posture, thereby becoming an intelligent link between humans and machines.

The German Bionic smart power suits and wearables protect workers' health, reducing the risk of accidents and injuries, and improving work processes. Both the Apogee and the Apogee+, which were specially developed for the care sector, are the world's first AI-based, fully connected robotic wearables for the workplace. The Apogee+, which was launched last summer, provides active support for nursing staff in hospitals and care facilities when lifting and mobilizing patients.

In contrast to non-electrically powered passive exoskeletons with exposed mechanical components, the Apogee+ features a closed unibody design that is not only easy to disinfect but also ensures effective protection against the risk of injury. An ergonomic early warning system provides real-time data to protect employees' health, reduce accidents, and improve work processes.

The company said that it has secured €15M in an extension Series A round of funding. The funding round was led by German automotive supplier Mubea, with participation from existing investors Benhamou Global Ventures, Bayern Kapital, IT Farm, Kailua Ventures, Cumberland VC, and Family Office Klein. The German company says it will use the funds to scale up its market activities and production to meet the increasing demand from industry, logistics, and healthcare. German Bionic is benefiting from today's trend towards investing in occupational health and safety to ensure a resilient and motivated workforce of tomorrow.

<https://siliconcanals.com>

SWEDEN

Advanced vacuum system for waste management

As the world continues to evolve at a rapid pace, the area of automated waste collection is also undergoing significant advancements. Envac, a Swedish company is committed to driving progress towards a cleaner and more efficient waste management system. One of the considerable benefits of automated waste collection is its high degree of automation. With its advanced vacuum system, the technology significantly reduces the need for manual labor, makes the waste collection process more hygienic, and reduces its environmental impact. Apart from automation, it also profoundly impacts cleanliness and hygiene. Swiftly removing waste from public spaces minimizes the spread of diseases and promotes better hygiene. This is particularly important for hospitals where patients and staff need a safe and healthy environment. Additionally, it has the po-

tential to lower expenses while simultaneously enhancing productivity.

The Envac system only requires users to interact with the waste inlet, where they deposit their waste. The inlets are typically placed within 30 meters of residential or office buildings in a group, with separate inlets for each type of waste. Users sort their waste at home and dispose of it in the appropriate unit, making the sorting process simple and encouraging recycling.

Compared to traditional waste rooms or bins, the inlets are completely sealed, minimizing unpleasant smells, mess, and unsanitary conditions, as well as reducing the risk of vermin. The waste inlets are connected to an underground pipe network, and emptying occurs when the inlets are full, improving energy efficiency. The waste is transported through the pipe network using negative airflow that sucks the bags to a remote collection station at a speed of 70km/h. Emptying takes only a few minutes per waste stream.

Being underground makes the Envac system resilient to extreme weather events, and with smart automation, it remains reliable even during times of societal pressure. The waste collection station can be two kilometers, or further, from the central urban area, reducing the impact of heavy traffic, such as noise, air pollution, and traffic jams. All the waste streams are transported through a single pipe network, with each waste stream emptied separately and directed to the corresponding waste container at the collection station. The air used for transportation is cleaned through an industrial filter before it is released from the building.

When a container is full, a standard collection vehicle takes it away for processing, reducing heavy waste-related traffic and carbon emissions by up to 90% compared to traditional, multiple collections. This makes the Envac system key to achieving sustainable urban development goals and creating a greener planet. Digitalization has significantly impacted waste collection in recent years, allowing waste management companies to monitor their operations, leading to more efficient and cost-effective waste collection processes. For example, sensors are

installed in waste inlets to detect when they are full, enabling the system to be energy efficient.

The automated waste collection system has transported approximately 240,775 tons of waste so far. The system has improved urban planning and management by eliminating heavy-duty collection vehicles and bulky waste storage containers on the streets. From an environmental perspective, it has prevented approximately eight tons of carbon emissions annually, equivalent to 232 tons over the last 25 years. Additionally, it has eliminated 15 tons of nitrogen oxide and 58 tons of carbon monoxide over time.

<https://www.innovationnewsnetwork.com>

UNITED KINGDOM

AI-based Robo guide

This innovative AI-powered robot, equipped with four legs, is designed to advance the mobility requirements of visually impaired individuals in various public settings such as museums, shopping centers, and hospitals. Through cutting-edge technology, RoboGuide aims to provide newfound independence for those with visual impairments, enabling them to navigate these spaces with greater ease and confidence. To aid the 2.2 billion individuals globally, including two million in the UK, living with sight loss, the project is committed to launching an enhanced version of the technology in the foreseeable future.

In a similar project, engineers from Binghamton University's Computer Science Department in New York State developed a robotic seeing-eye dog to enhance accessibility for the visually impaired. Recently, they showcased a robot dog guiding a person down a lab hallway, responding adeptly to instructions.

Researchers at the University of Glasgow (UOG) claim that four-legged, two-legged, and wheeled robots often face a significant limitation in their ability to assist the visually impaired due to their navigation technology. While GPS-dependent robots excel

outdoors, they falter indoors, where signal strength diminishes. Conversely, camera-based robots rely on the line of sight, posing challenges in safely maneuvering around obstacles or corners. This discrepancy hinders their effectiveness as reliable guides for individuals with visual impairments.

The quest for a comprehensive solution continues, aiming to bridge these gaps and enhance the autonomy and safety of visually impaired individuals in diverse environments. Utilizing a network of advanced sensors integrated into its structure, the RoboGuide system adeptly surveys and evaluates its environment with precision. Developed software on Unitree Go1 quadruped enables the robot to acquire knowledge of optimal routes between destinations and interpret real-time sensor data to navigate dynamic obstacles effectively while assisting individuals.

Additionally, leveraging state-of-the-art large language model technology, the RoboGuide can comprehend user inquiries and comments, responding with verbal feedback accordingly, as per the team.

<https://interestingengineering.com>

Construction ready 3d-printer

A joint venture between Holcim and British International Investment (BII) looks to accelerate access to 3D construction printing from Africa to the world. 14Trees, a joint venture between Holcim and British International Investment (BII), the UK's development finance institution and impact investor, launched a new construction-ready 3D printer, the Iroko. The new machine, which externally looks very similar to other existing systems, looks to improve construction speed, cost, and flexibility – scaling up digital automation to build resilient and affordable housing, education infrastructure, and commercial real estate worldwide.

Iroko introduces performance advantages that enable multi-story construction and building with more reliability and mobility – opening up global access to state-of-the-art construction methods – no matter the terrain. The 14Trees printer is a robust solution to

maintain affordability and deliver on structural performance. This would enhance the sustainability and profitability of 3D printing for construction – a sector positioned for yield and growth.”

Co-designed and manufactured with PMSA, a leader in construction equipment, Iroko's mobility and optimized assembly are key tenets of the design by 14Trees. The printer's aluminum frame is quick to assemble and light yet robust – meaning it can be mounted without cranes, and stored in a compact container, making transportation and deployment rapid and efficient. The 14Trees printer specializes in single to two-story residential and commercial applications and does not need extensions to take smarter construction to the next level.

Iroko is equipped with a unique multi-laser system controlling the print quality 50 times per second to improve the overall performance of the end product and enhance operator safety. The new design is fitted with a material preparation and feed system, compatible with Holcim's ink, TectorPrint, and 14Trees' growing range of low-carbon inks, which lowers a building's carbon footprint by up to 70 percent compared to traditional processes.

The innovative approach reduces CO2 emissions typical to standard methods of cement production, contributing to the achievement of the United Nations' Sustainable Development Goals on Industry, Innovation, and Infrastructure (SDG 9) and Sustainable Cities and Communities (SDG 11).

<https://www.voxelmatters.com>

NORTH AMERICA

UNITED STATES OF AMERICA

AI that communicates with machines and the brain

Arnav Kapur, a Delhi-born student of Massachusetts Institute of Technology (MIT), developed a device that has the potential to change the relation between man and machine. 'AlterEgo',

as per MIT, is a non-invasive, wearable, peripheral neural interface that allows users to “converse in natural language with machines, artificial intelligence (AI) assistants, services, and other people without any voice—without opening their mouth, and without externally observable movements—simply by articulating words internally.

In a demonstration, it is displayed that the device is placed behind the ear of a person, and difficult questions such as “the largest city in Bulgaria and its population” are asked. In the blink of an eye, the answer came post a Google search which the person conducted via his brain, without using speech or typing it on a search bar.

According to MIT, the primary focus of this project is to help support communication for people with speech disorders, including conditions like ALS (amyotrophic lateral sclerosis) and MS (multiple sclerosis). Beyond that, the system has the potential to seamlessly integrate humans and computers—such that computing, the internet, and AI would weave into our daily life as a ‘second self’ and augment our cognition and abilities.

The wearable device records neural signals as and when a person hears or thinks of words. The information is then transmitted to machines and the internet to find answers/solutions to the information sent. Without using any speech, typing keywords, or any visible actions, the user can send and receive information discreetly. The system provides feedback through audio using bone conduction, creating a closed-loop interface. This gives the feeling of speaking internally to oneself during human-computer interaction, without interfering with the user's normal auditory experience.

The device is also capable of doing tasks such as ordering a pizza without using any app/phone. The idea behind the device is for a user to have the entire internet in their head—eventually becoming an expert on any subject. According to MIT, Arnav's work explores whether AI and computing could instead be woven into human experience as a direct extension of our cognition, rather than via external devices. In this way, computers would ex-

tend human ability multifold, instead of diminishing or replacing humans from our environment.

<https://www.forbesindia.com>

Machine learning-based test to detect ovarian cancer

Scientists have combined machine learning with information on blood metabolites to develop a new test able to detect ovarian cancer with 93 percent accuracy. For over three decades, a highly accurate early diagnostic test for ovarian cancer has eluded physicians. Ovarian cancer is often referred to as the silent killer because the disease is typically asymptomatic when it first arises — and is usually not detected until later stages of development when it is difficult to treat.

According to John McDonald, Professor in the School of Biological Sciences at Georgia Institute of Technology, US, the new test's accuracy is better in detecting ovarian cancer than existing tests for women clinically classified as normal, with a particular improvement in detecting early-stage ovarian disease in that cohort.

The new test, published in the online issue of the medical journal *Gynecologic Oncology*, uses a patient's individual metabolic profile to assign a more accurate probability of the presence or absence of the disease.

"This personalized, probabilistic approach to cancer diagnostics is more clinically informative and accurate than traditional binary (yes/no) tests," McDonald said. "It represents a promising new direction in the early detection of ovarian cancer, and perhaps other cancers as well." McDonald said that while the average five-year survival rate for late-stage ovarian cancer patients, even after treatment, is around 31 percent — but that if ovarian cancer is detected and treated early, the average five-year survival rate is more than 90 percent. "Clearly, there is a tremendous need for an accurate early diagnostic test for this insidious disease," McDonald said.

The researchers developed their integrative approach by combining metabolomic profiles and machine learning-based classifiers to establish a diagnostic test with 93 percent accuracy when tested on 564 women from Georgia, North Carolina, Philadelphia, and western Canada.

As many as 431 of the participants were active ovarian cancer patients, and the remaining 133 women in the study did not have the cancer. Further studies have been initiated to study the possibility that the test can detect very early-stage disease in women displaying no clinical symptoms, McDonald said.

<https://www.thestatesman.com>

AI for fraud detection

Mastercard has introduced a generative artificial intelligence (AI) solution to help prevent fraudulent transactions. The company has upgraded its Decision Intelligence solution to let it scan an unprecedented one trillion data points to predict whether a transaction is likely to be genuine or not. The tool, dubbed Decision Intelligence Pro, examines the relationships between the entities involved in a transaction to assess its risk, Mastercard said in the release. It arrives as banks are increasingly using AI to ferret out criminal activity.

In less than 50 milliseconds, this technology improves the overall DI score, sharpening the data provided to banks," the release said. "Initial modelling shows AI enhancements boost fraud detection rates on average by 20 percent and as high as 300 percent in some instances."

According to the release, the new version of AI will give banks greater ability to protect customers from fraud and help reduce false positives, or legitimate transactions incorrectly marked as fraudulent.

The precision of the solution — achieved by scanning potential points of sale in real-time — has been shown in our own analysis to not only increase accuracy but also reduce the number

of false positives by more than 85 percent," said Ajay Bhalla, president of Cyber and Intelligence at Mastercard.

<https://www.pymnts.com>

Humanoid robot

Agility Robotics has developed a new "RoboFab" manufacturing plant to produce digital humanoid robots. A 175-cm-tall (5-ft 9-in) tall bipedal robot weighing around 65 kg (141 lb.) can carry loads up to 16 kg (35 lb.) in a pair of claw-like gripper hands, and it charges itself autonomously to theoretically stay on duty for 16 hours out of 24 — the equivalent of covering two full-time shifts.

It runs a similar set of bird-like backward-looking legs to the company's Cassie robot, which broke the Guinness World Record for the fastest 100-meter sprint by a bipedal robot in 2022. Both have short upper legs that typically stay oriented forward in a knees-up stance, then long "calves" extending back behind the torso, and a high ankle joint where you'd normally expect to see a knee, leading down to smallish toe pads in contact with the ground.

The advantage is that Digit can fold its legs up behind it in a way that would cause loud noises from the average human. It can also squat down in front of shelves to grab boxes without its knees protruding forward, so it can pick them up with less of a need to lean forward. It is equipped with camera vision and LiDAR.

It can be controlled via a game-pad-style tablet (and e-stop shutdown initiator) and hard-coded with various tasks — mainly in the 'picking things up and putting them down' category. Interestingly though, in the last few months, Agility has been experimenting with using large language model (LLM) AIs, effectively to get Digit to program itself in response to natural language verbal commands, as shown in the video below.

<https://newatlas.com>