

T H E E L E C T R O N

NEWSLETTER OF THE INSTITUTION OF ELECTRONICS

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EDITORIAL

Welcome to *The Electron* 2021. It hasn't been the best of starts for the electronics industry, as a worldwide shortage of computer chips beckons (reference: *Newsnight* March 22nd) due to a combination of harsh winter weather in the US, the grounding of The Ever Given, and Chinese stockpiling, amongst other factors, which have created what has been termed 'the perfect storm' for supply chain disruption. In addition live events continue to be on hold. Of course this means that we are again indebted to our contributors, who have continued to keep us informed in our quest to uncover the unique and unusual in the field of electronics.

In this issue we have introduced a new feature, that of adding the date to the article where possible, so as to indicate more precisely where the activity is placed in relation to the period covered by this issue, namely January 1st. to March 31st. 2021. Again we have tried to feature a broad spectrum of news from the electronics sector including materials science, bioelectronics, sensor technology, artificial intelligence, data centre technology, 3D-printing, electronics and the arts, and drone test and development amongst others.

GERMAN TV STREAMER MOVES SERVERS INSIDE WIND TURBINE



One of Europe's leading TV streaming providers, Zattoo of Germany, has taken the step of placing IT infrastructure inside a wind turbine as part of a new experiment.

Zattoo, a platform that is used by some 3 million users a month, has teamed up with wind energy innovator WestfalenWIND on the project, which is now live and handling millions of gigabytes of content delivery.

Zattoo is also collaborating with IT providers through WindCORES, a patented technology that involves the installation of climate-neutral data centres within wind turbines, which received the German Data Centre Prize in 2019.

Zattoo's objective is to use green electricity generated by wind energy for the distribution of TV content, locating the data centre at the very point where the electricity is generated.

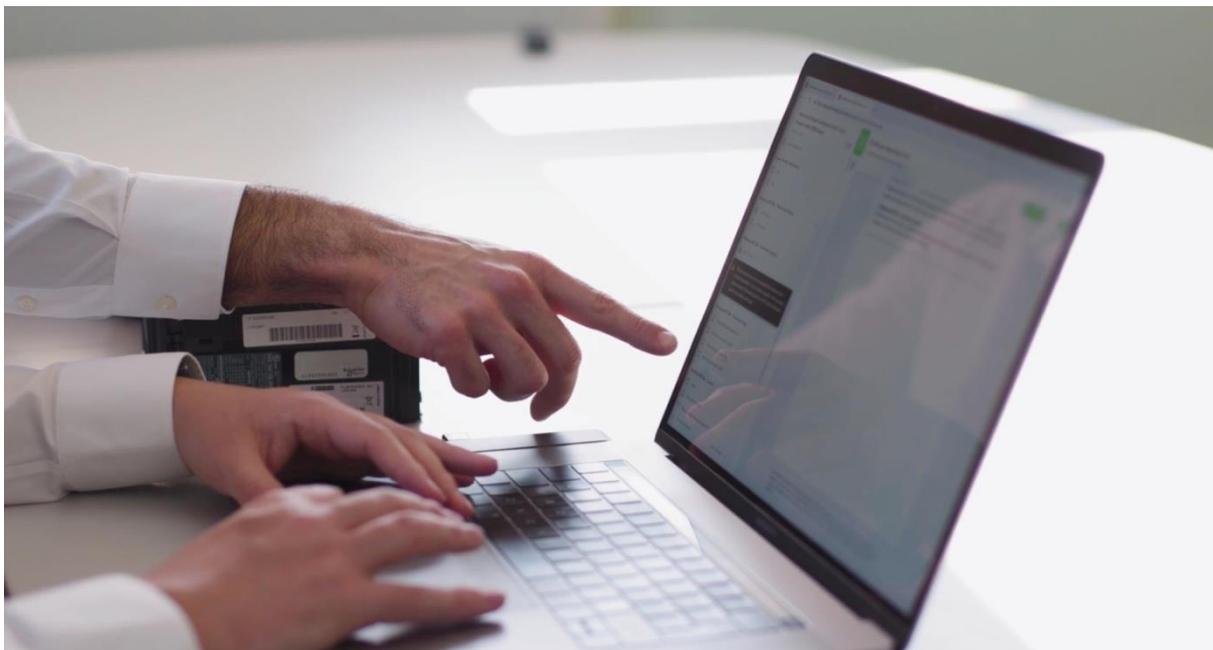
Zattoo migrated its first servers into the wind turbine at WestfalenWIND (a 170-strong wind turbine portfolio with a total installed capacity of 350MW) at the end of 2020. In the next phase of their project Zattoo will test to establish whether WindCORES meets its stability and standards requirements prior to rolling out more servers. Ultimately Zattoo aims to make the wind turbine its primary data centre location.

Stefan Lietsch, Chief Technology Officer for Zattoo, states:

"The idea of bringing computing capacity closer to clean energy production while using unused space capacity is so simple and obvious and, from our point of view, a project that will hopefully set a precedent."

[Contribution by James Orme, Techerati, February 3, 2021]

ECOSTRUXURE IT EXPERT WINS DCS AWARD



Schneider Electric's EcoStruxure IT Expert has won the Data Centre Intelligent Automation and Management Innovation of the Year Award, which commends innovative use of artificial intelligence, machine learning and data analytics in data centre infrastructure management (DCIM) software, at this year's DCS Awards.

The product provides visibility into the health and status of data centre components, gathering data from IoT-enabled physical infrastructure assets such as racks, switchgear, power distribution, cooling and UPS systems.

Through the use of artificial intelligence and machine learning it consolidates performance and alarm data so as to produce proactive recommendations to rectify unplanned issues before they become critical, making it the industry's first cloud-hosted monitoring platform that is vendor-agnostic and powered by AI.

The platform is defined by five attributes as follows:

- (a) Reliance on cloud technologies for ease of implementation, scalability, analytics and maintenance.
- (b) Connection to a 'data lake' that enables insight and event prediction within the framework of AI.
- (c) Utilisation of mobile and web technologies with integration with third party platforms.
- (d) Prioritisation of simplicity and user experiences in its design.
- (e) Function as a compliance tool to identify and eliminate potential cyber security risks.

EcoStruxure IT Expert additionally allows partners and service providers to more easily extend their visibility and manage multiple data centre and edge computing sites across a larger geographical area, delivering real-time alerts and updates that allow users to proactively mitigate unplanned downtime from anywhere at any time and from any device.

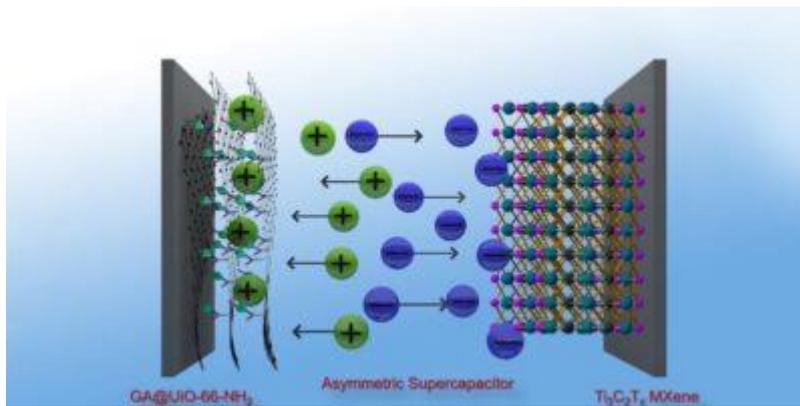
Marc Garner, Vice-president of the Secure Power Division for Schneider Electric UK and Ireland, commented:

"Data centres provide the foundations for digital transformation and by creating vendor-agnostic DCIM software platforms that are built on the cloud, our customers can gain

greater visibility into mission-critical IT environments, and leverage AI to proactively mitigate downtime."

[Contribution from *Data Centre Review*, January 15, 2021]

GRAPHENE HYBRID AIDS MANUFACTURE OF SUPERCAPACITORS



For some time scientists have been examining the potential for so-called 'supercapacitors' to challenge the role of batteries in electrical and electronic circuits. Now, researchers at the Technical University of Munich have been using a sustainable graphene hybrid material as the basis for a revolutionary supercapacitor design.

The advantage of supercapacitors over batteries is that they can quickly store large amounts of energy which can also be output quickly, as when a train slows to enter a station. The disadvantage, however, is lack of energy density. Thus, while a lithium accumulator can achieve an energy density of 265kW hours, a supercapacitor can typically only achieve about ten per cent of this.

The team at Munich, however, have developed a storage device which can now provide a reported energy density of up to 73Wh/kg and a power density of 16kW/kg.

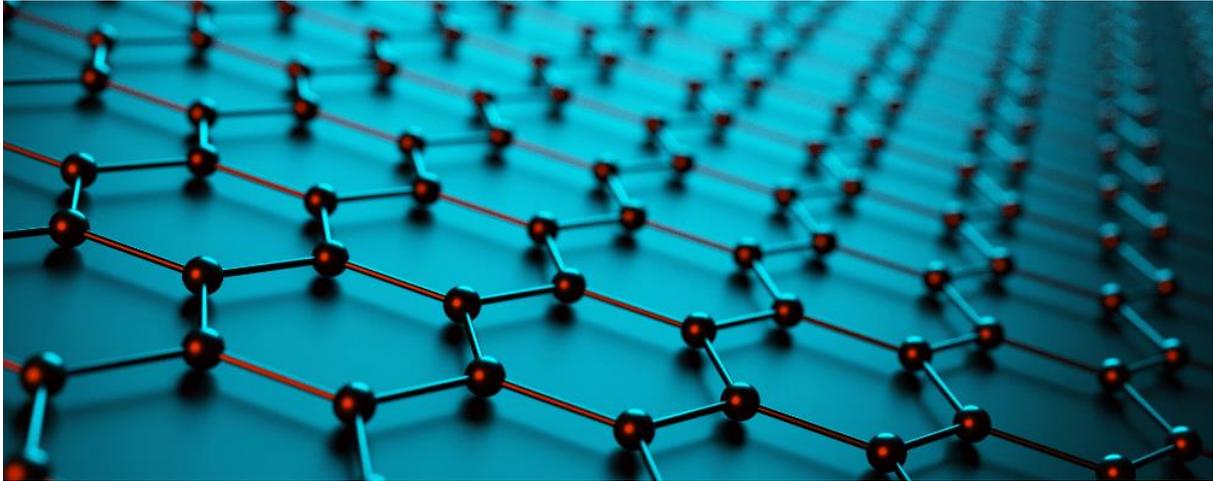
The breakthrough has been achieved by using a graphene hybrid material for the positive electrode combined with a proven negative electrode based on titan and carbon. The positive electrode combines modified graphene with a nano-structured metal organic framework, or MOF, and the high performance capabilities of the material derives from the combination of the microporous MOFs and the conductive graphene acid. The resulting hybrid MOFs have a very large inner surface of up to 900 square metres per gram (important for supercapacitors) and then operate as positive electrodes.

In order to achieve a chemically stable hybrid, strong chemical bonds are required between the components, which is what happens when the graphene acid is combined with a MOF amino acid, resulting in a special type of peptide bond.

The stable connection between the nano-structured components increase the charging and discharging cycles without significant performance impairment and, whilst a typical lithium accumulator has a useful life of around 5,000 cycles, the new cell was found to retain almost 90 per cent capacity even after 10,000 cycles.

[Contribution by Softei]

SMALLEST EVER PROCESSOR FABRICATED USING GRAPHENE CRINKLING



Physicists at the University of Sussex claim to have produced "the smallest microchips ever" by crinkling a strip of graphene and using it in combination with other two-dimensional materials "in a process similar to nano-origami".

The resulting nanomaterial was then made to act in the manner of a transistor, essential for managing power devices, while the graphene behaved like a microchip.

The new microchip, which is about 100 times smaller than conventional microchips, is viewed as a potential game-changer for smaller devices such as smartphones.

Professor Alan Dalton of the University of Sussex states:

"We're mechanically creating kinks in a layer of graphene. Using these nanomaterials will make our computer chips smaller and faster. It is absolutely critical that this happens as computer manufacturers are now at the limit of what they can do with traditional conducting technology. Ultimately this will make our computers and phones thousands of times faster in the future. This kind of technology, straintronics using nanomaterials as opposed to electronics, allows space for more chips inside any device. Everything we want to do with computers to speed them up can be done by crinkling graphene like this."

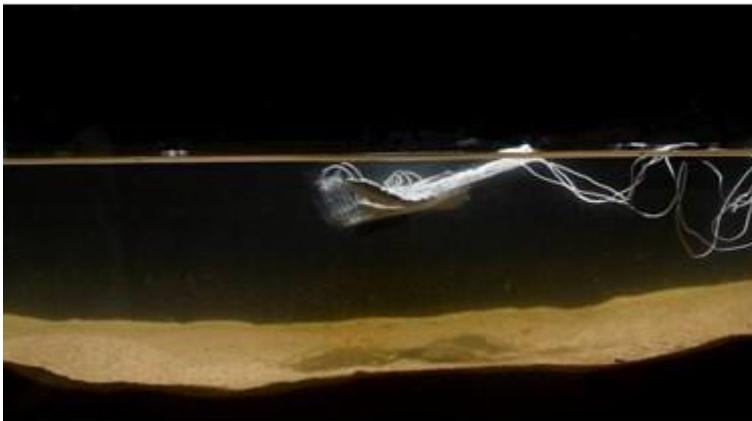
Lead Author Dr. Manoj Tripathi, also of the University of Sussex, adds:

"Instead of having to add foreign materials into a device, we've shown we can create structures from graphene and other 2D materials simply by adding deliberate kinks into the structure. By making this sort of corrugation we can create a smart electronic component, like a transistor or a logic gate."

[Reference: *ACS Nano Journal*]

[Contribution by PA Media, Techerati, February 15, 2021]

SILVER HYDROGEL COMPOSITE FOR BIOELECTRONICS



Researchers at the Carnegie Mellon University Soft Machines Laboratory have developed a silver-hydrogel composite with high electrical conductivity that is capable of delivering direct current whilst at the same time maintaining soft compliance and deformability.

Typically, hydrogels are lightweight, stretchable and biocompatible, making them suitable for items such as contact lenses, but poor at conducting electricity, which has tended to rule them out for use in areas such as digital circuit manufacture and bioelectronics.

Attempts to combine metals and hydrogels have been made in the past, but these have generally necessitated a trade-off between improved electrical conductivity and reduced compliance and deformability.

At Carnegie Mellon University micrometre-sized silver flakes were suspended in a polyacrylamide-alginate hydrogel mix. Partial dehydration was then applied, after which the flakes formed percolating networks that were electrically conductive and resilient to mechanical deformation. Manipulation of the dehydration and hydration process enabled the flakes to be made to either stick together or break apart, so forming reversible electrical connections.

The silver-hydrogel composite can be printed using standard methods such as stencil lithography, similar to screen printing. This technique was used to develop skin-mounted electrodes for neuromuscular electrical stimulation.

Potential future applications are envisaged most notably in the treatment of muscular disorders and motor disabilities, for example through the assistance with tremors as in Parkinson's Disease, or the grasping of items with fingers in the aftermath of a stroke. The composite could cover a substantial part of the body "like a second layer of nervous tissue over the skin".

Professor of Mechanical Engineering at Carnegie Mellon University, Carmel Majidi, says:

"With its high electrical conductivity and high compliance or 'squishiness', this new composite can have many applications in bioelectronics and beyond. Examples include a sticker for the brain that has sensors for signal processing, a wearable energy generation device to power electronics, and stretchable displays."

[Reference: *Nature Electronics*]

[Contribution by Neil Tyler, Editor, *New Electronics*, March 15, 2021]

USING GLASS TO DELIVER POWER



A patent-pending technology developed by Zytronic, known as Electroglaz, is opening up new opportunities for the wireless charging of low power devices and applications by allowing power to be delivered invisibly through glass.

Electroglaz is transparent and can be used to power a variety of low power electronic and electromechanical devices embedded within a glass panel, with potential applications envisaged in areas such as LED-lit display cases and shelving for museums, art galleries and high-end retail stores.

Electroglaz can also deliver low power (under 50V/3A) to USB sockets, induction charging pads, motors, fans, security cameras, sensors, air monitoring units in HVAC systems, and small displays. In particular it can be combined with Zytronic's patented multi-touch projected capacity technology (MPCT) to add multi-touch interactivity and object recognition in tabletops and other 'smart' furniture, and with Zytronic's ZyBrid hover contactless technology. The latter detects user interactions up to 30mm distant from the surface of the glass, offering yet further design and innovation possibilities for wireless charging.

The Electroglaz technology consists of a bespoke lamination of two or more conductive yet completely transparent, glass panels. Power is transferred across the inner conductive coatings within the insulated surfaces of the laminate. In order to access the power small apertures, typically of the order of 30 to 100mm, are machined into the laminated glass, which allow the customer connection and electrical device or assembly which connects to the positively and negatively charged inner coatings. A 1mm wide printed conductive busbar around the perimeter of the glass is applied to supply the external power to the laminate.

According to Zytronic, the design options available are "almost limitless". Initially the Electroglaz panels will be any size up to 1m x 1.8m. The maximum number of mounting holes machined into the glass will then depend on the size of both the panel and the apertures.

Technical Director for Zytronic, Dr. Andrew Morrison, states:

"We will closely consult with each customer depending upon their individual project requirements and product design and provide guidelines and recommendations on attaching electrical connections to the busbar and power delivery apertures. The industrial design engineer would then take the final system assembly through any applicable electrical safety tests and certification as per usual."

[Contribution by Softei]

3D PRINTING SYSTEM FOR MULTI-MATERIAL DESIGNS

Infotech, a leading developer, producer and supplier of high-precision systems for automatic dispensing, assembling and joining for the handling of tiny components, has pioneered a new fully automated system that is designed specifically for the 3D printing of liquid materials and multi-material structures.

By utilising parallel operation of several dispensing heads, different materials can be processed in one single printing step, and, with the aid of DELO's high-performance epoxy resins, components may be produced with different physical property ranges.

The core of the new system is a special dispensing unit that can be equipped with up to three different dispensing valves. Users can choose between a variety of established dispensing valves, such as jet valves, time-pressure valves or screw dispensers, according to the properties of the pressure media and the structures to be dispensed. Each valve sits on a separate vertical axis.

With the dispensing heads able to be operated in parallel, it is possible to combine different liquid materials in one printing process. Linear axes and integrated real-time control ensure maximum dispensing precision. The segmentation of the structure and the segment's allocation to the different dispensing valves are stored in the STL model and correctly implemented in the dispensing pattern by the slicer software. A camera moving along with the robot head detects the exact dispensing position and at the same time is used to calibrate the dispensing system.

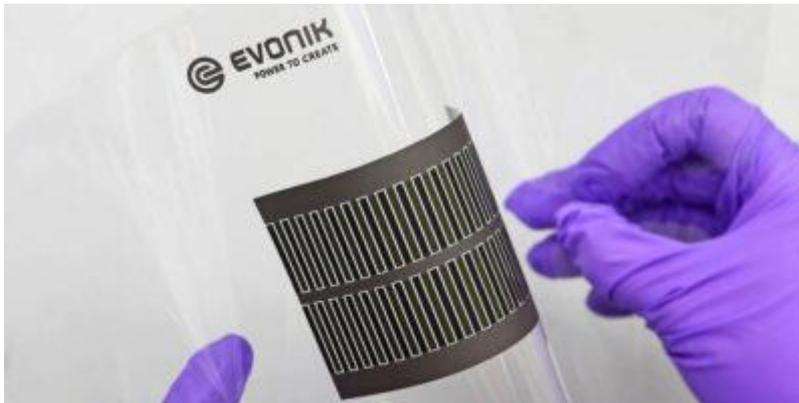
For the reliable printing of functional structures materials are applied in liquid form and then cure under UV light. The effective thickness of the applied layer is determined by a non-contact height measurement, which allows for the dynamic correction of the working distances of the dispensing units should this be necessary. The UV lamp head mounted in the system travels along the contour dispensed last, allowing the material to immediately attain its final strength.

The DELO materials can be used to reliably print components serving different functions, such as those with fixed and flexible areas or transparent and black areas. Structures with wall thicknesses of less than 50µm can be produced just as easily as complex structures such as overhangs and undercuts.

The system is said to be particularly suitable for prototype development and small series production, and typical application areas for components printed with DELO materials are envisaged in automotive and microelectronics, since the materials are highly resistant to temperature and media and have properties similar to those of high-performance plastics.

[Contribution by *SMT Today*]

PRINTED RECHARGABLE BATTERIES REMOVE METAL CONTAMINANTS



Printed electronics specialist InnovationLab has partnered with chemical company Evonik to develop a pioneering range of printed, flexible, rechargeable solid-state batteries that are environmentally friendly and avoid undesirable metal contaminants.

These batteries combine Evonik's TAeTTOOz printed battery materials with InnovationLab's high-speed printed electronics expertise in order to produce a thin printed product that uses polymers that are notably free from liquid electrolytes and do not leak, so removing the possibility of fire.

Dr. Christoph Kaiser, Head of the Tech-2-Market department at InnovationLab, states:

"Through our partnership with Evonik, we can now produce the first fully printable rechargeable battery using our volume production printing process. Because the Evonik material isn't charged during the production process, you can power up the battery after printing, which means you can produce them in standard production facilities instead of a specialised environment, saving considerable cost. We've also pioneered the easiest way to build up a rechargeable battery that's not comprised of contaminants, making it the greenest of all battery platforms. It's both easy to produce these new light and thin batteries, and it's easy to dispose of them."

Dr. Michael Korell, Head of New Growth Area Energy Storage at Creavis, the strategic innovation unit of Evonik, adds:

"Unlike traditional batteries, TAeTOOz material technology uses our patented redox polymers instead of metal or metal components. Our set of materials allow you to print ultra-thin, metal free, all solid-state batteries on flexible substrates enabling high-speed production of safer rechargeable batteries in the conformal shapes that fit naturally with fitness wearables, medical diagnostics, smart labels for food packaging, supply chain logistics and other applications."

[Contribution from Softei]

LITHIUM-ION BATTERY FIRES COST UK £158 MILLION A YEAR



Lithium-ion batteries are highlighted as being responsible for some 48 per cent of all waste fires in the UK and cost around £158 million a year according to the recently published research report 'Cutting Lithium-ion Battery Fires in the Waste Industry' by Eunomia Research and Consulting in partnership with the Environmental Services Association.

Lithium-ion batteries are noted to be found in many commonly occurring electrical and electronic items, such as mobile phones and even 'singing' greetings cards, and are responsible for some 200 waste fires every year, yet the issue is largely unknown to householders. In particular, it is noted that when these batteries enter the residual and mixed recycling waste streams, either loose or inside waste electrical or electronic equipment, they can cause fires when punctured or damaged in the compactor of a refuse collection vehicle, or during routine waste processing or sorting. Fires may then continue to burn for days, weeks or even months, causing extensive environmental damage through gas emission into the atmosphere and water pollution deriving from run-off when the fire is eventually extinguished. There may additionally be significant material damage, business disruption and loss of recycling resources.

In order to help combat this problem the report recommends:

(i) A ban on the disposal of batteries and small waste electrical and electronic equipment in residual and mixed recycling waste.

(ii) Adoption of separate kerbside collection of batteries and small waste electrical and electronic equipment by local authorities, with costs covered through revised extended producer responsibility schemes.

(iii) Consideration of a deposit return scheme to supplement retailer takeback for batteries and small waste electrical and electronic equipment.

Sophie Crossette, Lead Author of the report, states:

"The findings of this research highlight the significant financial burden Lithium-ion battery waste fires place on the waste sector and public sector services. To date much of the focus on preventing waste fires has been on improved controls and infrastructure at waste sites. As this report suggests, we now need to focus on upstream interventions to divert batteries and waste electrical and electronic products from the mixed waste stream in order to tackle this growing issue."

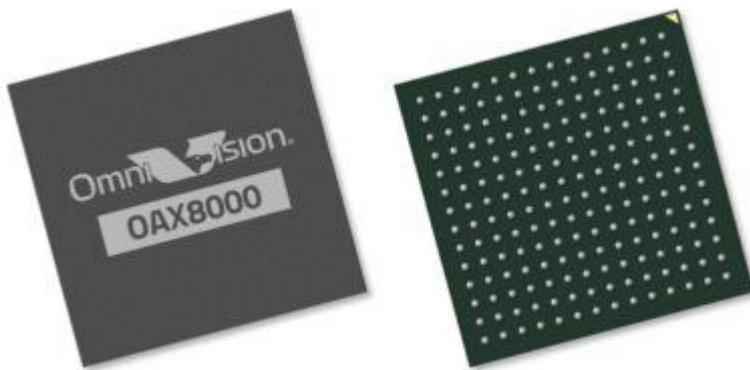
simultaneously with a single sensor. Further advantages include the sensor not requiring calibration, bump testing or maintenance during its lifespan, which is usually over five years, and the fact that it cannot be 'poisoned' due to local conditions or contaminants.

According to Crowcon "it can only be a matter of time until it becomes the natural choice for much flammable gas detection".

More information is available from www.crowcon.com

[Contribution from *Health and Safety Matters*]

FIRST DEDICATED DRIVER MONITORING ASIC



What is believed to be the world's first dedicated driver monitoring ASIC, the OAX8000, has been launched by OmniVision Technologies.

It features an integrated artificial intelligence (AI) neural processing unit, an image signal processor and a DDR3 memory. It is optimised for entry-level stand alone driver monitoring systems (DMS) and uses a stacked-die architecture, making it the industry's only DMS processor with on-chip DDR3 SDRAM. It is also believed to be the only dedicated DMS processor to integrate a neural processing unit with an image signal processor, which

provides dedicated signal processing speeds of up to 1.1 trillion operations per second to allow for eye gaze and eye tracking algorithms.

There is 1k multiply-accumulator, or MAC, units of conventional neural network (CNN) acceleration, which, with the integrated SDRAM, enables a low power consumption (just one Watt under typical conditions) in combination with the OmniVision automotive image sensor.

The OAX8000 on-chip neural processing unit is supported with TensorFlow, Caffe, MXNet and ONNX tool chains. The ASIC embeds quad Arm Cortex a% CPU cores with Neon Technology for accelerated video encoding and decoding and on-chip video analytics algorithms, as well as hardware for image processing, video encoding and RGB/IR processing. The high dynamic range processing capability allows the ASIC to accept input from RGB/IR image sensors and to support high quality output for videos taken during the day or night in conditions with widely contrasting brightness.

The encoder accepts up to 5Mpixel captures from the OmniVision automotive image sensors and outputs up to 2k resolution video at 30 frames per second.

Rapid start-up eliminates the delay between ignition and activation of the DMS camera and the ASIC also supports secure boot features for cyber security. It can also be used for processing vehicle occupant detection algorithms, such as distinguishing between a baby and a grocery bag, and providing alerts when objects are left behind in the vehicle.

From 2022 all new cars in the EU will be required to have a DMS camera.

[Contribution from Softei]

EEPROMS SET NEW BENCHMARK FOR WRITING TIME



The BR24H-5AC EEPROMs recently released by Rohm Semiconductor are believed to be the first in the industry to achieve a writing time of 3.5ms, as opposed to the 5ms of conventional products, by implementing original data writing and reading circuit technology. In addition, whilst standard products are capable of one million rewrites, the BR24H-5AC series guarantees up to four million writing cycles by data endurance, making it especially suitable for data loggings that require frequent data rewrites, as well as extending application service life.

For the automotive and industrial equipment sectors, where safety and traceability requirements make it necessary to store the operating history in non-volatile memory in the system, the EEPROMs can be used in place of other types of non-volatile memory, such as flash memory, where the application requires high reliability in the writing and storage of data under harsh conditions.

The EEPROMs can be used for storing factory settings, for example in on-board cameras in a vehicle's advanced driver assistance systems, a vehicle's on/off history, cluster mileage display, operating history (for example airbags) and emergency data logging. It would also be used to retain the settings for vehicle navigation or audio, and for data logging for 'always on' operating industrial automation systems and servers.

[Contribution by Softei]

SMART SHOT CAMERA BRINGS AUTOMATIC IMAGE RECOGNITION TO IOT



ON Semiconductor has launched the RSL 10 Smart Shot Camera which combines cloud-based artificial intelligence with ultra-low power image capture and recognition to enable a new generation of Internet of Things endpoints, such as surveillance cameras, restricted areas, factory automation, smart agriculture and smart homes. A companion smartphone application provides a user interface for the platform and acts as the gateway to cloud-based, AI enabled object recognition services.

The platform brings together the ON Semiconductor RSL 10 SIP, which provides ultra-low power Bluetooth low energy technology, and the ARX3A0 Mono 65 degree DFOV IAS module, a compact prototype used for the development of compact cameras with 360fps mono imaging based on the ARX3A0 CMOS image sensor. Complemented by motion and environment sensors and power and battery management, these technologies aim to provide a complete solution that captures images autonomously and identifies objects within them.

By using the RSL 10 Smart Shot Camera, developers can create an endpoint that automatically sends an image to the cloud for analysis when triggered by elements such as time, or an environmental change like light or temperature. The camera platform can also operate in low-power mode when monitoring a specific part of its field of view, automatically taking an image when the scene's contents change. The image will then be sent to the cloud for processing, with AI used to determine the contents of the image prior to taking action.

Potential application areas envisaged include the addition of smart cameras to wearable safety equipment such as hard hats, monitoring the contents of shopping trolleys to support automated checkout, monitoring the occupants of vehicles to provide early warning of any safety issues, and scanning the contents of cupboards for inventory.

[Contribution by Softei]

WIRELESS AUDIO PLATFORM AIMS TO STANDARDISE DSP-ENABLED BLUETOOTH AUDIO IP



With the aim of standardising DSP-enabled Bluetooth audio IP for the fast-growing Bluetooth audio markets, CEVA, a licensor of wireless connectivity and smart sensing technologies, has launched a highly integrated wireless audio platform known as Bluebud.

This addresses the technology complexities and scarcity of expertise that semiconductor and systems companies currently face for the development of wireless audio systems, serving to provide a standardised self-contained solution that companies targeting the lucrative Bluetooth audio market can effectively 'drop in' to their system-on-chip (SoC) design, dramatically reducing barriers to entry and time-to-market.

The platform combines CEVA's Riviera Waves Bluetooth 5.2 IP, with both Classic Audio and LE Audio, and the CEVA-BX1 audio processor, along with all of the required peripherals for wireless audio, in a compact low-power design with a footprint of less than 0.5 square

millimetres in 22nm. The single-core architecture reduces the overall latency from RF to audio output to under 20ms, which ensures "impeccable" audio/video synchronisation for movies and gaming. An advanced power management unit supports idle and sleep power-down modes using sophisticated clock and voltage scaling that is inherent within the fully integrated Bluetooth audio platform.

The onboard CEVA-BX1 DSP, along with the SenslinQ DSP software framework enables semiconductor and original equipment manufacturing (OEM) users to integrate differentiated, value-adding software from CEVA, or custom software, onto Bluebud. There is also optional software that includes ClearVox multi-microphone noise reduction and acoustic echo cancellation, WhisPro voice trigger and commands, and MotionEngine Hear for user control via tap and double tap, head tracking, in-ear detection and activity classification.

For light AI inferencing workloads, Bluebud allows users to run TinyML models such as a wake word engine to summon a voice assistant or detect sound events for contextual awareness, using native support for the TensorFlow Lit Micro neural network framework.

Erez Bar-Niv, Chief Technical Officer for CEVA, states:

"Consumer demand for TWS earbuds and other wireless audio devices has grown tremendously, with more diverse use cases and new features consistently being introduced. The Bluebud platform serves to standardise DSP-enabled Bluetooth audio IP for any semiconductor or systems company, solving the complex challenges of syncing audio packets over Bluetooth with a drop-in IP that delivers robust, high-quality Bluetooth connectivity and audio performance. Supported by our portfolio of audio, voice, sensor fusion and AI software, Bluebud customers can develop differentiated wireless audio solutions with outstanding performance, addressing the full range of tiers from budget through to premium experience, faster than ever."

[Contribution from Neil Tyler, Editor, *New Electronics*]

FIRST UK PROFESSIONAL SERVICES TECHNOLOGY SUPERCLUSTER



A collaboration between some of the UK's largest and most well-established professional services organisations and emerging tech companies is set to accelerate a technological revolution in the West Midlands.

Business leaders from Shoosmiths, Wesleyan, Bruntwood CBRE and others are working with around 12,500 leading tech and digital companies to investigate different ways in which artificial intelligence and advanced technologies can be applied in their day-to-day activities.

Under the umbrella of 'Super Tech', the first professional services technology supercluster in the UK, eight industry leaders from finance, law, property and technology have been selected to lead the initiative.

David Stewart, Group Chief Operating Officer at Wesleyan and co-lead for the financial cluster, says:

"Prof Tech [professional services technology], like Fin Tech, is an emerging sector with enormous potential to scale. Having undertaken a number of studies into Fin Tech, which in just a few short years is now worth £411.7 million per annum to the West Midlands economy, we've identified three ways in which we can facilitate growth: access to businesses, access to technology and access to talented people. Super Tech combines all three by connecting technology firms with the major professional services businesses we have across the region.

For established organisations like ourselves, involvement in Super Tech gives us access to the region's emerging tech talent and latest developments, while tech firms, whether focused on finance, property, law or insurance, can find new ways to solve business issues and gain direct access to a sector that is worth almost £28 billion - 26.5 per cent of the total regional economy."

Tony Randle, a partner at Shoosmiths and Law Tech lead for Super Tech, adds:

"If you look at where the investment is going in law, it is centred towards 'New Law' businesses that are able to leverage technology to improve and automate processes. Massive change is coming and tech is going to play a crucial role in determining whether law firms thrive or fail. At Shoosmiths we are very firmly standing behind Super Tech in supporting its goal of promoting much greater integration of technology in law and the wider professional services community."

[Contribution from *Data Centre Review*, February 15, 2021]

CONSTRUCTION BEGINS ON SCOTLAND'S ROBOTARIUM



Construction has now begun in Edinburgh on the National Robotarium, a dedicated research facility for robotics and artificial intelligence, which will be the largest and most advanced of its kind in the UK.

Based at Heriot-Watt University the National Robotarium, a collaboration between Heriot-Watt University and the University of Edinburgh, is supported by £21 million from the UK Government and £1.4 million from the Scottish Government as part of the Edinburgh and South East Scotland City Region Deal.

The 40,000 square foot building will house three distinct research and development areas, providing facilities for Robotics and Autonomous Systems, Human and Robotics Interaction, and High Precision Manufacturing. Amongst the specialist equipment will be dedicated laser labs, an autonomous systems laboratory and a living lab for piloting technology in a realistic home setting. In keeping with the National Robotarium's commitment to foster a responsible and collaborative approach the building will also feature a 'partner suite' that is dedicated to industry, academic and government collaboration.

The innovative design ensures that resources are matched by the building itself, with a focus on sustainability and energy efficiency. In winter the intelligent facade will provide solar heat and recycle warm air. An ecological zone will integrate sustainable urban drainage

systems, while a solar PV array will be installed on the roof. There will also be EV charging spaces and to facilitate public engagement linear grazing luminaire technology and an exterior projector will project graphics onto the facade.

Research projects will seek to address a wide range of global challenges. Examples include SPRING (Socially Pertinent Robots in Gerontological Healthcare), which will develop the world's first multi-user conversational robot for healthcare, and Offshore Robotics for Certification of Assets, a national hub of five universities led by Heriot-Watt that is advancing technologies that remove humans from hazardous work environments. The National Robotarium will also spearhead research into ways to manage trust between humans and autonomous systems to support adoption in scenarios that require human interaction, as with self-driving cars and autonomous wheelchairs.

Professor Helen Hastie and Professor Yvan Petillot are the joint academic leads of the National Robotarium, which is expected to open in the Spring of 2022.

Professor Hastie states:

"As a world-leading facility that will promote entrepreneurship and drive forward early-stage product development, the National Robotarium will play a significant role in supporting the UK's economic recovery from the Covid-19 pandemic. By drawing upon the world class talent of the staff at Heriot-Watt and our collaborative partner the University of Edinburgh, alongside students at the Centre for Doctoral Training in Robotics and Autonomous Systems, the National Robotarium will form a centre of excellence for fundamental research and knowledge exchange to address real-world challenges and industry needs.

The new building will facilitate a collaborative approach that is at the heart of the National Robotarium's ethos, helping to accelerate research from laboratory to market and paving the way for the UK to take a leadership role in AI and robotics technology."

Professor Petillot adds:

"The cutting-edge resources provided by the new facility combined with the expertise of our researchers will put us in a highly competitive position to elevate the UK onto the global stage in robotics and AI technologies. Our existing and new students will have the opportunity to apply their knowledge by working on real-world problems through internships and industry-led group projects facilitated by the Robotarium, accelerating their skills as they actively shape the future of the field."

[Contribution by *MedTech*, March 4, 2021]

RMGROUP BECOMES FIRST UK CERTIFIED ROBOT INTEGRATOR



Rees Machinery Group, otherwise known as RMGroup, a leading automated packaging machinery and service company, has become the first integrator to be certificated under the RIA/BARA Robot Integrators' Certification Scheme.

Under the scheme, the company, based at Newtown in Wales, had to demonstrate that it met a rigorous set of national and international standards for business compliance and capability, including technical knowledge and safety practices.

The scheme aims to standardise integrators' quality and workmanship and recognise safety controls that are proven to be effective.

Principal Auditor for the Robotic Industries Association and BARA in the UK, Jeremy Hadall, states:

"Integrators need to demonstrate that they are committed to providing the best service possible for their customers. The audit looks at the integrator's technical approach, their project management processes, and how they ensure their system safety, service facilities and staff competencies all operate to the highest standards."

RMGroup's expert technologists were audited on an ABB IRB640 robot to prove their proficiency using the robot safely, its functionality and creating a programme based on a palletising operation.

"I was really impressed how seriously the team at RMGroup took the audit, which included having the evidence and staff available to back up the self-assessment scorecard they completed prior to formal audit. It ensured the audit went smoothly."

All companies certified under the RIA/BARA Robot Integrators' Certification Scheme are required to be re-audited every two years according to the same 25-point list of measurable criteria. Selection of an independently audited integrator should then mean that the risk to the end-user making the investment is reduced.

More information about the scheme is available from www.bara.org.uk

[Contribution from *Controls, Drives and Automation*, February 22, 2021]

NEW AI ALGORITHMS BRING ROBOT HAND CLOSER TO HUMAN



Robot hands are now being deployed in a variety of applications, for example in manufacturing, surgery and hazardous tasks such as nuclear decommissioning. They are especially useful for performing activities such as computer assembly where assembling microchips requires high precision.

Now, researchers at the Warwick Manufacturing Group, University of Warwick, have developed a new set of artificial intelligence algorithms that allow robotic hands to learn how to coordinate finger movements and manipulate objects, which have resulted in a new type of hand known as the Shadow Robot Dexterous Hand.

By using physically realistic simulations of the hand the researchers, Professor Giovanni Montana and Dr. Henry Charlesworth, have been able to make two such hands pass and throw objects to each other, and spin a pen between their fingers. The three-dimensional simulations were developed using Multi-Joint Dynamics with Contact (MuJoCo), a physics engine from the University of Washington.

With the algorithms now proven successful in the simulation, the team now plans to test the AI methodology on real robotic hardware, which is envisaged to bring the hand closer to use in everyday life.

Professor Giovanni Montana states:

"The future of digitalisation relies on AI algorithms that can learn autonomously, and to be able to develop algorithms that give Shadow Robot's hand the ability to operate like a real one without human input is an exciting step forward. These autonomous hands could be used in the future to deliver robotic surgeons, to increase the productivity of assembly lines and to replace humans in dangerous jobs such as bomb disposal.

In future work we will let the robots perceive the environment as accurately as humans do, not only through computer vision algorithms that can see the world, but through sensors that detect temperature, force and vibrations so the robot can learn what to do when it feels those sensations."

Rich Walker, Managing Director of the Shadow Robot Company in London, adds:

"When we started building dexterous hands, it was because there was no way to get hold of one without building it! Twenty years later, we are now seeing researchers like Giovanni deliver the promise of the hardware by creating algorithms clever enough to control the robot hand - soon perhaps we will see super-human performance?"

Readers are referred to the paper 'Solving challenging Dexterous Manipulation Tasks with Trajectory Optimisation and Reinforcement Learning' by the researchers.

More information is available from www.shadowrobot.com

[Contribution from *Controls, Drives and Automation*, January 20, 2021]

COBOTS ENTER WORLD OF DANCE



Universal Robots have announced a partnership with award-winning quantum physicist and ballet dancer Dr. Merritt Moore, who is currently examining how the arts can take technology beyond the laboratory.

With the assistance of a collaborative robot, which has been named 'Baryshnibot' by her Instagram followers, Dr. Moore has choreographed a set of ground-breaking dance performances which demonstrate how humans and robots can collaborate beyond practical, day-to-day functions, and transcend perceptions of robots as simply tools for manufacturing.

Dr. Moore, who plans after lockdown to turn the performance into a live, interactive show, says:

"I believe that arts and STEM should not be considered separate disciplines. To be a scientist or engineer, creativity can benefit your work immensely. Similarly, as a dancer, the ability to be technical and analytical has allowed me to hone my practice. I hope the next generation of women will be inspired to defy expectations of how a career in STEM should look."

Mark Gray, Country Manager UK and Ireland for Universal Robots, also comments:

"Our cobots have been designed to collaborate seamlessly with humans, so we are incredibly excited to see how they can be easily appropriated for more complex tasks, such as dance and choreography."

[Contribution from *Controls, Drives and Automation*, March 15, 2021]

SCREENSKILLS TO DEVELOP NEW STANDARDS FOR HIGH-TECH TRAINING IN VIRTUAL PRODUCTION

At a Department for International Trade mission on the future of UK film-making on February 10th., it was announced that ScreenSkills is to lead the screen industries and education in the development of a new set of national standards for training in high-tech roles in virtual production.

The purpose of the national standards is to ensure that there is a common understanding and agreement across industry and academia regarding the definition of virtual production, the job roles within it and the skills that individuals need to have or attain in different roles and at different levels of seniority as its potential continues to evolve.

The standards will assist course designers in higher and further education and in industry training with common templates from which to work so as to ensure consistency and high quality training provision that keeps pace with industry needs in this quickly evolving field.

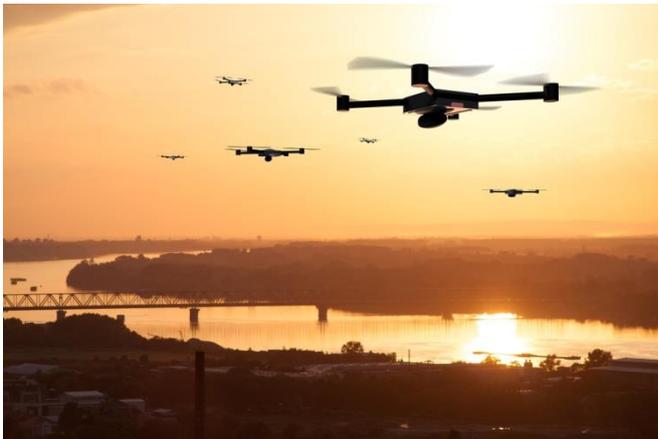
ScreenSkills has already run industry and education round tables to explore the benefits and challenges of virtual production, which brings together the physical and digital worlds with complex visual effects shot in-camera live rather than being added later post-production. ScreenSkills also leads in the development of National Occupational Standards in other screen roles and has developed over 20 apprenticeship standards.

Caroline Dineage, Minister for Creative Industries, commented:

"Virtual Production relies on the latest technology and innovative talent to bring exciting new possibilities to life on our screens. Developing our world class screen workforce will help the UK's film and TV sectors build back better. The clear career standards set out by ScreenSkills will strengthen our skilled talent base and ensure the UK stays ahead of the creative curve."

Further information is available from ScreenSkills, 94 Euston Street, London NW1 2HA.

FIRST DRONE TECHNOLOGY TEST AND DEVELOPMENT AREA TO BE ESTABLISHED IN LIVERPOOL



Drone Major Group has announced that the first ever drone technology test and development area project is to be established in the Liverpool City Region.

The project, known as Phoenix I, is to be delivered in partnership with the Liverpool City Region Combined Authority and is expected to place the region on course to become a global leader in the deployment of cutting-edge drone technology. It is the first in a series of interconnected projects developed by Drone Major Group, with several regional partners, to deliver for the first time commercially viable, scalable and environmentally sustainable

drone services across all environments (surface, underwater, air and space) in all of the sectors that are vital for the UK and world economy.

The Liverpool City Region benefits from some of the country's finest digital infrastructure, academic knowledge and individual experts, which will be integral to realising the true potential of autonomous drone systems in the UK. Notable examples include the University of Liverpool Centre for Autonomous Systems Technology (CAST), Liverpool Institute for Sustainable Coasts and Oceans (LISCO), and the drone research group at Liverpool John Moores University.

Robert Garbett, Founder of Drone Major Group, comments:

"Drones represent an unprecedented growth opportunity across a huge number of global industries. Liverpool City Region has clearly demonstrated its commendable intent to adopt a sustainable and commercially viable drone technology system for the city, ahead of the curve, which sets an example to all."

"The potential for this unique collaborative initiative is vast. It enables cities, regions and industries to achieve their potential and will create an overwhelmingly positive impact on UK, and indeed world, economic growth through enhanced commerce, employment, skills, education and decarbonisation."

Steve Rotherham, Metro Mayor for the Liverpool City Region, adds:

"The Liverpool City Region is a digital powerhouse. We have the world class infrastructure, expertise and ambition to be leaders of the Fourth Industrial Revolution. It's fantastic to see the Drone Major Group recognising that by choosing to open their test and development area here."

[Contribution from *Controls, Drives and Automation*, March 25, 2021]

