VOICE RECOGNITION

Voice recognition is booming in the consumer space, now sound recognition looks set to capture a sizeable share of the business market.
COMMENT  
Could a ‘solid-state’ plane help to encourage UK students to look afresh at electronics as a career?

NEWS  
UL expands its state-of-the-art EMC and wireless capabilities at its UK facility in Basingstoke

The ISO has released the world’s first global drone standard for public consultation

VIA partners with Lucid to deliver AI-based depth sensing capabilities to cameras

UKESF unveils ‘TurnOnTo Electronics’ campaign to shine a light on to careers in electronic engineering

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Voice recognition
After a slow start voice is finally starting to establish itself in the consumer market, the B2B space has yet to be convinced but that’s beginning to change. By Neil Tyler

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Distinguishing signal from noise
Why is Signal-to-Noise Ratio and drive voltage in industrial and automotive touchscreens so important? Chris Ard, of TouchNetix, explains why to New Electronics

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Growth continues, for now
Despite the prospect of Brexit, the threat of a trade war between China and the US and a slowing global economy, distribution continues to look robust. Neil Tyler reports

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While artificial neural networks underpin much of the research being undertaken into artificial intelligence, could they be leading us up a blind alley? By Chris Edwards

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Smart, safe and secure
New Electronics reports on this year’s electronica. The biggest show to date with record attendance and exhibitor numbers, we take a look at some of the announcements made

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An issue of trust
If fully autonomous vehicles are ever to become a reality, then we need to start finding answers to some ‘impossible questions’. By Bethan Grylls

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The radar sensor challenge
A 24 GHz Demodar radar solution, to support contactless sensors, is being used in the emerging industrial mass market. ADI’s John Morrissey explains

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SMALL | SAFE | SECURE | ADVANCED | FAST | EASY
Last week saw a ‘solid state’ plane, with no moving parts in its propulsion system, undertake a successful test flight.

Described as a breakthrough in ‘ionic wind’ technology, the plane is powered by wires on its wings which then have 600 watts of electrical power pumped through them, inducing an “electron cascade”, charging air molecules. These molecules then flow along the electrical field towards a second wire at the back of the wing, bumping into neutral air molecules as they move, and imparting energy to them. As they are expelled they create the thrust needed to fly the aircraft.

London born Steve Barrett, an aeronautics professor at MIT, and the lead author of the study said that his inspiration came from ‘Star Trek’, the 1960s classic science fiction TV series.

“I thought the future looked like it should be planes that fly silently, with no moving parts,” he said.

An amazing feat of electronic and mechanical engineering and one that, in the longer term, could see flights powered purely through electricity.

I mention this because it’s this kind of achievement that can help to create a buzz around an industry.

The announcement last week that the UK Electronics Skills Foundation has launched a new initiative to encourage more students to enrol in electronic and electrical engineering degrees, talked of wanting to create such a buzz around the UK electronics industry, with the aim of boosting the 3,330 UK students who enrolled in 2017.

The skills shortage that’s affecting the UK is well documented and while the ‘TurnOnToElectronics’ campaign should be welcomed and encouraged, I do wonder whether it’ll achieve the hoped-for results that so many previous campaigns have sought, and failed, to deliver.

Despite that, I remain optimistic that more young people will start to look at electronics and pursue careers in what is an exciting and fast-growing industry.

Because, if we get it right, not only will young people have the skills to get great jobs, but they’ll also have the opportunity to be pioneers in innovation, the like of which we saw fly at MIT last week.

Neil Tyler, Editor (neil.tyler@markallengroup.com)
REIMAGINE WIRELESS WITH THE ADRV9009 TRANSCEIVER.

The ADRV9009 RF transceiver is the only platform to support 2G/3G/4G/5G. For massive MIMO and phased array radar systems, it simplifies digital beamforming design and reduces complexity by handling local oscillator (LO) synchronization on-chip. The transceiver platform also features fast frequency hopping for efficiency in the design of portable test equipment.
Global safety science company, UL, has announced that it has expanded its capacity and capabilities in Basingstoke, Hampshire to address the UK’s growing demand for Electromagnetic Compatibility (EMC) and Wireless testing and certification services.

In what is being described as a significant investment, UL can now offer access to one of the largest commercial EMC and Wireless test facilities in the United Kingdom. The expansion has added 37,000 square feet to the current facility, tripling its size, of which 15,000 square feet is dedicated to EMC and Wireless testing.

The investment comes in response to new developments in technologies such as 5G and Artificial Intelligence (AI) and the expansion is intended to address these developments and includes a larger laboratory, shorter test programs and automation, and higher frequency bands, all in one single location. These expanded services aim to ease the pressures companies are facing today to have their products evaluated in a faster and more efficient way and crucially, reduce their time to global markets. “This is a major step forward in the development of UL’s compliance services in the U.K. The significant investment in new facilities will offer a service solution with state-of-the-art, custom-designed chambers and sophisticated equipment. Due to the enormous demand we’ve seen, we’re looking to raise the bar in terms of service excellence, and by partnering with our customers, we fully expect to grow and develop further,” said Phil Davies, general manager Consumer Applications Catapult and the UK Space Agency.

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UL expands state-of-the-art EMC and wireless capabilities

EXPANSION ENABLES FASTER MARKET ACCESS TO ONE OF THE UK’S LARGEST COMMERCIAL EMC AND WIRELESS TEST LABORATORIES. NEIL TYLER REPORTS

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SAINTS programme to use space data to solve problems

SAINTS – Situational Awareness Information National Technology Service – has been launched in the North East of England by the North East Satellite Applications Centre of Excellence, operated by Business Durham, the economic development organisation for County Durham, with the support of the Satellite Applications Catapult and the UK Space Agency.

SAINTS will connect data gathered from satellites and Earth-based sensors and will use AI to combine travel, business and satellite data to solve some of the country’s most pressing challenges.

Dr Graham Turnock, chief executive of the UK Space Agency, said: “The launch of SAINTS is a welcome development for the UK space industry and a signal of the ambition of the North East’s fast-growing space sector. It’s great to see new programmes that can help the UK thrive in the commercial space age.”

Plextek RFI designs for Astro Digital space flight application

Plextek RFI, the UK design house, has successfully designed and supplied a microwave power amplifier (PA) module for California-based satellite manufacturer and space mission operator Astro Digital. The module incorporates a power GaN output device and a GaAs driver circuit. It will form part of a propulsion system that is being supplied to an in-space transportation service company, and will be launched into space in 2019.

“The specification for this design project presented us with some significant challenges,” said Liam Devlin, CEO of Plextek RFI. “The module design seeks to maximise the DC to RF conversion efficiency, and attention to detail was required to manage the thermal performance in a compact space. “The different packaging technologies used also necessitated an innovative approach to the PCB design.”
Al and quantum computing partnership

imec and CEA-Leti have signed a memorandum of understanding (MoU) that lays the foundation of a strategic partnership in the domains of Artificial Intelligence and quantum computing.

The duo hopes their joint efforts will result in the delivery of a digital hardware computing toolbox that can be used by European industry partners to innovate in a variety of application domains – from personalised healthcare and smart mobility, to the new manufacturing industry and smart energy sectors.

Ilika, Ricardo and UCL, CPI is applying its knowledge across the formulation sector to help create a lithium-based solid-state Stereax material perfection while sharing the costs of precompetitive research.

£4m EV battery project

The Centre for Process Innovation (CPI) is collaborating on the PowerDrive Line, a project funded by the Government Faraday Challenge to deliver ultra-fast battery charging for electric vehicles.

Working alongside lead partners, including Ilika, Ricardo and UCL, CPI is applying its knowledge across the formulation sector to help create a lithium-based solid-state Stereax battery and establish a pre-pilot line for prototype cell technology.

The PowerDrive Line project has received more than £4million in grant funding in order to develop next generation, solid-state battery cells that will charge plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs). The overall goal is to develop safer and more power-dense battery systems that charge electric vehicles in as little as 15 minutes.

Worldwide drone standards

THE ISO HAS RELEASED THE FIRST GLOBAL DRONE STANDARDS FOR PUBLIC CONSULTATION. BETHAN GRYLLS REPORTS

After several years of global collaboration between standards institutions the first ever worldwide standards for the drone industry are being released by the International Standards Organisation (ISO).

These regulations are expected to trigger rapid acceleration of growth within the drone industry as organisations throughout the world are galvanised to adopt drone technology against a new background of reassurance on safety and security.

The ISO Draft International Standards for Drone Operations were formally released on 21 November 2018 for public consultation, with drone professionals, academics, businesses and the general public being invited to submit comments by 21 Jan 2019. Final adoption of these standards can be expected in the US, UK and worldwide next year.

The announcement is the first important step in the standardisation of the global drone industry, encompassing applications for all environments - surface, underwater, air and space. These first set of standards are particularly significant for the general public and Government, in that they address Operational Requirements of the more recognised and prevalent aerial drones, including protocols on safety, security and overall etiquette for the use of drones, which will shape regulation and legislation going forward. They are the first in a four part series for aerial drones, with the next three addressing General Specifications, Manufacturing Quality and Unmanned Traffic Management.

Plastic logic breakthrough

Plastic Logic, a specialist in flexible plastic electrophoretic displays (EPD), has developed a new mass production-capable technology and manufacturing process in collaboration with the organic electronics specialists from BASF.

Demonstrating this breakthrough, Plastic Logic has produced prototypes of two mass-producible 6” display products in 300dpi greyscale and 150dpi colour variants respectively.

This has been achieved through advances in Plastic Logic’s transistor matrix backplane, and BASF’s innovative organic semiconductor (OSC) materials. The optimised formulation and combination of semiconducting and dielectric materials results in greatly increased carrier mobility, necessary for high resolution display and is also contributing to the overall flexibility of the device which is the key feature of plastic EPDs. BASF’s material set can be easily deployed in low-level clean room environments, a must for mass-production.

As well as improving the definition of general imagery, Plastic Logic’s true 300dpi display will also make written text much sharper — something particularly beneficial for symbol-based languages such as Chinese and Japanese where character details have previously been lost due to pixel density limitations.

The process co-development with BASF, will also have a positive impact on other applications for Plastic Logic’s backplane technology. It is being applied to several other highly flexible and durable electronic applications such as sensors and detectors.
Affordable depth sensing

VIA AND LUCID LOOK TO DELIVER AI-BASED DEPTH SENSING CAPABILITIES TO CAMERAS. NEIL TYLER REPORTS

VIA Technologies is partnering with AI vision startup Lucid, to deliver AI-based depth sensing capabilities to more dual- and multi-camera devices in the security, retail, robotics and autonomous vehicle space.

With Lucid’s proprietary 3D Fusion Technology embedded into the VIA Edge AI 3D Developer Kit, security and retail cameras, robots, drones, and autonomous vehicles will be able to capture accurate depth and 3D with dual- or multi-camera setups while reducing the costs, power, and space consumption of previous hardware depth solutions. As VIA looks to build out its Edge AI solutions roadmap, Lucid will be adding camera- and machine-learning based depth capabilities on top of every platform.

In the current market, smart cameras with depth sensing capabilities have become critical for applications in the security, retail, robotics and IOT industries. For robots, drones and autonomous vehicles, depth sensing has dramatically improved the capability to navigate, save and reconstruct spaces in 3D, providing more autonomy for machines.

The current hardware solutions, emission- and laser-based, impact the total cost, size and power consumption of devices in particular. The VIA and LUCID solution will not only help eliminate these challenges but also speed up system scaling and deployment by enabling the integration of depth sensing capabilities within a much lower cost, form factor, and power budget.

Toshiba unveils 130nm Fit Fast Structured Array

Toshiba Electronics Europe has made the first customer shipment of a new 130nm manufacturing process node based FFSA (Fit Fast Structured Array) development platform. This high performance System-on-Chip (SoC) development platform supports custom solutions that feature low power consumption at a low cost point.

Toshiba’s ASIC (Application Specific IC) and FFSA platforms deliver efficient solutions for custom SoC development. All FFSA devices have a common silicon-based master layer that is used in combination with upper metal layers that are reserved and allow device customisation.

The FFSA platform looks to meet customer requirements for high performance and low power consumption; however, by limiting the customisation to just the metal layer masks, it also drastically reduces development costs.

As a result, samples and mass-produced devices can be delivered in a significantly shorter time than for conventional ASICs.

The FFSA 130nm process is added to Toshiba’s current 28, 40, and 65nm process portfolio adding another option for industrial equipment. The 130nm node process offers different master slices for up to 664kb of RAM and around 912,000 gates per device.

Demand for precision resistors

TT Electronics and UniRoyal, a resistor manufacturer, have established a JV to address the demand for precision resistors.

The partnership will focus on thick-film, thin-film and metal-based resistors, and will be registered in the UK. Manufacturing will be based at UniRoyal’s established site in Kunshan, China. TT UR Precision Resistors says it will be “uniquely positioned” to effectively address the electronics sector’s unprecedented and increasing demand for high-quality resistor technologies in volume at competitive prices.

TT and UniRoyal have successfully cooperated for more than a decade, producing high-quality resistors for specific target markets such as automotive, industrial automation and white goods. The new joint venture will initially produce proven, higher-volume resistors currently supplied by UR to TT, and develop new products targeted at strategic opportunities.

Fighting fake graphene

A lack of quality control in the graphene market has led to inferior products being touted as high-grade.

A National University of Singapore (NUS) research team set out to develop a systematic and reliable method for establishing the quality of graphene samples from around the world.

Upon analysing samples from over 60 different providers from the Americas, Asia and Europe, the NUS team discovered that the majority contained less than 10 per cent of what can be considered graphene flakes.

Just one of the samples tested in the study contained more than 40 per cent of high-quality graphene. Some samples were even contaminated with other chemicals used in the production process. These findings mean that researchers could be wasting valuable time and money performing experiments on a product that is falsely advertised, says NUS.

The university team hopes this finding will speed up the process of standardisation of graphene within ISO.
The UKESF (UK Electronics Skills Foundation) has launched the TurnOnToElectronics initiative, which is to be fronted by Gadget Show presenter Georgie Barrat.

According to Stewart Edmondson, the Foundation’s CEO, the campaign comes in the face of, “an increasingly large skills shortage. We want the campaign to create a buzz around the UK electronics industry with the end goal of encouraging more young people into pursuing careers into what is an exciting and fast-growing sector.”

Despite the UK having the world’s sixth largest electronics sector, worth in excess of £120billion per year, only 3,330 UK students enrolled in Electronic and Electrical Engineering degrees in 2017, according to UCAS.

This is less than half the number enrolling in more popular Mechanical Engineering degree courses and with Brexit looming there are growing concerns that the electronics skills crisis will only worsen, adversely affecting the UK’s economic prosperity.

Launched at The TechWorks Summit by Richard Harrington, UK Minister for Industrial Strategy and Sector Deals, the TurnOnToElectronics campaign is looking to “fight back against this crisis,” according to Edmondson.

Edmondson and Dr Geoff Merrett, Head of the Centre for Internet of Things and Pervasive Systems are calling on employers, universities and other stakeholders to join the campaign and work collaboratively with schools to attract more young people into electronics.

“With our partners, we want to provide opportunities for students to help them develop their interest in Electronics and engineering, through to university study and/or apprenticeship,” explained Edmondson.

The campaign will raise awareness about Electronics and will look to educate children, parents and teachers on the possibilities of Electronics and ensure it is associated with the hottest tech trends. “We plan to demystify Electronics and move away from the ‘circuit board’ perception and paint a picture of the exciting opportunities available and bring them to life,” said Edmondson.

The campaign will look to leverage the Foundation’s network of partners to draw stakeholders more closely together, build alliances, make connections and encourage collaboration.

According to Edmondson, “We will be developing interest in Electronics by providing ‘Electronics Everywhere’ resources to schools across the UK. These will be ‘hands on’ electronics projects for schools aligned with Computing and Physics curricula (initially at A-Level) supported by CPD for teachers.”

The campaign’s sponsors include leading electronics organisations such as Qualcomm, ARM, Dialog and Infineon and there are already 21 academic partners including the University of Cambridge, University of Southampton and Imperial College.

Georgie Barrat, the Gadget Show presenter fronting the campaign, said, “I’m delighted to be involved in UKESF’s TurnOnToElectronics campaign, which is shining a welcome spotlight on careers in electronic engineering.

“Often incorrectly seen as one of the less glamorous STEM areas, studying electronics can lead to an exciting and creative career, which enables students to make a real difference in the world.

“The UKESF is doing a fantastic job of encouraging more young people to study electronics and embark on a career in one of the world’s most important and dynamic industries.”

Edmondson added, “The UK has a long heritage of technological innovation and a world-class electronics industry. Adding to that, the UK Government’s new industrial strategy emphasises the importance of AI, robotics and transportation in further boosting productivity and earning power throughout the UK.

“The aim of our campaign is to ensure that this hugely important industry isn’t consumed by a black hole caused by a lack of talent. We urge supporters to sign our manifesto and pledge to help the campaign in any way they can!”
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Digital assistants, such as Alexa from Amazon or Microsoft’s Cortana, have established themselves as key components when it comes to gadgets, smartphones or managing the smart home and, with the prospect of artificial intelligence being embedded into more devices, more voice enabled devices are set to come to market. Not only in the consumer space, however, but increasingly in the B2B space too.

Voice recognition software and interactive devices are starting to have a massive impact on how we consume and interact with technology but, for voice recognition technology to achieve a real breakthrough, it will need to become more aware of the entire sound space, not just voice and musical sounds.

Voice recognition AI currently doesn’t include data on human sounds or animal sounds, for example, but once sound recognition and contextual awareness have been added to the mix the potential for this technology is unlimited.

Speaking at AudioCollaborative, an event organised by market analysts Futuresource in London, last month, Theunis Scheepers, UK Country Manager for Alexa Voice Services, Amazon, said that Alexa had originally been imagined as, “A computer in the Cloud, controlled by an individual’s voice. We wanted anyone to be able to use it, to ask it anything and for it to be able to respond to requests made at home, in work or on the move.

“The rise of computers has actually seen voice marginalised, what with the rise of keyboards, mice and then touchscreens – we wanted to create a more natural, and efficient, way to interact with technology.”

The adoption of voice has been a lot slower than expected but since 2017, according to Scheepers, “there has been a step up in engagement. We’re seeing rapid growth and by the end of this year 87million smart devices will have been deployed, and we expect that to rise to 388m in five years. The growth curve in this space is incredible.”

Alexa and other voice recognition devices continue to evolve, and Amazon is working to create a personality for the device.

“We see that as crucial for creating a sense of engagement with the technology,” he explained. “Alexa told something like 100million jokes to users this year and as its personality evolves we see more use cases developing. We’ll be able
to make it more aware of specific cultural references, which will be increasingly important as we roll it out into different territories.”

User requirements
Research conducted in the UK, US, France and Germany has found that listening to music tends to be the key activity for smart speaker owners, followed by checking the news, checking weather, transport or traffic and managing calendars and alarms.

“One is connecting with Alexa through music and asking it to provide a play list; music wasn’t seen originally as a first use case and that has changed. It’s helping consumers to use voice recognition to discover new music and encourages greater engagement.”

According to Scheepers, speaker identification is becoming increasingly important, especially as Alexa is being deployed in communal areas.

“We need to ensure that voice technology is able to identify the correct speaker and calls the right number, for example. The smart home is a fast expanding use case for voice recognition and our understanding of the smart home is changing, as a result.”

That raises the question as to how Amazon engages with developers.

“Amazon has developed a voice service platform to help developers,” said Scheepers. “We’ve invested in skills so that we can scale Alexa and help brands looking to voice-enable their products.”

There are currently 50,000 skills, essentially apps, on the Alexa platform and Scheepers said that the company was keen to engage with industry.

“There are 20,000 Alexa compatible devices deployed globally and we have a certification programme for platform designers and companies. Our aim is to make it easier to integrate Alexa into products – we can do the heavy lifting in the Cloud and tools are available to develop voice recognition enabled products. Some 5,000 brands have already engaged with us in the smart home space.”

According to Scheepers Amazon’s vision is for consumers to have the audio experience follow them from car to home and work.

“That will require many complex interactions for that to happen,” he conceded. “We see a future in which multiple voice assistants will be deployed with Alexa talking to Cortana, and so on.”

The impact on content is expected to be profound too, as voice becomes the primary way of accessing content, questions about who will control and own that experience will need to be addressed.

According to Joel Sietsema, SVP of Brand Management at Sound United, “Music will remain hugely important to this platform. We tend to see other applications falling away, in terms of their use, especially as the market moves from early adopters to majority users.”

One of the biggest challenges for the industry, according to Sietsema, is, “How we educate consumers in using voice and help them to get voice up and running in their homes; how do we troubleshoot problems – a voice agent would be very helpful going forward.”

“We see voice as complementary to standard interfaces,” suggested Brian Moller, VP Engineering, Roku. “It’s all about the user getting to the content as quickly as possible.”

According to Gerry Holman, European Sales Director, Linkplay, “All manner of devices and use cases deploying voice are under development. We’ve been working with the audio entertainment world but now our clients come from the telecoms, home appliance and automotive sectors.”

In terms of future development Amazon thinks developers will want to be more experimental, “They find the personality aspect more interesting and that’s likely to provide them with the opportunity to develop unique services,” said Scheepers. “The smart home is becoming more important and while users tend to start with music, they become more engaged and active within the smart home environment.”

B2B and voice
The adoption of voice assistants in the B2B space has tended to lag up to 2-3 years behind the consumer space.

Traditionally, new technology and platforms have tended to be developed in the B2B space before moving to the consumer market, with voice that has been reversed.

There is now, however, a huge buzz around voice recognition technology in the B2B space. How can voice can be used and what services and experiences could be developed?

Research from Futuresource found that the B2B segment was being held back by a lack of clarity and understanding about the application of voice and what the commercial use cases were.

Bryan Sutton, Director, Technical Sales. Microsoft said, “B2B adoption of voice is being held back because there really isn’t a use case that will drive speech. Alexa, like the iPad, delivered to consumers something that they didn’t really know they needed or wanted. We don’t have that killer app yet in B2B, whether that’s translation, transcription, conferencing and the like.

“Voice is a bit like ‘touch’ ten years ago. Why do I need it? Now I use it all the time – perhaps speech is at the same inflexion point?”

“When it comes to B2B the technology has got to be working from the start,” said Dr Paul Neil, Vice President Product and
Marketing, XMOS. “It will require an employee journey, and you’ll need to plan that very carefully.

“In the deployment of smart speakers form factor will exercise a lot of control. If you’re looking to add it to a white board, for example, you’ll have less control over the placement of microphones, where they sit for example, and that will require more flexible processing capabilities. Speakers will need to be able to adapt to different sound and physical landscapes.”

IBM’s Andy Barnes, Executive IT Architect, Watson IOT, warned that delivering privacy and security would be crucial to the successful deployment of voice in the B2B space.

“However, if the benefits outweigh the security concerns then I believe it will be adopted. Businesses have to work with GDPR, so they have to be responsible for how data is collected and shared.

“Questions that need to be addressed include: is my data being monetised and do I want people learning about my business if data is vulnerable?

“There are two aspects to using voice – the employer and the employee perspective. We need to be able to provide assurances as to how data is used, where it’s going. Trust will be the number one barrier to adoption.

“Until you have that trust, data doesn’t go to the Cloud until you say it can. In the enterprise world, that’s critical. Edge processing could provide a solution.”

Barnes also made the point that using voice may require some kind of secure biometric registration to ensure individual privacy and business security.

“Encryption will need to be built in,” he suggested.

The challenge for deploying voice in the work environment is significant.

According to Dr Neil, “the difference between the home and work space is profound. You need to be able to examine the whole soundscape of a space and everything in it. You need to be able to identify individual speakers within that soundscape, and you’ll need an element of control when it comes to determining who is speaking, removing noise in that environment.

“That will take a lot of processing and for silicon providers that’s a challenge, we’re having to pack more capabilities into smaller devices.”

Above: The use of voice in hospitality could see it deployed in hotels

Many businesses are looking to use voice but are looking to customise a pre-packaged product – they want voice to mirror their organisation’s culture, whether that’s through an accent or tone of voice, but that needs an extensive dialogue ‘tree’ and much better contextual awareness on the part of the technology.

Will one device win out? Unlikely, the focus, for now, will be on the functionality of devices and how they are dispersed in an environment.

Longer term, the aim of those working in this space is to not only create assistants that are more ‘human’ but to differentiate products in what is becoming a highly competitive marketplace.

In the business market return on investment will be crucial; what am I paying for and what will I be getting for that investment, are front and centre when it comes to discussions regarding the deployment of voice.

But as Barnes suggested, “The benefits of voice can also be measured indirectly. Does it make employees happier and more productive?”

Over the next five years B2B is expected to have caught up with the consumer space and voice is expected to have gone mainstream; not only will it be a more natural interface but through AI it will learn about its users and become more personalised. On top of that companies will be able to develop further, differentiated applications.

Sutton suggested that could lead to voice recognition devices, “Listening to emotions and understanding how you feel at a specific moment in time.”

Whatever the future holds the technology is in place or coming – “The basic building blocks, next generation processors, Cloud based services, the ability to support end-to-end encryption, all the basic requirements are in place,” concluded Prof Neil.
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At the last Asia-Pacific Economic Co-operation summit, held in Papua New Guinea earlier this month, the US and China again locked horns and far from reducing tension around the prospect of a trade war, proceeded to ratchet up the rhetoric. US vice-president Mike Pence attacked China’s trade practices in the region and voiced sharp criticisms regarding allegations that China is involved in forced technology transfers and intellectual property theft.

For their part the Chinese were equally combative. Chinese President Xi Jinping criticised aggressive US actions on trade and argued that: “Unilateralism and protectionism will not solve problems but add uncertainty to the world economy.”

Commentators and economists, many who had been expecting the APEC meeting to have thawed relations between the two countries, were left disappointed.

As a result, there’s a growing risk that president Trump will now impose further tariffs on Chinese exports to America and the technology sector is looking increasingly exposed.

But while this trade spat between the US and China is of global concern, there are other issues impacting the distribution market, from the on-going drama in the UK around Brexit, which is now only a matter of months away, to a broader economic slowdown – recent falls in technology stocks in the US also suggest the market might well have peaked.

When it comes to Brexit, Bank of England policymakers have warned that UK firms aren’t ready for Britain to crash out without a deal or a transition agreement and the Bank’s chief economist, Andy Haldane, has warned that firms are worried about a no-deal Brexit that will not only hurt investment but impact on broader economic growth.

While not enough companies may be planning for Brexit there are a growing number who are taking it upon themselves to organise and prepare for a possible no-deal Brexit. Electrocomponents, the parent company of RS Components, has recently revealed plans to spend £30million on stockpiling components in warehouses in the UK and in Europe. According to the company, a ‘no-deal’ would see increased border checks between the UK and Europe resulting in delays for customers.

According to Steve Rawlins, CEO, Anglia Components, “We are having to work closely with our customers to understand their demand going forward, to make sure that we put in place the right stock profile and are able to keep supporting them whatever the market does in the longer term.”

However, despite Brexit and macro-economic and trade issues causing concerns for distributors, their financial performance over the past 18 months would suggest that the market is still growing strongly.

In fact talking to several distributors New Electronics was told that if you couldn’t make money in this market, “you shouldn’t be in distribution.”

In terms of products, distributor Mouser has seen a 53 percent jump in semiconductor orders, while the demand for passives is up by 59 percent, and connectors are ahead 25 percent. According to Mark Burr-Lonnon, Mouser’s Senior Vice President of Global Service & EMEA and APAC Business, “While these are impressive figures, the increased trade tensions we’re now seeing between the US and China could start to have an impact.

“The connector industry, for example, where connectors are manufactured in China and then

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“We need clarity, our customers need clarity and while we are putting contingency plans in place the uncertainty around Brexit remains challenging.” Ian Wallace
imported into the US are open to the 25 percent tariff being proposed by the US administration. There has been less impact on semiconductors, because while the wafers may be produced in China most of the backend work is down elsewhere.”

“From our perspective the market has been very strong,” said Ian Wallace, Digi-Key’s Sales Director for the UK, Ireland and South Africa. “We’re seeing global growth of over 40 percent and in Europe we’re ahead by over 50 percent, and as our model continues to evolve and we continue to add lines I think 2019 will be just as good. However, we are certainly seeing a softening in parts of the market. The Internet of Things remains strong, as is industrial and medical, while automotive remains relatively strong.”

Wallace is certainly concerned by the issue of Brexit and suggests that until we know whether it’s a “hard or soft Brexit”, we simply don’t know what the implications of the UK leaving the EU will be.

“We need clarity, our customers need clarity and while we are putting contingency plans in place the uncertainty around this remains challenging.”

**Headwinds**

Speaking at electronica earlier this month, Kevin Sellers, Chief Marketing Officer, Avnet, said, “That while the Chinese economy is certainly slowing, it’s not yet clear whether that’s related to the imposition of tariffs or to broader economic trends. It feels a bit of both and we’re seeing additional capacity being re-directed – but, whether that’s because of US trade policy remains unclear.

“Automotive regulations in Europe are also causing problems – in the form of new EU regulations on carbon dioxide (CO2) emissions and market unpredictability brought on by Britain’s impending exit from the bloc isn’t helping either. Despite that there remain pockets of extremely strong growth such as industrial IoT, automation, defence and aerospace. These are all examples of markets that are doing well.”

According to Sellers, unlike a few years ago, information visibility is pretty good.

“We don’t tend to get the inventory shocks that we did,” he suggests. “Now we tend to know whether we are sitting on too much or too little inventory. At present I’d hazard that inventory levels are fine for current levels of demand – but if things were to slow down then inventory could become an issue.”

Parts of the market – passives, for example - remain a problem, but even here there has been movement.

“It is clear that lead times on chip capacitors and resistors are now shortening – we’re quoted 12-13 weeks now in some cases,” says Rawlins. “Weaker iPhone demand and a softening of the Chinese economy, whether that’s in the face of sanctions or not, are two of the factors behind this. We will use this opportunity to rebuild inventories that we’ve been using to keep customers supplied during the shortages.”

According to Wallace, “We’ve certainly had to contend with shortages of components and extended lead times. There are still issues regarding passive components and while I had hoped that would have been addressed by now – problems will extend into 2019, perhaps 2020 – you have to accept that it takes time to increase production and to make the necessary investments in productive capacity.

“We’ve seen more companies looking for help in acquiring and managing stock; others have wanted lead-time updates and better information from manufacturers and despite our model being a self-service one, we have looked to support them where we can.”

Pricing has been an issue, according to Wallace, and where pricing has been affected by manufacturing costs price increases have had to be passed on to customers.

“At Mouser we have managed to avoid raising prices, at least in the short term, due to effective inventory management and by buying significant amounts of components,” explained Burr-Lonnon, “but depending on how the trade spat between the US and China evolves, that could change.”

Both agree that distribution is a very competitive market with the high service level coming under pressure from broadliners and newer distributors entering the market, as well as competition from independent distributors.

Independent distributor Fusion has benefitted from what they describe as a period of extreme shortages.

“It’s been good for independent distributors,” says Tobay Gonnerman, Executive Vice President, Fusion Worldwide. “When there are a lot of shortages and gaps we look to smooth out the inefficiencies of the market. We can respond to patterns of demand as they become more apparent and we’ve been able to adapt quickly and flexibly when issues have arisen. In the case of some components we’ve seen lead times approaching between 40-70 weeks that have been caused by uncertainties in supply.

“Strong organic growth in demand from automotive, big data, industrial automation and the like have all come together to create a perfect storm and manufacturers are now tending to wait for demand to appear before investing in manufacturing capacity.”

Beyond 2019 Sellers said that industry needs to be, “looking at the bigger picture going forward, at the forces that will drive demand over the next 20 years. In the short term and at least for the next few years, global electronic markets are poised for further growth.”
Earlier this month, Munich welcomed the biggest electronica yet, with over 80,000 visitors – a rise of 10% from 2016 – while more than 3,100 exhibitors from over 50 countries provided insight into the electronics industry.

Among the exhibitors, New Electronics spoke to was Murata, which used the fair to launch the SCL3300-D01, a 3-axis inclination sensor with a tilt angle output and digital SPI interface. The inclinometer features four user selectable measurement modes which can be used to optimise the sensor’s performance for different applications, a mixed signal ASIC for signal processing and a flexible digital interface that removes the need for an external ADC.

It operates from a single 3.3 V supply and is suitable for battery-powered operation in remote locations, due to a typical sleep mode current draw of 3μA.

Murata also showcased its new narrowband Internet-of-Things (NB-IoT) cellular modem module which, at just 12.6 mm x 10.6 mm x 1.8 mm, is said to be the smallest in the world.

The module includes an ARM Cortex-M4 microcontroller (MCU) running at 156 MHz and is able to run AT commands due to the onboard SRAM and 4 MB of Flash memory. It also includes multiple GPIO lines, a UICC interface for SIM cards and SPI, UART interfaces and an open MCU option that allows designers to run their own applications.

Amid the various Rohde & Schwartz announcements at electronica, including a modular RF switch and control platform and increased functionality of its ELEKTRA EMC test software, was its Bluetooth Low Energy (BLE) signalling test solution. R&S offers an advertiser testing option for its CMW test platform to measure the RF parameters of advertiser channels. BLE signaling functionality enhances the BLE direct test mode and the BLE advertiser mode. With the R&S CMW, users can choose among all three BLE RF test modes to match their respective applications.

Cypress used the exhibition to introduce a nonvolatile data-logging solution with ultra-low power consumption, designed for the latest generation of portable medical and wearable devices and other IoT applications that demand nonvolatile memories to continuously log an increasing amount of user and sensor data while using as little power as possible.

The Excelon LP Ferroelectric Random Access Memory (F-RAM) has been created to deliver instant-write capabilities with virtually unlimited endurance, enabling these applications to perform mission-critical data logging requirements while maximising battery life.

While Melixis announced a major upgrade to its Time-of-Flight (ToF) technology for the automotive industry. The portfolio now includes its next-generation QVGA ToF sensor chipset and a forthcoming VGA ToF sensor. Both sensors are AEC-Q100 qualified and suitable for a wide range of automotive applications, including gesture recognition, driver monitoring and people/object detection.

The MLX75024 ToF QVGA sensor doubles the sensitivity of the previous generation while maintaining the same resolution (320 x 240 px) and ambient light robustness. This allows it to operate in lower light levels or reduce the illumination power required by at least 30%. System efficiency is further enhanced by a 50% reduction in current consumption and the resulting lower heat generation allows the design of more compact cameras. A new selectable gain feature allows designers to find the optimum trade-off between illumination power, accuracy and ambient light robustness. As a result, the SNR is two times better in low light conditions and distances greater than 1m.

To support this ToF sensor, Melexis has developed the MLX75123BA ToF companion chip, which offers a three-fold improvement in front-end noise over its predecessor. The companion chip is used to configure parameters such as pixel gain, and now supports pixel binning to simplify hardware and software for lower resolution applications.
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Electronica saw record attendees and exhibitor numbers. Neil Tyler reports on some of the announcements from this year’s show

Record visitor numbers, exhibitors and much increased floor space saw electronica 2018 once again highlight the importance of this bi-annual event to the electronics industry, with the focus this year on blockchain, artificial intelligence and medical electronics.

Falk Senger, Managing Director of Messe München, said of the four-day event that, “electronica remains the most important meeting place for the electronics industry and this year was a record.”

With over 3000 exhibitors from around the world there were plenty of new products and services on show.

Renesas Electronics unveiled a new energy-harvesting embedded controller that can eliminate the need to use or replace batteries in IoT devices.

The device, based on Renesas’ SOTB (silicon-on-thin-buried-oxide) process technology, delivers an extreme reduction in both active and standby current consumption, a combination that was not previously possible in conventional microcontrollers (MCUs).

The extreme low current levels of the SOTB-based embedded controller will enable system manufacturers to completely eliminate the need for batteries in some of their products through harvesting ambient energy sources.

Renesas’ first commercial product using SOTB technology, the R7F0E embedded controller, is a 32-bit, Arm Cortex-based embedded controller capable of operating up to 64MHz for rapid local processing of sensor data and execution of complex analysis and control functions.

Power Integrations, a specialist in high-voltage integrated circuits for energy-efficient power conversion, released its BridgeSwitch integrated half-bridge (IHB) motor driver IC family.

These devices feature high-and low-side advanced FREDFETs (Fast Recovery Diode Field Effect Transistors) with integrated lossless current sensing, resulting in an inverter conversion efficiency of up to 98.5% in brushless DC (BLDC) motor drive applications to 300W and eliminates the need for a heatsink.

Despite a fire at its stand, Analog Devices had plenty on display with a broad range of solutions within its advanced Industry 4.0 roadmap.

“Our customers want to move fast toward Industry 4.0 but also need to ensure their investments are part of a viable, long-term plan,” said Brendan O’Dowd, general manager, Analog Devices’ Industrial Automation Business Unit. “This can be extremely difficult to navigate given the current pace of innovation. The solutions on show are critical building blocks in these strategies, which include Deterministic Ethernet, security, and condition-based monitoring.”

The ADcmXL3021 module, for example, is a complete sensing system based on ADI’s micromechanical (MEMs) sensor technology and monitors early indicators of machine fatigue and failure across industrial equipment and transport vehicles.

In terms of Industry 4.0 ams, a supplier of high performance sensor solutions, introduced a shutter image sensor for machine vision and Automated Optical Inspection (AOI) equipment that supports the 1” optical format.

The CSG14k sensor features a 3840 x 3584 pixel array, giving 14Mpixel resolution at a frame rate considerably higher than any other comparable device on the market.

The high performance and resolution of the CSG14k are the result of innovations in the design of the sensor’s 3.2μm x 3.2μm pixels. The new pixel design is 66% smaller than the pixel in the previous generation of 10-bit amis image sensors, while offering a 12-bit output and markedly lower noise.

Microchip unveiled a highly integrated LoRa System-in-Package (SiP) family with an ultra-low-power 32-bit microcontroller (MCU), sub-GHz RF LoRa transceiver and software stack.

The combination of long-range wireless connectivity with low-power performance is designed to accelerate the development of LoRa-based connected solutions.

The SAM R34/35 SiPs are supported by certified reference designs and proven interoperability with major LoRaWAN gateway and network providers, significantly simplifying the entire development process with hardware, software and support. The devices also provide the industry’s lowest power consumption in sleep modes, offering extended battery life in remote IoT nodes.

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A 24 GHz Demorad radar solution to support contactless sensors is being used in the emerging industrial mass market, as John Morrissey explains.

The radar sensor challenge

4 GHz, silicon-based mmWave radar technology is enabling a new generation of real-world, no contact smart sensors in mass market applications such as automotive, UAVs/drones, broad industrial, and consumer.

These sensors provide real-time information such as an object’s presence, movement, angular position, velocity, and range from a few centimetres to several hundred metres from the sensor. Until recently, radar sensors at mmWave frequencies were realised using discrete solutions that were large in size, complex, and expensive to build, which limited broad industrial market adoption.

Now 24 GHz radar is able to provide the performance and high integration levels necessary for applications such as object detection, tracking, security control, and collision avoidance warning systems.

With the emergence of new sensor applications for RF radar comes a set of new development challenges for engineers who want to quickly evaluate, design, and manufacture a radar sensor solution.

Acknowledging the challenges, Analog Devices recently introduced a 24 GHz radar system level prototype solution called Demorad (Fig. 1), which enables application development hardware and software on a full system reference design. The Demorad system is a microwave radar evaluation platform with out-of-the-box software examples that enable the start-up of a radar sensor within minutes. It enables the rapid product prototyping of radar sensor products that can measure real-time information such as target/object presence, movement, angular position, velocity, and range from the sensor.

The system hardware solution includes RF antennas and a full RF to baseband signal chain, that quickly connects to a laptop/PC (Fig. 2) with an easy to use, graphical user interface and radar algorithm software. Radar FFT and control firmware are available in the Blackfin DSP libraries. In a matter of a few minutes, users can plug the platform system into a computer with loaded software.

Full software support of the 24 GHz radar IC using a software GUI and DSP radar support function libraries are available with added capability to write raw data for postprocessing on a PC using MATLAB tools for radar sensor software design, such as 2D/3D radar FFFTs, CFAR, and classification algorithms.

Shown in Figure 3 is the frequency-modulated continuous wave (FMCW) radar ramp or chirp generation for radar transmit, and a set of important radar equations that are used to define the radar sensor design information.

The range resolution is dependent on transmit carrier sweep bandwidth - the higher the transmit sweep bandwidth, the higher the range velocity of the radar sensor. Velocity resolution depends on dwell time and carrier frequency - the higher the carrier frequency or the dwell time, the higher the velocity resolution. Angular resolution depends on carrier frequency - the higher the carrier frequency, the better the angular resolution.
Range Doppler Mode
In range doppler mode, the range to the targets, as well as the speed can be analysed. Range doppler mode is one of the most powerful modes of operation because of its ability to process multiple transmit ramps or chirps simultaneously by evaluating a two-dimensional Fourier transform. The range doppler processed data is displayed in the range doppler map. Range doppler is powerful in that it allows a separation of targets with different velocities, even if they are located at the same distance. This is useful for multiple fast moving targets in different directions, for example, to resolve complicated traffic scenarios with cars moving in opposite directions or during overtaking manoeuvres.

Digital Beamforming (DBF) Mode
In DBF mode, the distance and the angle to the target are displayed. The receive signals from the four receive channels are used to estimate the angle of the target. The display shows spatial distribution of targets in the xy-plane. In DBF mode, the system is configured the same as in FMCW mode but with different processing of the IF downconverted signals. After calculating the range, the angle information of the target is calculated by evaluating the phase differences between the four receive channels. Each Demorad system comes with factory calibration data that is loaded when the GUI is run. The sampled IF signals are then corrected before evaluating the sensors’ measured data.

The Demorad platform utilises MIMO operation by using the two transmit outputs and appropriate antenna placement. This yields seven receive channels to increase the angular resolution of the sensor, for example four real receive channels and four virtual receive channels with overlap on one channel. The waveform used in Demorad utilises a fast ramp feature with an up chirp of 280 µs and down chirp of 4 receive for a total ramp period of 284 μs. 256 samples are taken or data sampled in the up ramp with the AFE ADCs running at 1 MSPS.

The Demorad uses FMCW radar to detect range and velocity of objects up to 200 meters away with a resolution of approximately 75cm. The field of view (FOV) is approximately 120° in azimuth and 15° in elevation, based on the antenna array design.

By combining antennas as used in digital beamforming (DBF) Demorad uses DBF to calculate angular information in the FOV.
Distinguishing signal from noise

Why is Signal-to-Noise Ratio and drive voltage in industrial and automotive touchscreens so important? Chris Ard explains

Capacitive touchscreens are constructed using an orthogonal grid of transmitter and receiver (or ‘drive’ and ‘sense’) electrodes which are usually formed on either side of a transparent substrate and behind a transparent touch surface such as glass. In the steady state, the capacitance between transmitter and receiver is more or less uniform across the surface. When a finger (or other conductive object) approaches the surface, there is a small change in capacitance at that point. Measurement of the resulting change at the affected nodes allows a finger position to be determined.

The magnitude of the change is referred to as the touch delta. In an ideal system, the threshold at which a touch event is reliably confirmed by the system is set as close to the background measurement level as possible.

However, in real-world applications, two competing factors can affect the ability to set a low touch threshold:

• The size of the signal generated by the user’s finger or other input device such as a conductive stylus.

• Electrical noise in the system which contaminates the signal. The problem for touchscreen system design is that, in touching the screen’s surface, the user couples noise into the electrodes.

Sources of ambient noise can include electro-magnetic emissions from devices such as radios and light fixtures. The display itself can also be a source of significant noise which may be coupled to the sensor’s electrodes.

In the touchscreen of a consumer device adequate system performance is assured because the signal is rarely compromised in conditions of normal use.

In automotive and industrial touchscreens, the operating conditions can be more difficult – and calls for a touch-sensing system with the ability to distinguish signal from noise.

The ability to reliably sense a small touch delta matters much more in industrial and automotive applications than in consumer devices. This is because of the way touchscreens are used and the operating environments in which they are used tend to reduce the signal generated by the user’s finger, therefore reducing the touch delta.

These factors include: the wearing of gloves; thick protective cover material and the use of sculpted and contoured surfaces to enable users of the display UI to position their fingers more accurately; and the use of a hover or proximity function.

These features have been difficult to implement because all entail the detection of a much smaller touch delta than would normally be the case – a finger hovering in the air a few millimetres from the surface of the screen draws around a thousand times less change in capacitance than when it comes into contact with the screen.

While the size of the touch signal is much reduced – the amplitude of noise is often greater than in consumer applications, and can occur over a broader range of frequencies.

Industrial touchscreens are often used in proximity to motors and other high-voltage equipment that generate vast amounts of EMI.

When the touch delta signal is smaller and the noise is greater, requirements for high reliability are at risk of being compromised: this must be avoided, so that valid touch events are always detected, and noise-induced false touch events are rejected.

The benefit of a high SNR

Repurposed consumer touchscreen controller ICs can struggle to meet these requirements. This is because they typically have a signal-to-noise ratio (SNR) of 50-55dB, which is enough to provide reliable touch detection in a mobile handset touchscreen, but which is inadequate in the high noise/small signal environment of automotive or industrial touchscreens.

The obvious solution for systems based on this kind of touchscreen controller is to boost the amplitude of the signal by raising the drive voltage supplied to the sensing elements.
transmitter electrodes: in general, the higher the drive voltage, the greater the touch delta. Touchscreen controller manufacturers have consequently modified their devices to operate at drive voltages above the 3V level commonly used in consumer devices, up to much higher levels of 30V or even as much as 40V for use in automotive and industrial applications.

Increasing the drive voltage however, has two profound drawbacks. First, it generates much higher radiated emissions, which can undermine EMC compliance efforts. The harmful effect of the touchscreen emissions is amplified because conventional drive signals often have square waveforms that generate complex harmonic content. For typical capacitive touchscreen elements, the measurements are usually made at a frequency between 50kHz and 500kHz.

The complex emissions from a 30-40V touchscreen driver at these frequencies are strong enough to badly impair the audio quality of media systems in the vehicle. In medical systems, high emissions can lead to interference with the sensitive instruments which are used in a healthcare setting.

The second drawback of a 30-40V drive circuit is that it can accelerate a familiar process of corrosion of traces at the edge of the display assembly. The metals (especially silver or copper) commonly used here can corrode or migrate when exposed to high temperatures and high humidity and in the presence of a voltage difference from that of a neighbouring conductor. At a pulsed drive voltage of 30V, the local field strength is a huge 3MV/m during the pulse and 0V/m when inactive while the gap between traces is as small as 10µm.

Over time, electro-migration can form small conductive dendrites between traces which eventually short the touch sensor channels and cause the touchscreen to fail prematurely (Figure 1). This is true for sensors that are fabricated on glass or plastic substrates. Copper traces are prone to the same effect, but at a slower rate than silver.

The dielectric materials in the sensor stack, such as the adhesives, are also subject to damage from the high electric field strengths and can begin to degrade optically as microscopic bubbles form, reducing the lifetime of the product.

**Low, neutral drive voltage**

A much better way to solve the problem of detecting small signals in a high noise environment is to maintain a low drive voltage but to increase the touchscreen controller’s SNR. The touch-sensing performance achievable with a high-SNR touchscreen controller has recently been demonstrated in a reference design system, from TouchNetix, intended for deployment in industrial or automotive applications.

The demonstration touchscreen design is based on the axiXiom AX310 touchscreen controller, which has an SNR of 80dB (see Figure 2). In the axiXiom family of controllers, TouchNetix has made use of sophisticated narrowband transmission techniques little used previously in touchscreen systems. Allied to noise mitigation technology and a sophisticated DSP engine, the axiXiom controller’s sensing architecture and analogue front end are so sensitive that they can recover the carrier even when it is thousands of times smaller than the interference.

The axiXiom chip’s high sensitivity enables it to operate with a sinusoidal drive waveform at a low drive voltage of 2.5Vpk-pk with an overall neutral bias. This generates extremely low levels of electromagnetic emissions, enabling OEMs to easily meet CISPR25 Level 3 specifications for radiated emissions without implementing expensive noise counter-measures. The low drive voltage also dramatically reduces the risk of early touchscreen failure due to materials degradation in hot and humid conditions.

Because of the high SNR, even with this very low drive voltage, excellent touchscreen performance is possible: the TouchNetix reference design demonstrates the ability to reliably detect finger touches through acrylic overlay more than 10mm thick, and even through screen assemblies with a small air gap. Hover capability is equally impressive: the AX310 can detect a pre-contact target above the screen surface at a distance of more than 80mm. In contrast to existing methods for hover detection, the axiXiom system requires no extra electrodes, and no extra edge margin is occupied around the outside edge of the touch panel.

**Conclusion**

The availability of the axiXiom high-SNR touchscreen controller opens up new possibilities in display UI design, adding huge value to the touchscreen in vehicles and industrial equipment. Sculpted overlays and hover and zoom functions make the touchscreen much easier to use and, combined with low emissions and minimal rates of materials degradation, is transforming the OEM’s approach to modern touchscreen design.
Today, artificial neural networks underpin much of the research into artificial intelligence (AI) and machine learning. But they face major issues that may see the whole architecture become a blind alley in the search for efficient AI.

A major problem with artificial neural networks, particularly those used in deep learning, is how power hungry they are. That has meant parcelling the work off to remote cloud servers. But for real-time systems, the finite speed of light presents a difficulty. Denis Dutoit, strategic marketing manager at research institute CEA-Leti, said at a workshop held as part of the VLSI Symposia in Honolulu earlier this year: “We have to process more data at the edge to understand the information that is coming from sensors. If we need a decision made in 1ms or less, the server that does that can’t be more than 150km away.”

Engineers working in AI based on neural networks are trying to use techniques such as pruning and approximate computing to reduce the workload of edge computers expected to handle AI applications. But machine-learning researchers are all too aware they are a long way from what is possible. It is easy to see why that is because the active human brain gets by on a power budget of just 20W. Although the neural network took its inspiration from the brain’s structure, it maybe did not take enough.

The key question is why is the brain so efficient? Some argue that much of what drives the brain’s processing lies in the way that neurons process stimulus. Whereas artificial neural networks process arithmetic values and thresholds, the brain relies on trains of electrical spikes that move through the synapses that connect neurons together. Peter van der Made, founder and CTO of start-up Brainchip argues the spiking behaviour can be processed by the simplest of neural models implemented in the company’s chips, rejecting even an influential expressive model based on just a few differential equations developed by Eugene Izikevich 15 years ago.

Few are convinced that the brain has given up its secrets so easily and are looking to build more accurate models of its working. “Nobody knows how much detail you can strip away before you strip away something important,” says Professor Steve Furber of the University of Manchester and leader of the SpiNNaker programme there.

In early November, about ten years after they produced the formal proposal for its construction, the team led by Furber celebrated the completion of a machine that can deploy a million Arm cores spread across 1200 boards to simulate roughly one percent of the human brain. Each core has the capacity to simulate a thousand neurons and a million synapses – reflecting the ratio of processing to interconnect found in biological brains.

In that decade, the team has learned a lot. SpiNNaker set out largely as a hardware-oriented project: using Arm cores built from asynchronous logic in a massively parallel machine with the depth of logical interconnectivity found in biological brains.

“The [million-core] machine brings new ideas to achieving reliability,” Furber says. “At that scale it’s not all going to work at the same time, ever. Most of it will: you don’t have the situation where 30 per cent of it isn’t operational at any one time. It’s
more like one per cent or a fraction of one per cent. But you have to know which fraction it is. Developing the redundancy and software framework to do that has been a challenge."

Now part of Europe’s Human Brain Project, SpiNNaker is the digital foil to the University of Heidelberg’s predominantly analogue BrainScalesS architecture. Some see analogue-domain processing as a possible endpoint of neuromorphic research. Barbara de Salvo, deputy director of science and long-term research at CEA-Leti, says resistive memories have properties that lend themselves to energy-efficient spike-based processing but much depends on what more extensive digital simulations tell researchers.

SpiNNaker’s programmability lets researchers explore the many models of neural interactions neuroscience has explored. Thanks to this flexibility, SpiNNaker has spread around the world as an increasing number of researchers have got involved in neuromorphic computing and brain science and found they need digital computers optimised for the task to simulate their models. With many located in European labs, SpiNNaker systems now sit as far afield as Sandia Laboratories in the US and Auckland University of Technology.

“It’s intrinsically a very interdisciplinary game,” Furber says. “We are computer engineers. We bring expertise in microchip design. But if we are going to build artificial brains we don’t have the expertise to do that. The Human Brain Project provides an excellent environment for collaboration.”

The software development continues, including techniques to load the enormous quantities of data needed to support simulations with the complexity of a brain of a small mammal. Most jobs today are much smaller, partly because load times outweigh actual experimental time in most situations. A recent change to the software in which the models are generated within the machine from a high-level description. “It’s an obvious step but it’s non-trivial getting it to run.”

Second generation
With the learning from the original SpiNNaker project, the Manchester group has teamed up with colleagues at the University of Dresden to develop a second generation. SpiNNaker-2 provides the opportunity to move to a new process technology – the 22nm FD-SOI process offered by the German university’s neighbourhood fab operated by GlobalFoundries.

“With SpiNNaker-1 we were building to a very tight budget. The 130nm technology we used was a mature process even then,” Furber says. “We can be more aggressive on the process now, which will give us an order of magnitude improvement in performance.”

The FD-SOI process also provides the opportunity to use techniques such as adaptive body biasing to reduce energy consumption.

Although SpiNNaker-2 keeps the Arm processor architecture at its heart, the revised design takes advantage of additional silicon budget to deploy accelerators. “We’ve worked out what the system spends a lot of its time doing,” Furber says. “Learning is still in a rapid state of flux. Everything is evolving. We want to keep the software flexibility of SpiNNaker.”

The Arm processor will be supported by dedicated accelerator that the kinds of exponential functions commonly used in mathematical models of neurons as well as a hardware random number generation. Using the Arm Cortex-M4 as the main processor core, there is a greater emphasis on double-precision floating-point arithmetic than before. Although, as Furber points out, biology is noisy and likely to be amenable to computing platforms that use approximate computing, the higher accuracy is needed to support the kinds of models scientists need to run to find out which approximations can be made.

“Often the users are coming from a background of running code on double-precision supercomputers and clusters. When offered SpiNNaker, the first question they ask is will they get the same answer?”

The tape-out target for the first complete SpiNNaker-2 processor, which will contain 144 Arm cores is April 2020. The run-up to that is a series of smaller design projects intended to reduce the risk inherent in a large MPSoC design. The first processor-based test chip, called Santos, was used to test a quad-core design on a 28nm bulk CMOS process. The second, which saw first silicon in recent months, deployed two quad elements on the FD-SOI process. “We are planning one more prototype. That will be to de-risk the memory controller design. Modern DRAM memories have got really scary in their interfaces,” Furber says.

The final MPSoC will be powerful enough to, in effect, put the equivalent of an insect brain on a chip. “Something of the scale of an insect brain on a drone that would be an interesting place to be,” Furber says, pointing to the EPSRC-funded Brains-on-Board project as an example of the kind of group that might implement such a design. A SpiNNaker-2 machine on the same scale as today’s million-core system would support simulations of around 10 per cent of the human brain. “It would take another couple of steps get the whole brain, assuming the aim is to get to that point,” Furber says.

With the ability to run many, smaller models at high speed, computer architects and neuroscientists may be able to unlock enough of the secrets before full-sized brain simulations get underway and allow the insights from the software-based SpiNNaker to distill into custom hardware.
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NÜRNBERG MESSE
An issue of trust

If fully autonomous vehicles are ever set to become a reality, we need to start finding answers to some ‘impossible’ questions. By Bethan Grylls

The rules that govern the road were developed for human drivers, but with the development of autonomous vehicles, the way in which services and people move around are set to change. As such, legislation will need to be reviewed and adapted to accommodate for the new driver: the machine.

Human error is said to be the cause of the majority of road accidents. There were 1,770 UK road deaths in the year ending June 2018 alone, according to the Department for Transport (DfT). Insurer AXA has pointed to it being responsible for 90% of traffic accidents; adding that it believes removing the driver from the driving seat is how road fatalities can be dramatically reduced. “Technology doesn’t have the limitations or lapses in concentration which humans do,” it noted.

It is, in fact, a widely held consensus that around 1.3 million road deaths could be prevented annually with the introduction of autonomous vehicles; Government adds that reducing such accidents could contribute £2 billion of savings to the UK economy by 2030. Yet, in a survey conducted by IAM RoadSmart of 1,000 British drivers, more than a third of motorists, believe the technology is a bad idea, with 45% saying they are “unsure”. Almost two-thirds believe a human should always be in control of a vehicle.

The reason behind this uncertainty is mostly attributed to the fear of relieving full control to the autonomous vehicle, which has been heightened by media attention to the few self-driving vehicle accidents that have occurred. “People are killed on the roads every day by accidents that probably could have been eliminated by some type of assisted safety system, but those incidents aren’t advertised,” said Lance Williams, VP, automotive strategy, ON Semiconductor. “An accident in a self-driving car however, is all over the news.”

But handing over the power to the machine raises difficult questions, such as machine morality – what does the car do in certain unavoidable situations which could result in injury or loss of life – and liability – who is responsible and accountable?

At this year’s electronica, New Electronics approached a number of industry experts to hear their point of view, but found that most were uncomfortable to make credited comment due to the nature of question. Despite the majority wishing to make their statements anonymously, one individual admitted that it was a topic that “needed to be talked about”.

Also among the comments made was: “I don’t fully trust machines to make decisions based on their own experiences, I would like human intelligent built into the algorithms. But for autonomy to succeed, people will have to start trusting machines”.

Trust is a particular area many outline as a problem. Without it, none of the anticipated benefits such as improved road safety and traffic conditions can be realised. Consequently, a number of institutes and investing companies, as well as Government have been actively discussing and looking to develop new standardisation that accommodates for such concerns.

As AI and autonomous technology develops further, Government, trade and research bodies seek to develop fair, safe and ethical standards.

Being such a complex topic, consultations have been opened to the public for some time now. Among them is MIT’s Massive Online Experiment (MOE) known as the “Moral Machine” which was launched in an effort to collate human responses to certain scenarios. The idea behind this – and many other similar projects – is that the general consensus can be used and integrated into machine learning to create an ethical, fair and safer system.

MIT’s test presents various situations based on the Trolley Problem, a well-known ethics quandary, introducing elements such
as gender, age, law and status to determine whether certain factors affect a user’s decision.

For example: a passenger of a fully autonomous vehicle makes their way down a road. Suddenly a group of pedestrians appear in the car’s path. Should the car hit the group or swerve and put the passenger or a pedestrian in danger?

MIT found that generally people take a utilitarian approach – in that they prefer autonomous vehicles to minimise casualties. In other words, they would favour a car with one driver to swerve off the road to avoid ten people. However, at the same time, the respondents also revealed they would be much less likely to use a vehicle programmed that way.

“Most people want to live in a world where cars will minimise casualties,” explained Associate Professor Iyad Rahwan of MIT. “But everybody wants their own car to protect them.”

Earlier this year, NXP Automotive communications manager, Monica Davis, wrote of the consequence of such attitudes, commenting that it becomes a “social dilemma, as self-interest risks overpowering moral values”, along with a technical dilemma for the industry, “how does industry design algorithms that reconcile moral values and personal interest?”

The IEEE AI Ethics Initiative is presently looking into these matters, and as a result, have developed Ethically Aligned Design (EAD), which aims to set the global standards for ethics in autonomous and intelligent systems (A/IS). But as such a complicated topic, it’s probably fair to predict that the booklet, currently on version 2, is yet to see more revisions.

Williams points to infrastructure as an area that needs more focus, explaining that presently, the cars are well ahead. The Government Actuary’s Department (GAD) has also noted this as one of the most important areas in need of consideration. “At present, the road network is designed to accommodate the existing ‘driven’ transport. The combined effects of road traffic accidents, weather-related damage and ever increasing traffic volumes continue to make both repairs and design/expansion of the existing infrastructure a significant challenge for both Government and users,” GAD stated.

“One connected autonomous vehicles (CAVs) would require markings, signals and signs to be maintained to a higher standard than at present to make sure the instructions can be followed,” GAD also highlighted a greater need to maintain road surfaces as CAVs may be less able to adapt to hazards such as potholes.

It believes once a proper infrastructure is established, the benefit to traffic flow will be great, enabling vehicles to move more efficiently. GAD also envisions further benefits, in which it proposes that self-driving vehicles could drop passengers off and self-park, noting that this could – in theory – result in parking fines becoming non-existent. However, for this to be possible, it states that cities and towns will have to be redesigned – and with plentiful parking so to avoid the risk of CAVs clogging roads.

But Williams says this vision is “far off” pointing to the current poor conditions of the road slowing redesign. He also notes that construction work will cause further problems, with the potential for site barriers to be misplaced and to cause errors in vehicle alignment.

A fundamental change in insurance policy will also have to be addressed, GAD stated. With human drivers no longer in charge of the wheel, responsibility may shift from ‘named driver’ to manufacturer. But, GAD pointed out that many are so confident in their technology, they will readily accept liability.

Most recently, the Law Commission has launched an open consultation into “new rules for the UK’s self-driving future”. The discussion opens up further possibilities, asking anyone willing to contribute, questions such as ‘should a new Government agency monitor and investigate accidents involving automated vehicles?’; whether ‘criminal and civil liability laws need to be modified’; and ‘should a car mount a pavement to let an emergency vehicle through like a human driver would?’

It’s clear to see that there are many unanswered questions – with more appearing each year – and despite experts claiming what impressive technology is available, it’s clear to see that self-driving cars will not be possible until debates such as these are settled. Further to this, GAD has pointed out that a mixture of self-driving and driven vehicles will, in fact, actually make matters worse – with delays increasing. In other words, if we are ever to truly have autonomy, we need global acceptance – and that is going take a long time.
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E – Paper Displays

Electronic paper and e-paper are display devices that mimic the appearance of ordinary ink on paper. Unlike conventional backlit flat panel displays that emit light, electronic paper displays reflect light like paper. This may make them more comfortable to read, and provide a wider viewing angle than most light-emitting displays.

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Applications include electronic pricing labels in retail shops and digital signage, table menus at bus stations, electronic billboards, health and fitness displays, etc.

Global Distribution Agreement

Mouser Electronics and Sigfox Announce Global Distribution Agreement

Mouser Electronics, Inc., the industry’s leading New Product Introduction (NPI) distributor with the widest selection of semiconductors and electronic components, announces a global distribution agreement with Sigfox, the world’s leading Internet of Things (IoT) services provider. Through the agreement, Sigfox Sens’it Discovery System and SDR dongle are now available at Mouser.

Sens’it Discovery is a customizable IoT solution that combines the Sens’it 3 device with the sens’it application, along with Sigfox connectivity. With battery life of up to one year depending on use and frequency of messages, the device incorporates six different sensors (thermometer, hygrometer, light meter, accelerometer, magnetometer, Reed switch) and a central button for multiple use cases. The device works in any of the 31 countries and regions where Sigfox has coverage and can be configured to communicate in multiple areas with different Sigfox Radio Configurations (RC), RCL, R2C, R3C, or R4C.

Sens’it offers a dedicated software development kit (SDK), which allows developers to create their own firmware, rework the Sens’it behavior, and use it for their own use case. This makes Sens’it device a powerful and versatile device for anyone who wants to start with IoT.

New all-in-one electrical troubleshooting test tool

New all-in-one electrical troubleshooting test tool from Nicomatic & Eca group features accurate fault-localization to speed maintenance and repair

Nicomatic, one of the leading manufacturers of high-performance interconnect solutions, has introduced a new multi-functional test tool that comes in a compact, portable case designed to simplify electrical troubleshooting. The company’s Electrical Ground Support Equipment (E-GSE) TC50-eTool, developed in partnership with the ECA Group - which is renowned for its expertise in developing innovative solutions for use in hostile or harsh environments - enables:

- Voltage/current/resistance measurement
- Phase order checking, diode testing, insulation testing, and thermal imaging
- Additionally, the tool uses Nicomatic’s Smart’eCore solution based on reflectometry technology to provide precise wire-fault localization, enabling quick diagnosis and thereby minimizing aircraft ground time.

New OMC 779” connectors for industrial and automotive

OMC introduces new OMC 779” connectors for industrial and automotive

OMC’s new connector series offers a wide variety of features, including high current capability, signal integrity, and robust mechanical design. The series is ideal for use in industrial and automotive applications, offering reliable performance in demanding environments.

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Optically-Isolated Flexure Probe

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Lattice Expands Ultra-Low Power sensAI Stack

Lattice Expands Ultra-Low Power sensAI Stack with Optimized Solutions for Always-On, On-Device AI

CN1’s vision is to provide developers with a low-power, high-accuracy, and high-performance AI solution that is suitable for always-on applications. The company’s AI solution is based on its leading-edge FPGA technology and includes a range of tools and libraries for developers to easily integrate AI into their designs.

Pickering invests £5M in UK and Czech Republic facilities

Pickering invests £5M in UK and Czech Republic facilities to meet demand for Reed Relay and Simulation and Test products

Completion of phase 2 expected in Q1 2019

The Pickering Group is investing in its UK and Czech Republic facilities to meet the growing demand for reed relay and simulation and test products. The company is expanding its presence in these two strategic locations, with a focus on delivering high-quality, reliable products to meet the needs of the aerospace and defense industries.

Pickering also continues to invest in its global sales and marketing organization, expanding its reach to better serve customers worldwide. The company’s investment in the UK and Czech Republic facilities will enable it to meet the increasing demand for its products and services.

technoDISC

technoDISC - New Round Plastic Enclosures For IoT Electronics

ROLEC’s new design is UV-stable and hardened to IP 66/68, making it ideal for Industry 4.0 and IoT applications. It combines industrial grade features with modern aesthetics and functionality. It is designed to be fully adaptable with raised fixing holes and mounting screws, allowing for easy installation and integration into various applications.

The enclosure is designed to be sturdy and reliable in harsh environments, withstanding extreme temperatures and humidity. It offers a robust and secure solution for various industrial applications, providing the necessary protection for electronic components.

Find the right sensor

Find the right sensor for your design

Air quality, EVs, robots and many more markets addressed by product portfolio detailed in new literature from TTI

TTI, Inc., a world leading specialist distributor of electronic components, has just published a handy Sensors Application Guide which – for the first time – is split by market sectors rather than by franchise or device type. Sections include Smart Building, Smart Appliances, HVAC, Renewable Energy, Robotics and Factory Automation; Materials Handling; EV and Automotive; Medical; Wearables; Drones and Unmanned Vehicles.

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