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CONTENT

- **Alumni section**
- **AI-Driven universal speech translator' to be developed by Meta**
- **Microsoft paper details its 'singularity' artificial intelligence infrastructure service**
- **Microsoft Teams users warned of malicious files from hackers**
- **Bionic EyeTech aims to help blind people see**
- **Self-Healing material paves way for durable robot hands**
- **Changing floor shape could cut concrete usage by 75 percent**
- **Heart surgeons use Virtual Reality to improve patient outcomes**
- **Fusion power experiment generates 'milestone' energy load**
- **STMicroelectronics transforms digital vision with the market first 0.5Mpixel depth image sensor**
- **MIT Engineers develop biocompatible surgical “duct tape” as an alternative to sutures**





Native and Hybrid App Development

A native app is a smartphone application developed specifically for a mobile operating system (Swift for iOS, java/Kotlin for Android).

Since the app is developed within a mature ecosystem following the technical and user experience guidelines of the OS, it not only has the advantage of faster performance but also “feels right”.

What feeling right means is that the in-app interaction has a look and feel consistent with most of the other native apps on the device. The end user is thus more likely to learn how to navigate and use the app faster.

Finally, native applications have the significant advantage of being able to easily access and utilize the built-in capabilities of the user's device (e.g., GPS, address book, camera, etcetera).

When a user sends text messages, takes pictures using the device's default app, set reminders, or uses the device's music app (the one that came with the phone), they're using native apps.

Cross Platform development

There are two major players in this field 1. Flutter backed by Google, 2. React Native from Facebook Here I will be talking more about Flutter.

What is Flutter



- Flutter is an open source framework by Google for building beautiful, natively compiled, multi-platform applications from a single codebase.
- Flutter code compiles to ARM or Intel machine code as well as JavaScript, for fast performance on any device.
- Deploy to multiple devices from a single codebase: mobile, web, desktop, and embedded devices.
- Take control of your codebase with automated testing, developer tooling, and everything else you need to build production-quality apps.
- Flutter is supported and used by Google, trusted by well-known brands around the world, and maintained by a community of global developers.

How Flutter Works

Flutter is a cross-platform UI toolkit that is designed to allow code reuse across operating systems such as iOS and Android, while also allowing applications to interface directly with underlying platform services. The goal is to enable developers to deliver high-performance apps that feel natural on different platforms, embracing differences where they exist while sharing as much code as possible.

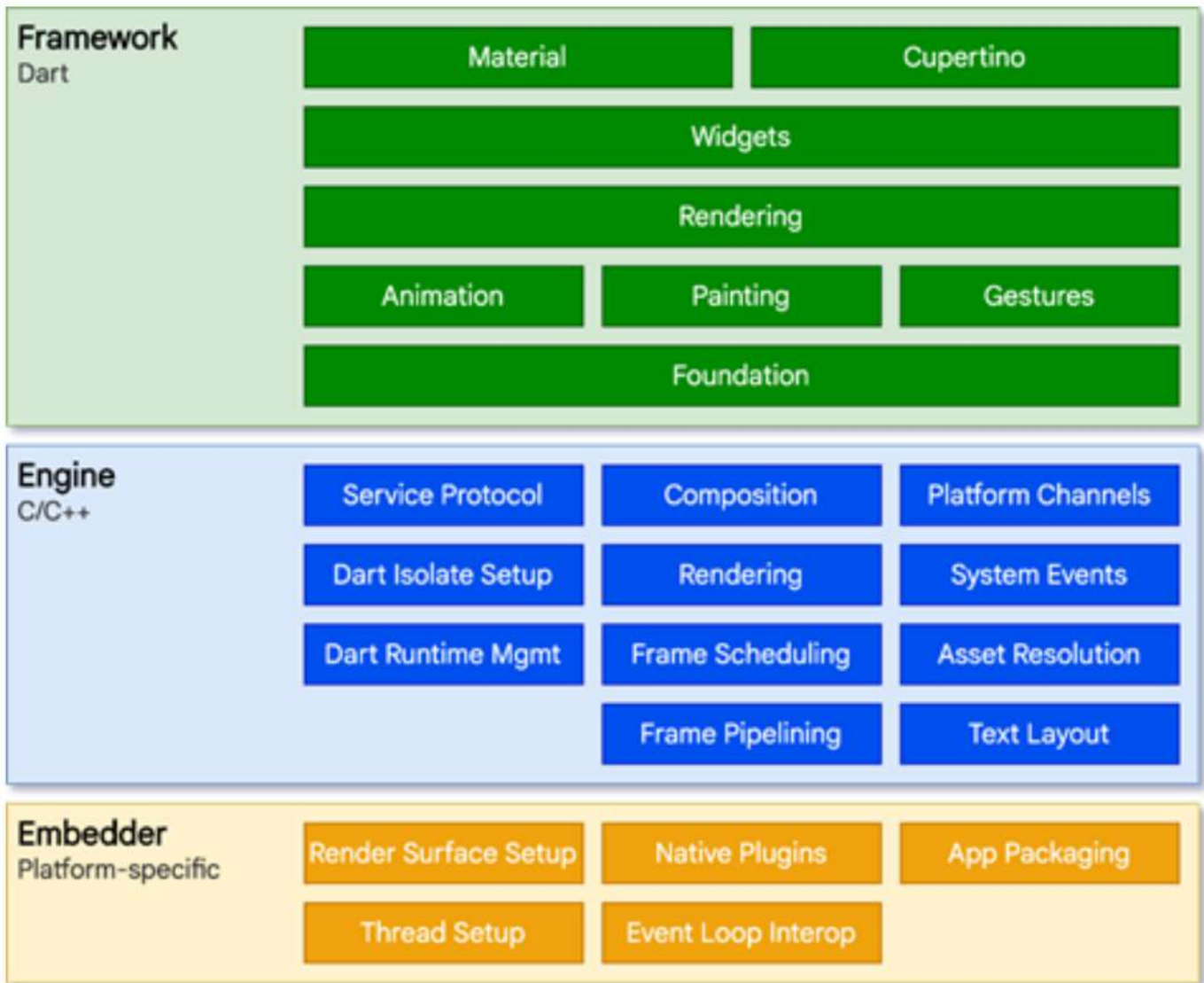
During development, Flutter apps run in a VM that offers stateful hot reload of changes without needing a full recompile. For release, Flutter apps are compiled directly to machine code, whether Intel x64 or ARM instructions, or to JavaScript if targeting the web. The framework is open source, with a permissive BSD license, and has a thriving ecosystem of third-party packages that supplement the core library functionality.

Architectural layers

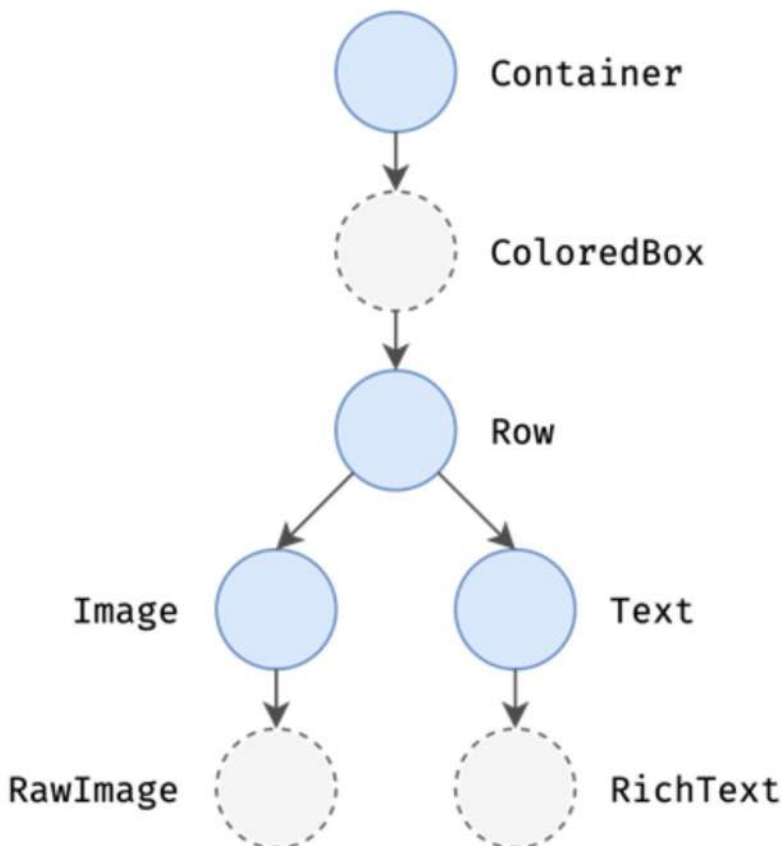
The fundamental building blocks of Flutter user interfaces – Widgets

Widgets are the building blocks of a Flutter app's user interface, and each widget is an immutable declaration of part of the user interface.

Widgets form a hierarchy based on composition. Each widget nests inside its parent and can receive context from the parent. This structure carries all the way up to the root widget (the container that hosts the Flutter app, typically MaterialApp or CupertinoApp).



Widgets



Advantages of Cross platform apps

1. Same UI and Business Logic in All Platforms
2. Reduced Code Development Time
3. Similar to Native App Performance
4. Custom, Animated UI of Any Complexity Available
5. Own Rendering Engine
6. Simple Platform-Specific Logic Implementation
7. The Potential Ability to Go Beyond Mobile

If you are excited to work in hybrid app development and want to start with Flutter feel free to connect with me over LinkedIn <https://www.linkedin.com/in/neeraj-maurya-119425156/> and I will be happy to assist you.

Sources: flutter.dev



AI-Driven universal speech translator' to be developed by Meta

As part of the social media giant investment in the iteration of the universe, the founder and Chief Executive Officer (CEO) of Meta Inc held a broad presentation with the company's Artificial Intelligence (AI) team with a view to addressing the company's future endeavours in "Building the Metaverse with AI." The Meta's AI lab proposition which was presented on the official Facebook page of Meta properties, underscored how "through the power of artificial intelligence, we will enable a world where people can easily share, create, and connect physically, and virtually, with anyone, anywhere." All through the live presentation, Zuckerberg referred to AI as "perhaps the most important foundational technology of our time."

It is a given that the adoption of the artificial intelligence technology has and will continue to maintain its role as a very important element in the development and creation of the metaverse, thus becoming the fuel for digital transformation on a global level.

The Meta CEO had in the course of the presentation, unmasked the latest project of the tech giant dubbed: "Project CAIRaoke." According to Zuckerberg, the Project CAIRaoke would be a "fully end-to-end neural model for building on device assistants, as it combines the approach behind BlenderBot with the latest in conversational AI to deliver better dialog capabilities."

Facebook's Artificial Intelligence research teams had July last year developed the open sourced Blender Bot 2.0 chatbot programmed to stimulate the creation of long-term memory that can recurrently "access, search the internet" to obtain specific information, and conduct modern and complex conversations addressing almost any topic.

The Project CAIRaoke on its own was created to serve as an intellectually advanced assistant saddled with a much more intelligent response to articulated comments in a video. The video also brought to the fore the underlying problems faced concerning assistant technology, one of them is the general misunderstanding of any demand generated from a user.

At the presentation, the Meta Chief Executive posited that the company's redirect in focus towards AI technology for the Metaverse investment will cut across two critical areas of AI research, the "egocentric perception" and "a whole new class of generative AI models."

Even though the AI research team of the company did not explicitly specify in their blogpost the exact time the projects will be completed nor presented a planned route on vital milestones needed to complete their projects, they on the other hand presented an ideological vision of the endless possibilities of having an Artificial Intelligence-powered universal language translation.

Meta AI researchers in a blog post wrote: "Eliminating language barriers would be profound, making it possible for billions of people to access information online in their native or preferred language. "Advances in [machine translation] won't just help those who don't speak one of the languages that dominate the internet today; they'll also fundamentally change the way people in the world connect and share ideas," they added.

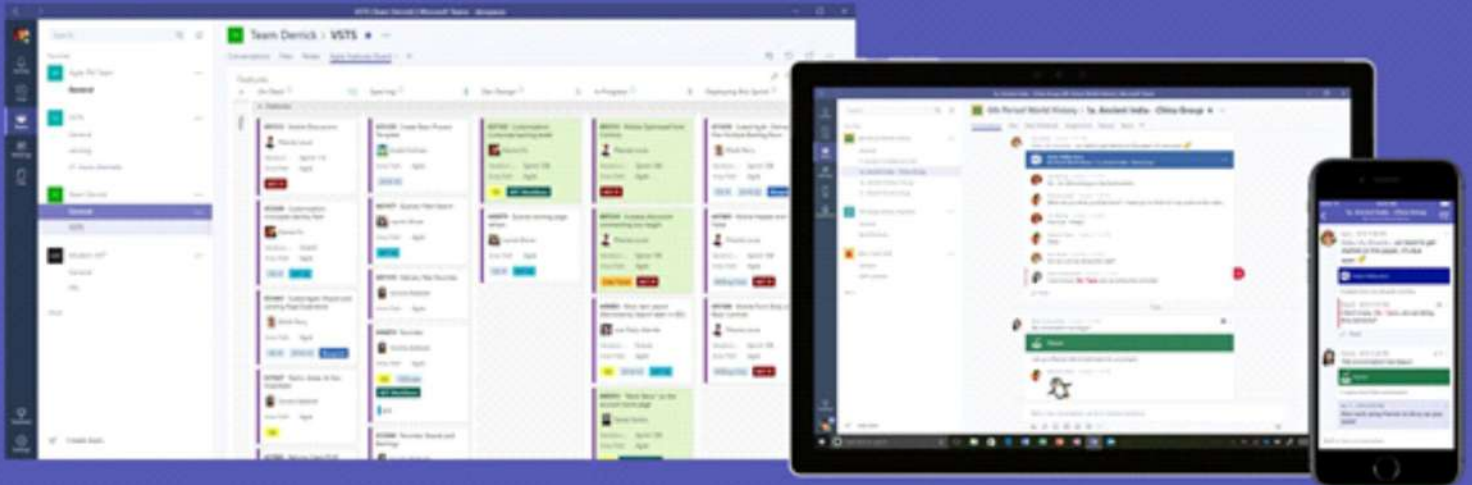


Microsoft paper details its 'singularity' artificial intelligence infrastructure service

Software Company, Microsoft has shown how it operates 'singularity', its planet-scale distributed scheduling services for Artificial Intelligence workloads presented by 26 employees of the multinational company. The company while publishing a paper titled: "Singularity: Planet-Scale, Preemptible and Elastic Scheduling of AI Workloads", posited that the purpose of Singularity is to help it control costs by driving high utilization for deep learning workloads. With the published paper giving technical details about the service's effort, the structure of the service appears to be related to helping data scientists and AI practitioners build and experiment on their models on a Microsoft-provided distributed infrastructure service explicitly created for AI. The newly published paper has notable authors listed in it, which included Azure Chief Technical Officer Mark Russinovich; Partner Architect Rimma Nehme, who worked on Azure Cosmos DB until moving to Azure to work on AI. "at the heart of Singularity is a novel, workload-aware scheduler that can transparently pre-empt and elastically scale deep learning workloads to drive high utilization without impacting their correctness or performance, across a global fleet of accelerators (e.g., GPUs, FPGAs)," the paper noted. The officials of Microsoft in addition to this enumerated plan to make field-programmable gate arrays (FPGA) available to customers as a service, and it would be recalled that in 2018, Microsoft went public about its "Project Brainwave" work, designed to provide fast AI processing in Azure. "the company had then made a preview of Azure Machine Learning Hardware Accelerated Models powered by Brainwave in the cloud, with the move considered as the first step in making FPGA processing for AI workloads available to customers. To ensure the availability of AI-powered FPGA available to customers, the company needed a 'device proxy' tool that "runs in its address space and has a one-to-one correspondence to a physical accelerator device. When a job worker initiates device APIs, they are intercepted and sent over the shared memory to the device proxy process that runs in a separate address space, and whose lifetime is decoupled from the lifetime of the worker process." the implication of this is that when this is achieved, it allows more additional jobs to be scheduled in a more efficient way, with thousands of servers in use for more time, while also enabling swift scaling, up or down, without disruption. "Singularity achieves a significant breakthrough in scheduling deep learning workloads, converting niche features such as elasticity into mainstream, always-on features that the scheduler can rely on for implementing stringent SLAs," the paper concludes.



Microsoft Teams



Microsoft Teams users warned of malicious files from hackers

With regards to the pandemic and the need to connect remotely while getting work done, the Microsoft Teams have continued to thrive globally. In July 2021, Teams recorded an increase that contributed to it whopping 270 million monthly active users. As this growth may feel remarkable and worthy, cybercriminals are also on the loose to target millions of users by setting Microsoft teams as a launchpad for phishing and malware attacks. according to a blog post by cloud security firm Avanan, it is now observed that starting since January 2022, hackers are exploiting Teams conversations by dropping malicious executable files. Avanan mentions that this file writes data to the Windows registry, installs DLL files and creates shortcut links that permit the program to self-administer. With thousands of these attacks identified and analyzed by Avanan, the company has come to a conclusion that these .exe files are being used by hackers in Microsoft Teams. The rapid rise in these team attacks has proven a source of concern to unsuspected users.

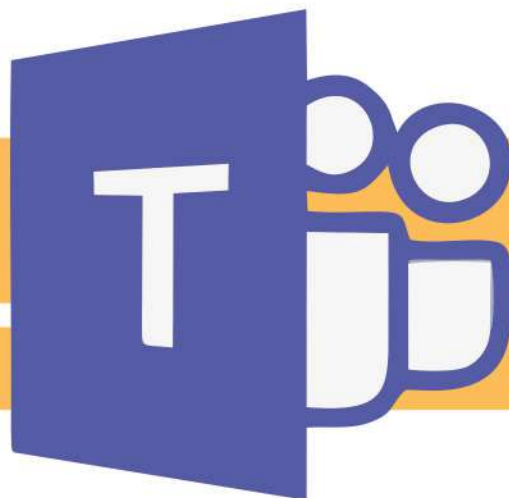
The practice of this attack has identified that hackers will attach .exe files through Teams chats, a Trojan is installed on the end-user's computer. In the attack done via email, Avanan have identified that hackers are hacking into Teams. This hack is done with East-West attacks that start via email, or by simply spoofing a user. An .exe file called "User Centric" is then attached to a chat. This Trojan files when clicked, then install as DLL files and create shortcut links to self-administer and hackers can eventually take over the user's computer. Using an executable file, or a file that contains instructions for the system to execute, hackers can install malicious file libraries (DLL files) that allow the program to self-administer and take control over the computer.

In other to attach malicious files to a Teams chat, the first step is accessing Teams. Hackers have a number of ways that is carried out. Hackers can gain entry by compromising a partner organization and listen in on inter-organizational chats. They can compromise an email address and use that to access Teams. They can steal Microsoft 365 credentials from a previous phishing campaign, giving them carte blanche access to Teams and the rest of the Office suite. Given that hackers are quite adept at compromising Microsoft 365 accounts using traditional email phishing methods, they've learned that the same credentials work for Teams.

According to Avanan, once entry into an organization is secured, an attacker is already informed what technology is being used to protect it. That means they can tell what malware will bypass existing protections. The fact that default Teams protections are lacking compounds this problem, as scanning for malicious links and files is limited.

Further, many email security solutions do not provide robust protection for Teams. Hackers, who can access Teams accounts via East-West attacks, or by leveraging the credentials they harvest in other phishing attacks, have carte blanche to launch attacks against millions of unsuspecting users. This attack has shown that hackers have gained a deep understand of Teams as a potential attack vector as the usage continues to grow rapidly. Avanan stated that a significant increase in these sorts of attacks should be expected.

For Teams user it's time to be aware and refuse the urge to download any files from unknown sources. Users are encouraged to reach out to IT when an unfamiliar file is suspected. Organizations are also advised to deploy robust, full-suite security that secures all lines of business communication, including Teams. News of this Teams bug comes as Windows 10 users are being issued alerts on the resurgence of the nasty QBot bug, a malware that dates as far back as 2007, now with more terrifying outcomes. According to security experts at Digital Forensics and Incident Response (DFIR), this malware can give hackers full access to personal files such as emails, passwords and web browsing history within 30 minutes of getting into a victim's system. The malware sharing thrives via fake phishing emails which try to trick users into downloading the bug with subject lines that include tax payment reminders, job offers, and even COVID-19 alerts.



Bionic EyeTech aims to help blind people see

The small wireless device - which is designed by Phoenix99 - and after being successfully tested on sheep in 2021, an application has now been made to start testing in human patients. Samuel Eggenberger, a biomedical engineer at the the University of Sydney's School of Biomedical Engineering, said: "There were no unexpected reactions from the tissue around the device [when we tested it on the sheep] and we expect it could remain in place for many years."

The Phoenix 99 device operates by being able to bypass faulty retina cells, and 'trigger' those that are still able to work.

The technology itself wirelessly linked to a small camera attached to a pair of glasses, and works by stimulating a user's retina in order to restore the vision to an extent.

Dr Diane Hilal-Campo told the BBC: "Advancements in technology have been redefining ophthalmology. With an estimated 2bn people suffering with sight problems across the world, it was estimated back in 2018 that market value of the bionic eye grow to \$425m by 2028.

According to DataBridge: "The bionic eye market is expected to gain market growth in the forecast period of 2021 to 2028. Data Bridge Market Research analyses that the market is growing with the CAGR of 8.80% in the forecast period of 2021 to 2028 and is expected to reach 425.85 USD million by 2028. The growing of the incidences of vision loss will help in escalating the growth of the bionic eye market.

"The bionic eye is an electrical prosthetic device, which is surgically implanted into a human eye in order to let the transduction of light that is the change of light from the environment into impulses the brain can process in people who have sustained serious damage to the retina. The bionic eye encompasses an exterior camera and transmitter and an internal microchip. The camera is mounted on a pair of eyeglasses, where it helps to form the visual stimuli of the environment before emitting high-frequency radio waves."





Self-Healing material paves way for durable robot hands

Researchers have developed new, 3D-printed materials capable of self-healing that could aid in the development of realistic artificial hands and other soft robotics. The low-cost jelly-like materials can sense strain, temperature and humidity and can also partially repair themselves at room temperature.

“Incorporating soft sensors into robotics allows us to get a lot more information from them, like how strain on our muscles allows our brains to get information about the state of our bodies,” said lead researcher David Hardman from the University of Cambridge.

The team developed the new material with robotic hands and arms in mind. These materials can detect when they are damaged, take the necessary steps to temporarily heal themselves and then resume work – all without the need for human interaction.

“We’ve been working with self-healing materials for several years, but now we’re looking into faster and cheaper ways to make self-healing robots,” said co-author Dr Thomas George-Thuruthel.

A prototype of the new material earlier versions of the self-healing robots needed to be heated in order to heal, but the Cambridge researchers are now developing materials that can heal at room temperature, which would make them more useful for real-world applications.

“We started with a stretchy, gelatin-based material which is cheap, biodegradable and biocompatible and carried out different tests on

how to incorporate sensors into the material by adding in lots of conductive components,” said Hardman.

The researchers found that printing sensors containing sodium chloride – salt – instead of carbon ink resulted in a material with the properties they were looking for. Since salt is soluble in the water-filled hydrogel, it provides a uniform channel for ionic conduction – the movement of ions.

When measuring the electrical resistance of the printed materials, the researchers found that changes in strain resulted in a highly linear response, which they could use to calculate the deformations of the material.

Adding salt also enabled sensing of stretches of more than three times the sensor’s original length, so that the material can be incorporated into flexible and stretchable robotic devices.

The researchers believe the new materials will be cheap to produce and easy to make, either by 3D printing or casting. They are preferable to many existing alternatives since they show long-term strength and stability without drying out, and they are made entirely from widely available, food-safe, materials, they added.

“It’s a really good sensor considering how cheap and easy it is to make,” said George-Thuruthel. “We could make a whole robot out of gelatin and print the sensors wherever we need them.”

The self-healing hydrogels bond well with a range of different materials, meaning they can easily be incorporated with other types of robotics.



Changing floor shape could cut concrete usage by 75 percent

Swapping solid slab floors for a 'thin shell' vaulted alternative could help the construction industry towards its net-zero targets, according to a concept presented by a UK research team.

An interdisciplinary team of structural engineers, mathematicians and manufacturing experts from the Universities of Bath, Cambridge and Dundee has unveiled a full-scale demonstration of a thin-shell floor, which uses 60 per cent less carbon in its construction than an equivalent flat slab that could carry the same load.

The new vaulted style of floor, developed in the UK, uses 75 percent less concrete than a traditional flat slab floor and could help the construction industry reduce its carbon footprint. The curved vault-shaped structure is covered by standard raised floor panels to create a level surface.

Created by the UKRI-funded Acorn (Automating Concrete Construction) research project, the innovative vault-shaped floor design takes advantage of concrete's inherent natural properties and strengths.

The team has demonstrated that the new process

could significantly reduce the carbon footprint of our built environment.

Dr Paul Shepherd, a reader in Bath's Department of Architecture and Civil Engineering and the principal investigator for Acorn, said: "Achieving the net zero targets recently ratified at the COP26 conference will require significant change by the construction industry, which is responsible for about half of the UK's total emissions.

"Since concrete is the world's most widely consumed material after water, and its production contributes more than 7 percent of global CO2 emissions, the easiest way for construction to begin its journey to net zero is to use less concrete.

"That has been the driving force behind this project, which we hope could make a major difference to the impact of construction."

Innovations in robotics, automated design and off-site fabrication are also key aspects of the project.

Most building floors use thick flat slabs of solid concrete, which are inefficient since they rely on the bending strength of concrete to support loads. Concrete isn't very good at resisting the tension

induced by bending, so these floors also need lots of steel reinforcement. Acorn's approach is to use concrete for what it is inherently good at - resisting compression.

By putting the material only where it is needed, and ensuring that it works in compression, the Acorn design uses much less concrete. The new shape might prove impractical to make using traditional temporary form work, so the Acorn team has in parallel developed an automated adaptable mould and a robotic concrete-spraying system that can be used in an off-site factory setting.

Alongside this new style of fabrication, the team has also developed bespoke software to seamlessly optimize floors for a given building design and control the automated manufacturing system to produce them.

Since the floor is made off-site, it also needs to be transported to site and then assembled. This created fresh challenges for the team, who had to split the large floor into nine transportable pieces and develop a connection system to join the pieces together. However, this approach also brought some advantages, in terms of reducing the time needed on-site for construction.

The Acorn team was also able to incorporate reversible joints, so that the floor can be disassembled and reused elsewhere at the end of the building's life, promoting a circular economy for the construction industry.

The practicality of this integrated system has been demonstrated to Acorn's industry partners, with a full-scale 4.5m x 4.5m thin-shell building constructed in the NRFIS Laboratory of Cambridge University's Civil Engineering Department.

Early results have suggested that Acorn's approach of using material sparingly can already deliver significant carbon savings, with future research likely to lead to even more as the various processes are optimised further. Despite being the first of its kind, each piece took only half an hour to make and the whole floor took a week to assemble – future commercial versions could be manufactured in dedicated industrial facilities much more quickly, with site erection times much reduced accordingly.

Dr Shepherd added: "After three years of research, it is amazing to see the fruits of all our hard work dominating the laboratory and drawing interested looks from all who passed by. It's not every day you can jump on top of your research! I just hope that one day soon this type of low-carbon automatically manufactured building becomes so widespread that people walk by without noticing."

Adam Locke, programme leader of the Europe Hub Technology and Innovation at Laing O'Rourke, one of Acorn's industry partners, added: "The Acorn demonstrator is a very useful stepping-stone in the progressive pathway to decarbonising our solutions and complements very well our own work in this area." Decarbonisation of the construction industry and its heavy reliance on using concrete is a popular topic for research.

In May 2021, a joint venture between graphene specialists at The University of Manchester and alumni-led construction firm Nationwide Engineering unveiled graphene-enhanced concrete that could revolutionise the concrete industry and its impact on the environment.

Meanwhile, in April 2021, the inaugural tenants of Hollands first 3D-printed concrete home received their house keys. The house is the first of five such structures planned as part of 'Project Milestone' - a joint construction and innovation project of Eindhoven University of Technology, Van Wijnen, Saint-Gobain Weber Beamix, Vesteda, the Municipality of Eindhoven and Witteveen+Bos.



New virtual reality technology has been designed that could improve outcomes for thousands of patients who undergo a surgical or keyhole procedure for congenital heart disease every year.

Every day in the UK around 13 babies are diagnosed with congenital heart disease - heart conditions that develop in the womb, before a baby is born. Depending on the severity of their condition, they might need one or more procedures to help their hearts function normally.

Now Kings College London researchers have developed a way of bringing together the scans that are routinely used to plan congenital heart disease surgery to create a three-dimensional, beating digital double of the heart.

The researchers hope that using VR to plan and practise procedures will shorten operating times and reduce the need for multiple surgeries, leading to better outcomes and experiences for patients and their families. They hope that it could be in regular use within the next two years.

“We have had a lot of help from the fantastic team at King's Medical Engineering Quality Management System, who are helping us to move the device through from a prototype to a nationally regulated device which can be used to help plan these complex procedures,” said researcher Dr Natasha Stephenson.

Trials of an early version of the technology, which used only echocardiograms (ultrasound scans of the heart) to create the VR heart, found that surgeons preferred it for understanding the anatomy of their patient's hearts. They also reported that it increased their confidence and improved their decision-making.

Funding from the British Heart Foundation has supported the researchers to add two more types of scans into the system - computed tomography (CT) and magnetic resonance imaging (MRI). While these types of scans are regularly used to help plan surgeries, they are usually only viewed on a flat screen.

Surgeons using the technology are immersed into the heart. It allows them to interact with and manipulate the images however they like. They can also test options for the procedure in VR before they get to the operating table.

Every patient with congenital heart disease has their own set of unique changes to their heart. By giving surgeons a better understanding of this and offering them an opportunity to practice and perfect operations, the researchers hope this technology will also help to improve the experiences of thousands of patients and their families each year.

“We think that this technology could also be used outside of congenital heart disease surgeries, to plan any procedure which aims to correct a structural problem within the heart, such as valve surgery in an adult patient,” said lead researcher professor John Simpson.

Last year, another project showed that jurors who view the scene of a crime in VR before making their verdict in a court case have a better chance of reaching the right decision.



Fusion power experiment generates 'milestone' energy load

A “milestone” fusion energy experiment has been completed that demonstrates its potential as a safe and sustainable low-carbon energy source.

According to researchers from the EUROfusion consortium, which encompasses 4,800 experts from across Europe, the experiment at the UK Atomic Energy Authority (UKAEA) site in Oxford more than doubled previous energy generation records that were achieved in 1997.

Fifty-nine megajoules of sustained fusion energy were generated for five seconds in the Joint European Torus (JET) tokamak machine.

The scientific data from the experiment is seen as a major boost for ITER, the larger and more advanced version of JET.

The ITER tokamak proof-of-concept fusion plant has been under construction in France since 2013. Its main reactor is planned to be completed in late 2025 and is designed to create and sustain a plasma of 500MW (thermal power) for 20 minutes, with just 50MW of thermal power injected into the reactor.

As pressures mount to address the effects of climate change through decarbonising energy production, hopes have long rested on the idea that fusion plants could provide a safe, efficient, low-carbon means of tackling the global energy crisis.

Science minister George Freeman said: “These milestone results are testament to the UK's role as a global leader in fusion energy research. They are evidence that the ground-breaking research and innovation being done here in the UK, and via collaboration with our partners across Europe, is making fusion power a reality.

“Our Industrial Strategy for Fusion is intended to ensure the UK continues to lead the world on the commercial roll-out of this transformational technology, with the potential to deliver clean energy for generations to come.”

Ian Chapman, UKAEA's CEO, said: “These landmark results have taken us a huge step closer to conquering one of the biggest scientific and engineering challenges of them all. It is reward for over 20 years of research and experiments with our partners from across Europe.

“It's clear we must make significant changes to address the effects of climate change, and fusion offers so much potential. We're building the knowledge and developing the new technology required to deliver a low-carbon, sustainable source of baseload energy that helps protect the planet for future generations. Our world needs fusion energy.”

Fusion is the process that powers stars like our sun and promises a near-limitless green electricity source for the long term, using small amounts of fuel that can be sourced worldwide from inexpensive materials.

The fusion process brings together atoms of light elements like hydrogen at high temperatures to form helium and release tremendous energy as heat. Fusion is inherently safe in that it cannot start a runaway process.

The JET test facility is able to generate temperatures 10 times hotter than the centre of the sun so that scientists can test the technology.

Last month, UKAEA asked residents in five areas to provide feedback on potential plans to construct a prototype nuclear fusion power plant.





STMicroelectronics transforms digital vision with the market's first 0.5Mpixel depth image sensor

STMicroelectronics (NYSE: STM), a global semiconductor leader serving customers across the spectrum of electronics applications, has announced a new family of high-resolution Time-of-Flight sensors that bring advanced 3D depth imaging to smartphones and other devices.

The 3D family debuts with the VD55H1. This sensor maps three-dimensional surfaces by measuring the distance to over half a million points. Objects can be detected up to five meters from the sensor, and even further with patterned illumination. VD55H1 addresses emerging AR/VR market use cases including room mapping, gaming, and 3D avatars. In smartphones, the sensor enhances the performance of camera-system features including bokeh effect, multi-camera selection, and video segmentation. Face-authentication security is also improved with higher resolution and more accurate 3D images to protect phone unlocking, mobile payment, and any smart system involving secure transactions and access control. In robotics, the VD55H1 provides high-fidelity 3D scene mapping for all target distances to enable new and more powerful capabilities.

"The innovative VD55H1 3D depth sensor reinforces ST's leadership in Time-of-Flight, and complements our full range of depth sensing technologies," said Eric Aussedat, ST's Executive VP,

Imaging Sub-Group General Manager. "The FlightSense™ portfolio now comprises direct and indirect ToF products from single-point ranging all-in-one sensors to sophisticated high-resolution 3D imagers enabling future generations of intuitive, smart, and autonomous devices."

Indirect time-of-flight (iToF) sensors, such as VD55H1, calculate the distance to objects by measuring the phase shift between the reflected signal and the emitted signal. This is a complementary technique to direct time of flight (dToF) sensors, which measure the time for transmitted signals to be reflected back to the sensor. ST's broad portfolio of advanced technologies enables the Company to design both direct and indirect high-resolution ToF sensors, and offer optimized solutions tailored to application requirements.

VD55H1's unique pixel architecture and fabrication process, leveraging in-house 40nm stacked wafer technology, ensures low power consumption, low noise, and optimized die area. The die contains 75% more pixels than existing VGA sensors, within a smaller die size.

The VD55H1 sensor is now available for lead customers to sample. Volume production maturity is scheduled for the second half of 2022. A reference design and complete software package are available to help accelerate sensor



evaluation and project development.

Further Technical Information

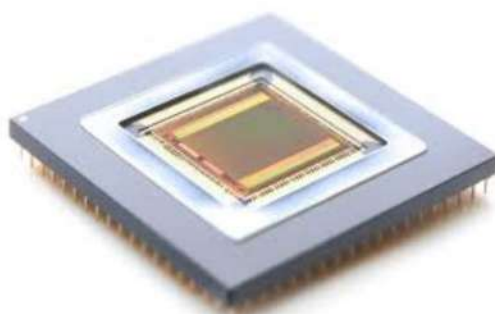
Featuring a 672 x 804 back-side illuminated (BSI) pixel array for iToF depth sensing, the VD55H1 is the first sensor of its type in the industry.

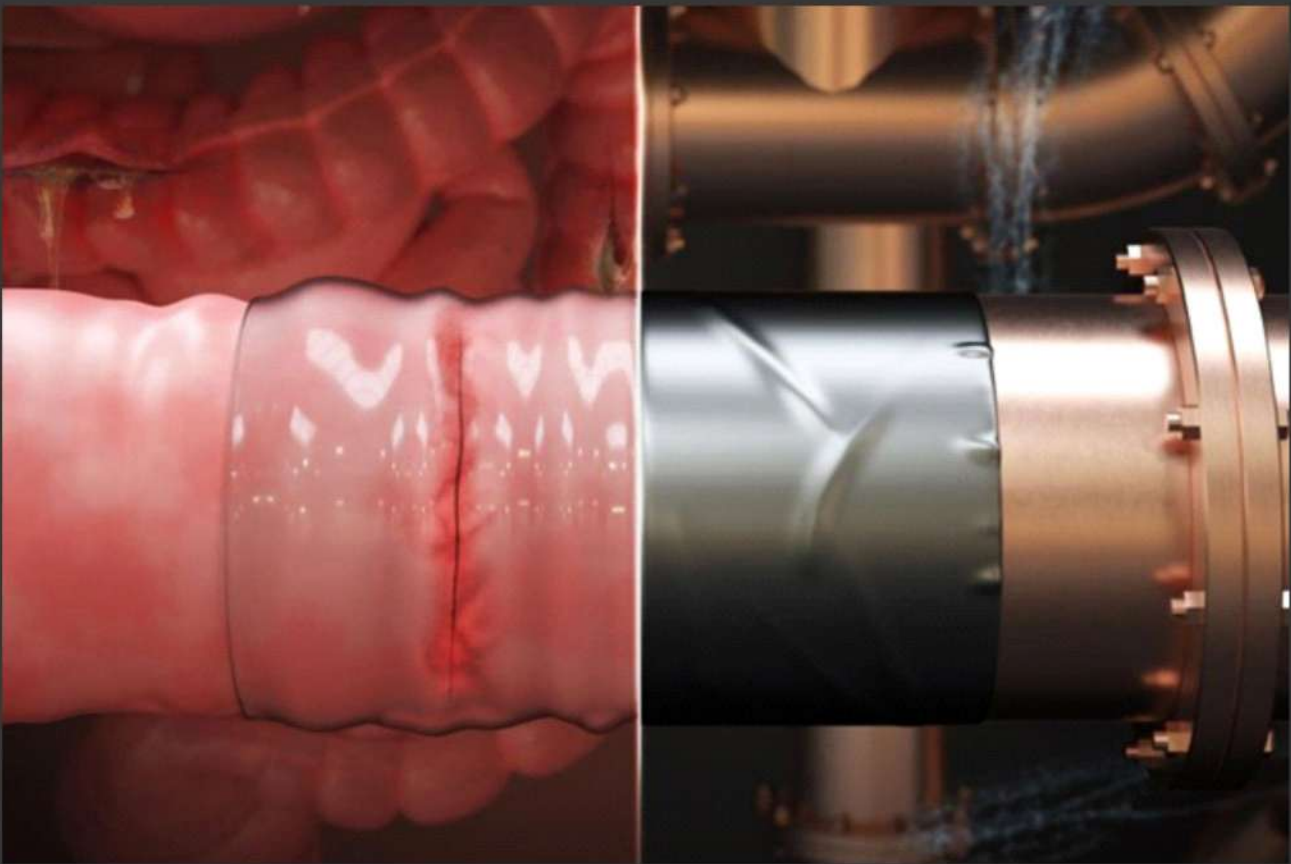
It has the unique ability to operate with a modulation frequency of 200MHz with more than 85% demodulation contrast at 940nm. This reduces the depth noise by a factor of two over incumbent sensors that typically operate around 100MHz. In addition, multi-frequency operation, an advanced depth-unwrapping algorithm, low pixel noise floor, and high pixel dynamic range ensure superior measurement accuracy over long ranging distance. Depth accuracy is better than 1% and typical precision is 0.1% of distance.

Other features include a short capture sequence that supports a frame rate up to 120 fps and improves motion-blur robustness. In addition, advanced clock and phase management including spread spectrum clock generator (SSCG) provides multi-device interference mitigation and optimized electromagnetic compatibility.

The power consumption can be reduced to less than 100mW in some streaming modes, to help prolong the runtime of battery-operated devices.

A consumer device form factor reference design for the VD55H1 has been created that includes the illumination system. A supporting fully featured software driver and a library containing an advanced depth-reconstruction image-signal-processing pipeline compatible with Android embedded platforms is also provided.





MIT Engineers develop biocompatible surgical “duct tape” as an alternative to sutures

The sticky patch could be quickly applied to repair gut leaks and tears.

A staple on any engineer's workbench, duct tape is a quick and dependable fix for cracks and tears in many structural materials. MIT engineers have now developed a kind of surgical duct tape — a strong, flexible, and biocompatible sticky patch that can be easily and quickly applied to biological tissues and organs to help seal tears and wounds.

Like duct tape, the new patch is sticky on one side and smooth on the other. In its current formulation, the adhesive is targeted to seal defects in the gastrointestinal tract, which the engineers describe as the body's own biological ductwork.

In numerous experiments, the team has shown the patch can be quickly stuck to large tears and punctures in the colon, stomach, and intestines of various animal models. The adhesive binds strongly to tissues within several seconds and holds for over a month. It is also flexible, able to expand and contract with a functioning organ as it heals. Once an injury is fully healed, the patch gradually degrades without causing inflammation or sticking to surrounding tissues.

The team envisions the surgical sticky patch could one day be stocked in operating rooms and used as a fast and safe alternative or reinforcement to hand-sewn sutures to repair leaks and tears in the gut and other biological tissues.

“We think this surgical tape is a good base technology to be made into an actual, off-the-shelf product,” says Hyunwoo Yuk, a research scientist in MIT's Department of Mechanical Engineering. “Surgeons could use it as they use duct tape in the nonsurgical world. It doesn't need any preparation or prior step. Just take it out, open, and use.”

Yuk, the study's co-lead and co-corresponding author, and his colleagues published their results on February 2, 2022, in the journal *Science Translational Medicine*. Other co-authors include MIT postdoc and lead author Jingjing Wu; project supervisor and co-corresponding author Xuanhe Zhao, who is a professor of mechanical engineering and of civil and environmental engineering at MIT; and collaborators from the Mayo Clinic and the Southern University of Science and Technology.

A gut instinct

The new surgical duct tape builds on the team's 2019 design for a double-sided tape. That early iteration comprised a single layer that was sticky on both sides and designed to join two wet surfaces together.

The adhesive was made from polyacrylic acid, an absorbent material found in diapers, which starts out dry and absorbs moisture when in contact with a wet surface or tissue, temporarily sticking to the tissue in the process. The researchers mixed into the material NHS esters, chemical compounds that can bind with proteins in the tissue to form stronger bonds. Finally, they reinforced the adhesive with gelatin or chitosan — natural ingredients that kept the tape's shape.

The researchers found the double-sided tape strongly bonded different tissues together. But when consulting with surgeons, they realized that a single-sided version might make a more practical impact.

"In practical situations, it's not common to have to stick two tissues together — organs need to be separate from each other," Wu says. "One suggestion was to use this sticky element to repair leaks and defects in the gut."

Surgeons typically repair leaks and tears in the gastrointestinal tract with surgical sutures. But sewing the stitches requires precision and training, and following surgery the sutures can trigger scarring around the injury. The tissue between stitches could also tear, causing secondary leakages that could lead to sepsis.

"We thought, maybe we could turn our sticky element into a product to repair gut leaks, similar to sealing pipes with duct tape," Wu says. "That pushed us toward something more like single-sided tape."

Same tape, new tricks

The researchers first tuned their adhesive recipe, replacing gelatin and chitosan with a longer-lasting hydrogel — in this case, polyvinyl alcohol. This swap kept the adhesive physically stable for over a month, long enough for a typical gut injury to heal. They also added a second, nonsticky top layer to keep the patch from sticking to surrounding tissue. This layer was made from a biodegradable polyurethane that has about the same stretch and stiffness of natural gut tissue.

"We don't want the patch to be weaker than tissue because otherwise it would risk bursting," Yuk says. "We also don't want it to be stiffer because it would restrict the peristaltic movement in guts that is essential for digestion."

In initial tests, the patch did stick to tissues, but it also swelled, just as a fully wet, hydrogel-based diaper would. This swelling stretched the tape and the underlying tear it was intended to seal.

"It was almost an impossible problem because hydrogel naturally swells," Yuk says. "But we did a simple trick: We prestretched the adhesive layer a bit, then introduced the nonadhesive layer, so that when applied to a tissue, that prestretching cancels out the swelling."

The team then carried out experiments to test the patch's properties and performance. When the patch was placed in a culture with human epithelial cells, the cells continued to grow, showing that the patch is biocompatible. When implanted under the skin of rats, the patch biodegraded after about 12 weeks, with no toxic effects.

The researchers also applied the patch to defects in the animals' colons and stomachs, and found it maintained a strong bond as the injuries fully healed. It also produced minimal scarring and inflammation compared with repairs made with conventional sutures.

Finally, the team applied the patch over colon defects in pigs, and observed that the animals continued to feed normally, with no fever, lethargy, or other adverse health effects. After four weeks, the defects fully healed, with no sign of secondary leakage.

Taken together, the experiments suggest that the surgical patch could potentially safely repair gastrointestinal injuries, and could be applied just as easily as commercial duct tape. Yuk and Zhao are further developing the adhesive through a new startup and hope to pursue FDA approval to test the patch in medical settings.

"We are studying a fundamental mechanics problem, adhesion, in an extremely challenging environment, inside the body. There are millions of surgeries worldwide a year to repair gastrointestinal defects, and the leakage rate is up to 20 percent in high-risk patients," Zhao says. "This tape could solve that problem, and potentially save thousands of lives."

