

Department of Computer Applications(MCA)

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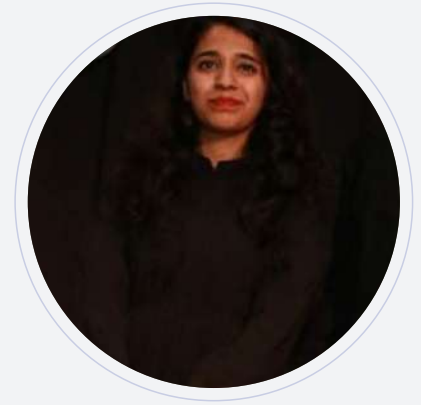
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Alumni Section

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5G Technology

5G technology is the latest and most advanced iteration of mobile network technology, and it has the potential to revolutionize the way we interact with our devices and with each other. With faster download and upload speeds, lower latency, massive connectivity, and low power consumption, 5G technology promises to unlock new possibilities for businesses and individuals alike.

This article will explore the key features and potential benefits of 5G technology, as well as the challenges that come with its implementation.

Key Features of 5G Technology

The key features of 5G technology are speed, low latency, massive connectivity, and low power consumption.

- **Speed:** 5G technology can provide up to 20 Gbps download and 10 Gbps upload speeds, which is ten times faster than 4G. This speed makes it possible to download and stream large files and high-quality video content quickly and easily.
- **Low Latency:** 5G technology has a latency of less than 1 millisecond, making it highly responsive and ideal for real-time communication and applications. This low latency is critical for applications that require immediate and precise responses, such as self-driving cars and virtual reality.
- **Massive Connectivity:** 5G technology can connect up to one million devices per square kilometer, making it ideal for the Internet of Things (IoT) devices. With 5G, the number of IoT devices is expected to grow exponentially, creating new opportunities for businesses and individuals.
- **Low Power Consumption:** 5G technology is designed to be energy-efficient, reducing the carbon footprint of the telecommunications industry and contributing to environmental sustainability. It is also critical for IoT devices, which often run on batteries and need to conserve power to operate efficiently.

Potential Benefits of 5G Technology

- The potential benefits of 5G technology are vast and diverse, and they extend to various areas of society and the economy. Here are some examples of how 5G technology can enhance our lives and our businesses:
- **Enhanced Mobile Broadband Services:** With 5G technology, mobile broadband services can deliver faster and more reliable internet speeds, allowing users to download and stream high-quality video content on the go. This capability is critical for applications such as video conferencing, remote work, and e-commerce.
- **Transformative Applications in Healthcare:** 5G technology can enable transformative applications in healthcare, such as remote patient monitoring and telemedicine. These applications can improve healthcare outcomes and reduce healthcare costs, particularly for patients living in rural or remote areas.
- **Improved Transportation Systems:** 5G technology can improve transportation systems by enabling real-time traffic monitoring and management, reducing congestion and improving safety. It can also enable autonomous vehicles, which can reduce accidents and improve the efficiency of transportation systems.

- **Enhanced Education:** 5G technology can enhance education by providing faster and more reliable internet speeds, allowing students and teachers to access educational content and resources from anywhere. It can also enable new forms of remote learning and collaboration, which can expand access to education and improve educational outcomes.
- **New Business Models and Services:** 5G technology can enable new business models and services, such as smart cities, which can improve urban planning and management, and smart homes, which can improve energy efficiency and enhance the user experience.

Challenges and Opportunities

While 5G technology represents a significant step forward in the evolution of wireless communication, it also presents several challenges and opportunities.

One of the main challenges of 5G technology is the infrastructure required to support it. 5G technology requires a significant investment in new towers and base stations, which can be expensive and time-consuming to build. Additionally, the small cell technology used in 5G networks requires a denser network of base stations, which can be difficult to implement in some areas.

Another challenge of 5G technology is security. With the increased number of connected devices in a 5G network, there is a greater risk of security breaches. The challenge will be to develop security protocols that can keep up with the increased speed and bandwidth of the network.

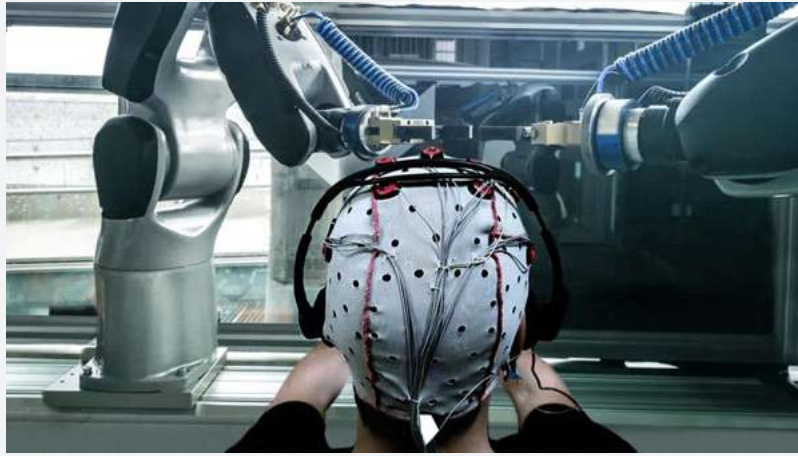
However, despite these challenges, 5G technology also presents significant opportunities. It has the potential to transform many industries, including healthcare, transportation, and entertainment. It will enable new applications and services that were previously impossible, and it will help to drive innovation and economic growth.

Conclusion

In conclusion, 5G technology represents a significant step forward in the evolution of wireless communication. It promises to deliver faster speeds, greater bandwidth, and lower latency than previous generations, which will enable new applications and services that were previously impossible. While it presents several challenges, including infrastructure and security, it also presents significant opportunities to transform many industries and drive innovation and economic growth.



Mind control: 3D-patterned sensors allow robots to be controlled by thought



Highlights

- The sensor can read the brain electrical signals even with hair and bumps.
- Now a days to read Electroencephalography(EEG) is used to read the electrical signal from Brain, wherein specialised electrodes are placed on the surface of the head or are implanted. most of the technics has wet sensors using a gloopy gel.
- Researchers are developing graphene-based dry sensor, that could read brain activity without any stickiness.

A new study published in the journal ACS Applied Nano Materials took a step toward making this a reality. The team produced "dry" sensors that can record the brain's electrical activity despite the hair and the bumps and curves of the head by constructing a specific, 3D-patterned structure that does not rely on sticky conductive gels.

University of Technology Sydney (UTS) researchers have developed biosensor technology that will allow you to operate robots and machines entirely by thought control.

The enhanced brain-computer interface was created with the Australian Army and the Defence Innovation Hub by Distinguished Professor Chin-Teng Lin and Professor Francesca Iacopi of the UTS School of Engineering and IT.

In addition to military applications, the technology has tremendous potential in industries such as sophisticated manufacturing, aerospace, and healthcare, such as allowing persons with disabilities to control wheelchairs or operate prosthetics.

Electroencephalography (EEG) is a technique doctors use to monitor electrical signals from the brain by implanting or placing specialized electrodes on the surface of the head. EEG not only aids in diagnosing neurological problems but may also be used in "brain-machine interfaces," which use brain waves to operate an external object such as a prosthetic limb, robot, or even a video game.

Most non-invasive versions employ "wet" sensors that adhere to the scalp using a gloopy gel that can irritate the scalp and occasionally cause allergic responses.

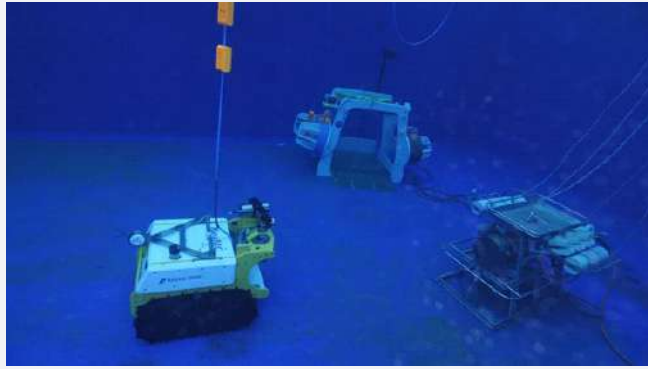
Researchers have been working on "dry" sensors that do not require gels as an alternative, but none have performed as well as the gold-standard wet kind. Although nanomaterials such as graphene may be a viable choice, their flat and often flaky nature makes them incompatible with the uneven curves of the human skull, especially over long periods.

As a result, Francesca Iacopi and colleagues set out to develop a 3D graphene-based sensor based on polycrystalline graphene that could accurately monitor brain activity while being stick-free.

The researchers produced numerous 3D graphene-coated structures with varying shapes and patterns, each approximately 10 m thick.

A hexagonal pattern performed the best of the designs examined on the curved, hairy surface of the occipital region the location at the base of the head where the brain's visual cortex is located. Eight of these sensors were combined into an elastic headband that kept them against the back of the head.

France is building an advanced science lab 1.5 miles under the sea



Highlights

- An underwater library is setup in France to complete various scientific missions that includes, studying the deep-sea ecosystem, monitoring climate change impacts on the ocean, and exploring mineral resources and hydrothermal vents.
- The laboratory is controlled remotely using a fibre-optic cable and has infrastructure for environmental measurement, acoustic positioning system, interfacing underwater instrumentation, etc.
- Scientists can control the laboratory's lighting, cameras, and other equipment from the shore, and communicate with the scientists in the lab via video conferencing.

A new, fully remotely controlled underwater laboratory is being built near Marseilles in France. The Laboratoire Sous-marin Provence Méditerranée (LSPM) is a cutting-edge aquatic research facility located 24.9 miles (40 kilometers) south of Toulon, France. The first of its kind in Europe, it is now up and running. It has many high-tech scientific instruments and sensors for oceanography, geology, and particle physics, among other fields.

The infrastructure, located at 8,038 feet (2,450 meters) underwater, is home to cutting-edge scientific equipment, including the Kilometer Cube Neutrino Telescope (KM3NeT) neutrino detector, which comprises 2,070 spheres arranged on 115 lines anchored to the ocean floor and held taut by submerged floats. The platform also houses EMSO environmental sensors, crucial for monitoring the ocean's health.

According to the LSPM, the facility will feature the following underwater infrastructure:

- electro-optical cables for shore connection,
- junction boxes for interfacing underwater instrumentation,
- long base acoustic positioning system,
- junction box dedicated to environmental measures.

Back on Terra Firma, the lab will feature the following critical infrastructure:

- A main control room in La Seyne-sur-Mer: real-time control of experiments, data acquisition, and processing, high-speed connection to other control and storage centers,
- The remote control room at the Centre de Physique des Particules de Marseille (CPPM): the showroom, reception, and multimedia installations.

These gigantic arrays of detectors can detect neutrinos emanating from the Southern Hemisphere sky. On the rare occasions [the neutrinos] interact with water molecules, they produce a bluish flash of light in the darkness of the ocean abyss," Paschal Coyle, director of research at the Centre de Physique des Particules de Marseille and director of LSPM, told Ars Technica. "Detecting this light allows us to measure the directions and energies of the neutrinos."

The platform will also feature an underwater robot called "BathyBot." This robot has advanced sensors that can measure various oceanic parameters such as temperature, oxygen, carbon dioxide concentrations, current speed and direction, salinity, and particle concentration. Like other instruments on the LSPM, this robot will be remotely controlled from the shore.

Scientists identify blood sugar molecule to predict Alzheimer's onset ten years in advance



Highlights

- 17-year-long study researchers discovered a biological marker that could predict the onset of Alzheimer's disease ten years in advance.
- The researchers focused on analysing glycans, which are sugar molecules that are attached to proteins and lipids in the blood. They found that certain patterns of glycans were associated with an increased risk of developing Alzheimer's disease.
- The researchers believe that glycans could be a useful biomarker for predicting Alzheimer's disease, as they are relatively stable over time and can be easily measured from a blood sample.

Karolinska Institutet researchers have discovered a potential biological marker that could predict the onset of Alzheimer's disease ten years in advance.

They conducted a 17-year study that led to an understanding of "glycan structure in blood." According to the study, the level of glycan can help predict the risk of developing Alzheimer's disease.

"The role of glycans, structures made up of sugar molecules, is a relatively unexplored field in dementia research. We demonstrate in our study that blood levels of glycans are altered early during the development of the disease. This could mean that we'll be able to predict the risk of Alzheimer's disease with only a blood test and a memory test," said Robin Zhou, the first author of this study, in a statement.

The team conducted this study on 233 participants at the Swedish National Study on Aging and Care in Kungsholmen to evaluate different biomarkers for dementia. The participants' samples were collected between 2001 and 2004. In addition, all participants were checked on a regular basis for signs of memory loss and dementia. The authors also performed follow-ups every three to six years for a total of 17 years.

The researchers were able to demonstrate the role of glycans in the blood, which may allow the disease to be detected early, through this study.

In this disease, brain neurons begin to die as a result of an accumulation of the proteins amyloid beta and tau. The authors previously demonstrated a link between tau protein and glycan levels in Alzheimer's disease patients.

"We also show that a simple statistical model that takes into account blood glycan and tau levels, the risk gene APOE4 and a memory test, can be used to predict Alzheimer's disease to a reliability of 80 percent almost a decade before symptoms such as memory loss appear," said Sophia Schedin Weiss, corresponding author.

This knowledge could pave the way for the development of simple screening procedures for the better treatment of the individuals impacted by the disease. It is critically important as previous Alzheimer's drug clinical trials have highlighted that treatment should begin early to protect neurons from dying before it is too late.

Novel device smaller than rice successfully shrinks pancreatic cancer



Highlights

- Researchers have developed Nanofluidic device which deliver drugs directly to the pancreatic tumor.
- The nanofluidic drug-eluting seed (NDES) delivers low-dose immunotherapy in the form of CD40 monoclonal antibodies (mAb).
- By precisely delivering the NDES into the tumor, the device protects the body from exposure to the powerful cancer drug.

In a significant groundbreaking medical development, researchers have created a tiny device, smaller than a grain of rice, to deliver drugs directly to the pancreatic tumor.

In the near future, this implantable nanofluidic device could be a game changer in treating pancreatic cancer. Nanomedicine experts at Houston Methodist Academic Institute developed the device.

Nano-device uses less dosage to shrink cancer

The nanofluidic drug-eluting seed (NDES) delivers low-dose immunotherapy in the form of CD40 monoclonal antibodies (mAb).

As seen in murine models, the result was remarkable tumor shrinkage. Compared to traditional systemic immunotherapy treatment, this tumor reduction was achieved with a "fourfold decrease" in drug dosage. This means that fewer drugs is needed to treat the aggressive form of pancreatic cancer with this tiny device. Corrine Ying Xuan Chua, one of the study's co-corresponding authors, explained the findings: "One of the most exciting findings was that even though the NDES device was only inserted in one of two tumors in the same animal model, we noted shrinkage in the tumor without the device. This means that local treatment with immunotherapy activated the immune response to target other tumors. In fact, one animal model remained tumor-free for the 100-days of continued observation."

Protects other parts of the body

By precisely delivering the NDES into the tumor, the device protects the body from exposure to the powerful cancer drug. This also leads to fewer side effects, which improves the patient's health.

"Our goal is to transform the way cancer is treated. We see this device as a viable approach to penetrating the pancreatic tumor in a minimally invasive and effective manner, allowing for a more focused therapy using less medication," said Alessandro Grattoni, co-corresponding author, in a statement.

The findings are encouraging, as pancreatic cancer is among the most aggressive and difficult-to-treat cancers. And most often this cancer is diagnosed at an advanced stage; in fact, 85 percent of patients have already developed the metastatic disease at the time of diagnosis. As a result, the treatment becomes more difficult.

Up next, the team plans to conduct additional lab trials to evaluate the effectiveness and delivery of technology.

World's first smart gun uses fingerprinting to protect against misuse



Highlights

- This Smart gun is operating like any other firearm.
- It uses integrated fingerprint and 3D facial recognition systems to verify your identity in any situation.
- The gun is powered by a rechargeable lithium-ion battery and uses encryption technology.

Biofire Technologies, a company based in Broomfield, Colorado, said on 13th April that it is launching the world's first biometric handgun, The Biofire Smart Gun. The gun has fingerprint unlocking which protects against misuse.

“The 9mm Biofire Smart Gun locks the moment it leaves your hand and cannot be fired unless an authorized user picks it back up. Your Smart Gun only fires for the people you choose, so your firearm can never cause a tragic outcome in the hands of a child, criminal, or anyone else,” says the company's site.

“For authorized users, the Biofire Smart Gun operates just like any other firearm. Biofire's proprietary Guardian Biometric Engine uses integrated fingerprint and 3D facial recognition systems to verify your identity in any situation. Instantly unlock your firearm just by picking it up - no codes, buttons, or gadgets required.”

The company further notes that it engineered the Biofire Smart Gun so that users never have to choose between safe storage and instant access. It is possible to enroll multiple users and personalize the gun's settings.

The company behind this new and improved firearm comes from a variety of backgrounds making their product that much more versatile.

“We're a team of gun owners, engineers, and parents developing innovative new solutions to keep our loved ones safe. Before Biofire, we built satellites, medical devices, autonomous weapons systems, supersonic jets, and, of course, firearms. Everyday, we are fortunate enough to work on the technology we've always wanted in our own home defense firearms,” concludes their site.

The gun is powered by a rechargeable lithium-ion battery and uses encryption technology to ensure it can't be modified into a conventional handgun. It will cost \$1,499 and can be preordered with a refundable \$149 deposit.

China claims its next-gen radar detects all air threats, including stealth fighters



Highlights

- New generation radar system which claimed to be capable of spotting and tracking cruise missiles, drones, helicopters, stealth aircraft, and loitering weapons.
- Multipurpose radar system can perform non-military tasks like monitoring air traffic in the civil aviation industry and predict extreme weather, reducing the effect of natural disasters.

Beijing's leading provider of defense electronics, China Electronics Technology Group Corp(CETC) is promoting its new-generation radar system that can allegedly fend off almost all air threats in modern combat.

The YLC-16 multipurpose S-band radar system uses cutting-edge technologies such as an all-digital, fully solid active phased array, sophisticated processors, and other cutting-edge components, according to a report by state-affiliated China Daily on 15th April.

"It is one of the latest radar models CETC is offering on the international market and is the best three-dimensional, middle-range surveillance radar any buyer now can find on the market," said Tang Ji, a manager at the CETC during the 10th World Radio Detection and Ranging Expo in Beijing.

"Many foreign militaries, like some in Africa and Asia, have expressed strong interest in this radar system and proposed to come to our institute to see the real product and learn more about it,"

This system is claimed to be capable of spotting and tracking cruise missiles, drones, helicopters, stealth aircraft, and loitering weapons. Foreign militaries in Asia and Africa have shown interest in knowing more about the product after drawing attention to it. The YLC-16 is the top three-dimensional, middle-range surveillance radar system on the market, said Tang Ji, a manager at Nanjing's CETC 14th Institute.

The radar is sleek-looking, uses little power, and operates with a high degree of stability and dependability. The modular structure also enables remote control and real-time data transmission by optical fiber, microwave, or satellite.

Multipurpose radar system

The YLC-16 can perform non-military tasks like monitoring air traffic in the civil aviation industry. The GLC-36S active phased array radar, which enables multi-dimensional precise scanning of hazardous weather, was also developed by CETC 14th Institute.

In order to get information on the intricate inner structure of the weather phenomenon, this also covers typhoons, rainstorms, and thunderstorms.

The radar's information will increase our ability to track and predict extreme weather, reducing the effect of natural disasters. China's largest and most influential producer of military radar is Tang's Institute. The new YLC-16 radar system is the most recent offering on the global market, and the items have already been sold to numerous countries. The product began field testing in the province of Fujian in December 2021 and is anticipated to draw in more potential customers.

Meet AutoGPT: The new kid on the AI block that's making the internet go crazy



Highlights

- AutoGPT is a tool that lets you build AI agents that can complete task in effective manner by using GPT-4.
- As one of the first example of GPT-4 running full autonomously. AutoGPT pushes the boundaries of what is possible with AI.

After the release of GPT-4, the world was barely catching its breath, when a new craze seems to be catching up already. This time it is called AutoGPT, a tool that lets you build artificial intelligence (AI) agents that can complete tasks for you using GPT-4.

Even as some of the top names in the AI industry call for a pause on the release of future iterations of products, the journey to building them has already begun. It is unlikely that the next step in the AI race will be as revolutionary as ChatGPT. What it is likely to be are many small increments over existing technology and AutGPT is one such tool.

How does Auto-GPT work?

Created by Toran Bruce Richards, Auto-GPT is an open-source application and more of an experiment that could even be labeled as a tool to showcase GPT-4's capabilities. What the script manages to also do is string together tasks that one needs GPT-4 to perform and perform them in the intended sequence.

To do this, a user needs to first create an AI agent on the app, give it a description of its role, and then lay out five goals that it needs to fulfill. While doing this, one also needs to provide it an OpenAI API key along with a Google API key.

Once this is done, the tool can simply run tasks in an iterative manner which would include taking a GPT-4 output and putting it back into the AI model to make improvements to the results.

In case, a user wants to check the result at each step of the way, they can also ask the tool to seek permission before proceeding to the next step. The applications of such a tool are numerous and some have taken it to the extreme and suggested that AI can be put to work and used to earn money, as well.

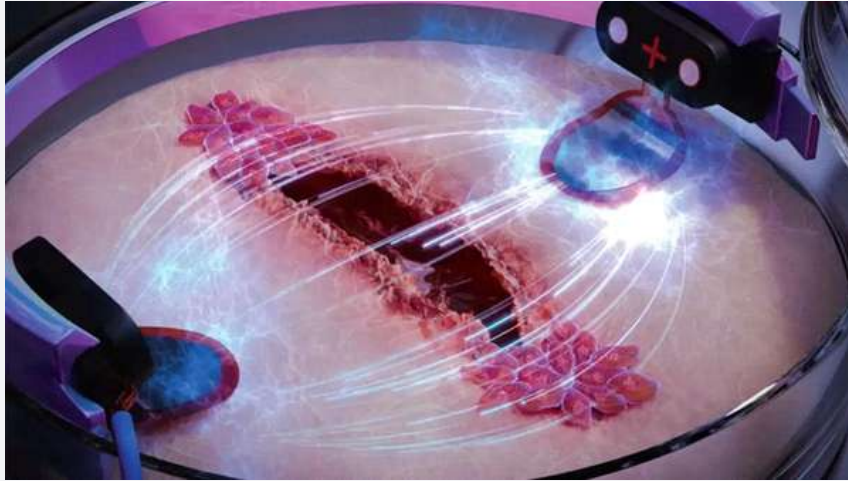
While that might be a bit of a stretch at the moment, it hasn't stopped people from trying to build agents with such intentions, something that has gone viral on social media.

Users may also be warned that GPT-4 and other AI models have a habit of "hallucinating" and can create some fictional data based on tasks. So, not all results can be trusted 100 percent.

Auto-GPT is just one of the many tools that now allow people to create their own AI agents. For those worried if this could lead to the rise of autonomous AI, it is unlikely given GPT-4 itself has its limitations and is a very narrow-AI, able to complete one type of task.

Researchers are now aiming for artificial general intelligence (AGI), where an AI system can solve problems that it is not specifically trained for and that is something we really need to have safeguards on from the moment go.

Electricity can heal even the worst kind of wounds three times faster, new study finds



Highlights

- Patients who have diabetes, cancer and other problem that are very difficult to repair wounds, this technology claims to recover and heal that are not possible heal.
- Society looks down to wounds problem to overcome this problem in very less time i.e., three time faster.
- There are a very few chances of spreading the bacteria in critical condition of wounds

Researchers from Chalmers Institute of Technology (CTH) and the University of Freiburg have proposed an interesting technique that enables chronic wounds to heal faster than ever.

Medical conditions like diabetes, cancer, disturbed blood circulation, and spinal injuries can sometimes impair our body's natural ability to heal wounds. Patients who live with such conditions often experience wounds that don't heal.

These unrepaired chronic wounds become a source of infection and sometimes even lead to amputations, making patients' lives very difficult. In their latest study, the researchers claim to heal chronic wounds three times faster using electric current.

“Chronic wounds are a huge societal problem that we don't hear a lot about. Our discovery of a method that may heal wounds up to three times faster can be a game changer for diabetic and elderly people, among others, who often suffer greatly from wounds that won't heal,” said Maria Asplund, one of the study authors and an associate Professor of Bioelectronics at CTH.

Using electric stimulation to repair wounds

A 2021 report published by the Natural Library of Medicine reveals that about 2.5 percent of Americans i.e., over eight million people in the US alone, experience chronic wounds at least once.

Any such wound makes a person vulnerable to infections, and if the person is old, the risk of their catching diseases increases. Therefore, it becomes crucial to treat them as soon as possible. Interestingly, the electric stimulation method proposed by the researchers is based on a well-known hypothesis that suggests that human skin is electrostatic.

It means that the cells of our skin are sensitive to electric current. So when placed in an electric field, the cells are likely to start moving toward the direction of the area. Using this hypothesis as the base of their study, the researchers conducted an interesting experiment.

They created a biochip containing cultured skin cells with properties similar to human skin cells. Next, they chose two cells and made wounds on them. One cell was allowed to repair under an electric field (200mV/mm), while the other healed without any electric stimulation.

The researchers noticed that electricity enabled the former to heal three times faster than the latter. “We were able to show that the old hypothesis about electric stimulation can be used to make wounds heal significantly faster,” said Asplund.

According to the study authors, an electric field act as a guide to skin cells. In the absence of current, the cells move randomly, and therefore, the process of healing is slow. However, when cells are electrically stimulated, they all align in one direction and migrate fast toward the damaged site, eventually making a wound heal more quickly.

Moreover, no side effects were noticed on the cultured wounded cells due to the electric stimulation.

Electric wound healing can help millions

Asplund and her team believe that their healing method could be beneficial, especially for diabetes patients across the globe who are generally at greater risk of experiencing chronic wounds. In many such patients, even minor cuts turn into ulcers and long-lasting infections.

They tested their approach in diabetes models and noticed that the speed of healing in cultures cells with diabetes increased under the influence of an electric field. Asplund further explained, “With electric stimulation, we can increase the speed of healing so that the diabetes-affected cells almost correspond to healthy skin cells.”

The researchers claim that electric wound healing could help millions of patients worldwide who bear chronic wounds' pain. They will continue their research to improve the method further and dig deep into the various factors that enable skin cells to heal faster in the presence of electricity.

