Hello Future Articles Archive

Year: 2022

Welcome to the Hello Future articles archive for the year 2022. This document compiles all articles published during this period, reflecting the ideas, innovations, and insights that defined the year.

The purpose of this archive is to preserve and share significant contributions from the Hello Future community, while providing an overview of developments and trends.

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Telco Software: A New Era for Carriers

A three dimensional mesh of spherical particles with varying colours and brightness connected together by lines in a network against a purple background.
Friday 2nd of December 2022
The widespread operational adoption of software, cloud and virtualization technologies is revolutionizing the way carriers design, build and manage their networks.

Disaggregation, virtualization, automation: carriers will need to be softwarized to survive. The current transformation in the world of networks is rewriting the way carriers work and paving the way for major upscaling in terms of operational efficiency and flexibility. For customers, this means the arrival and development of an on-demand network model.

IT-Inspired Networks

“The introduction of IT software practices for networks—including Cloud hosting for network functions—and the widespread use of data to automate network operations” are the two main phenomena at work, explains Laurent Leboucher, Group CTO & Senior Vice President Orange Innovation Networks. “Our networks are becoming more autonomous, and our teams are more efficient and more productive with the same headcount. It’s a significant change and the impact on our practices and working methods is just as big. This means we need to help employees develop new skills, to support them in their transition to emerging roles through upscaling and rescaling.”

Disaggregation and Automation

What does this transition mean for networks and operations? With software comes disaggregation: “Until now, carriers have purchased and deployed network equipment combining hardware and software functions. In recent years, these functions have moved away from hardware, which is becoming commonplace. This already affects devices such as routers and switches. It is also central to mobile

networks, which are virtualized across the Group's geographic areas. A vast backbone disaggregation program has been launched."

Softwarization paves the way for new customer promises based on NaaS and on-demand networks.

"These disaggregated, virtualized, cloud-based capabilities allow us to benefit from the advantages of shared computing and storage, with economies of scale as a bonus. Automation, which is already in place with traditional mechanisms, will come into its own in the virtualized networks era, making our operations even more efficient. Finally, artificial intelligence technologies will be used to improve data usage. Anomaly detection, predictive maintenance, threat identification, etc.: our networks will become more autonomous and more resilient to unexpected events, with refined and effective management."

A Time of Change for Businesses and Customers

This fundamental transition concerns work linked to networks, from upstream tasks such as design, integration and planning, to downstream tasks like supervision and field interventions. For the latter, the aim is to achieve more targeted interventions, optimizing journeys, while offering more autonomy to technicians. Orange is creating a training curriculum to support those in roles affected by this transformation.

Softwarization also paves the way for new customer promises based on NaaS and on-demand networks. "For our customers, in the Business market in particular, this means new consumer habits, with the possibility of configuring a network from a portal or via APIs [software interfaces] to request bandwidth, establish a secure slice, etc. For the general public, the challenge of monetizing networks materializes in the form of new services, designed in conjunction with developer communities by showcasing our APIs — in the field of immersive content applications for example, which require low latency and therefore the prioritization of certain traffic."

Getting to the Heart of Innovation

This transition has been creeping in for a few years now, through particularly dynamic standardization and innovation work within open-source communities. "In particular, the entire Telco Cloud platform is addressed by the Linux Foundation, through the Anuket project dedicated to standardizing specifications for virtualized and cloud-native network functions. Likewise, work to virtualize RANs is underway within the framework of the Open RAN Alliance. In conjunction with the GSMA, the Linux Foundation has also recently launched the CAMARA initiative to support the interoperability of network APIs, making them more accessible to developers."

https://hellofuture.orange.com/en/mixed-reality-at-stroke-patients-bedsides/

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Mixed Reality at Stroke Patients' Bedsides

Friday 21st of January 2022 - Updated on Tuesday 29th of November 2022

The connected operating room is one of the big promises of 5G, as its throughput and latency will help telesurgery to advance by bringing doctors from other hospitals right into the theater. The start-up Intradys, based in Brest, is working toward this goal. Its solution, which combines mixed reality and artificial intelligence, makes it possible to bring a team of specialists together remotely around a patient. This technology would save valuable minutes when treating strokes.

"It was as if the surgeons were side by side, as they could talk to each other and point to the same things in the patient's images."

It was a world first. In November 2020, a surgeon from Brest operated on a stroke patient using mixed reality glasses, and a colleague from Rennes watched over and helped him from a computer workspace in his own hospital. Both doctors had live access to the same neuroradiological images, as well as a 3D representation of the arteries. "This technology really changes the way colleagues can communicate," enthuses Gwenaël Guillard, the promising young Breton who is CEO of Intradys and developed this solution, which he called Lumys. "It is impressive to see how a connection is formed between two individuals who can not only speak to each other as if they were side by side, but also point to the same things in the patient's images."

Remote Assistance That Will Save Lives

This is not about virtual reality; it's about mixed reality. In virtual reality, a headset isolates the user from real life. With these mixed reality glasses, virtual elements, such as photographs or 3D representations, are superimposed onto the reality of the operating room but they do not replace it. "Seeing in 3D gives the on-site doctor a more in-depth understanding, but more importantly, it allows the remote doctor to share that understanding, so they have the same data to discuss. This is nothing like a phone conversation," says Guillard. The doctor is able to see and hear the room,

their patients and their colleagues perfectly, and thanks to Lumys, they can also communicate remotely with another professional. That is the main purpose of this technology. For complex operations following strokes, the remote support of a more experienced medical professional can be life-saving.

Strokes are one of the main causes of death in France. Each year, 150,000 people suffer strokes, and 30,000 of them die. Treating patients is a real race against time; the faster the treatment, the less severe the consequences will be. “Operations to treat strokes take place 24 hours a day, 7 days a week. They are always emergencies. Every immediate connection with a specialist is valuable. You can’t wait one or two days for a colleague to come back or for someone to make the journey,” explains Guillard. Lumys could also be used in medical schools or to make it easier for representatives of equipment manufacturers to train doctors.

5G: Bringing AI into the Equation

In order to integrate AI into his solution, Guillard carries out tests at the Orange 5G Lab in Rennes. The ultimate aim of the Lumys headset is to bring decision-making support to the heart of operating rooms, without the need for a monitor or computer. Everything will happen through the headset, with patient data being analyzed in real time by a cloud-based AI. “With this in mind, 5G is a way of transferring very large volumes of data without delays, while ensuring data security and prioritization,” explains Guillard.

The entrepreneur anticipates that we will see a hyperconnected operating room in the near future: “All procedures there will be optimized by harnessing all the data that circulates hospitals. The operating room will also be externally connected to other hospitals, for example large university hospitals could be connected to more local hospitals. Thanks to solutions like Lumys, complex operations will be able to be carried out remotely with the support of university hospitals.”

5G has already played a major role in the COVID-19 pandemic. Cast your mind back to January 2020 when images of a hospital being built in 10 days in Wuhan, China took the world aback. But one thing went unnoticed — the makeshift facility was fully 5G connected! 5G connectivity helped to process the huge volume of communication in this area far from the city center, and allowed for an advanced remote consultation system to be implemented, giving Beijing-based experts the opportunity to discuss treatment protocols with their colleagues in Wuhan. And this is clearly just the beginning.

https://hellofuture.orange.com/en/with-5g-xr-experiences-increasingly-inclusive-and-accessible-to-all/

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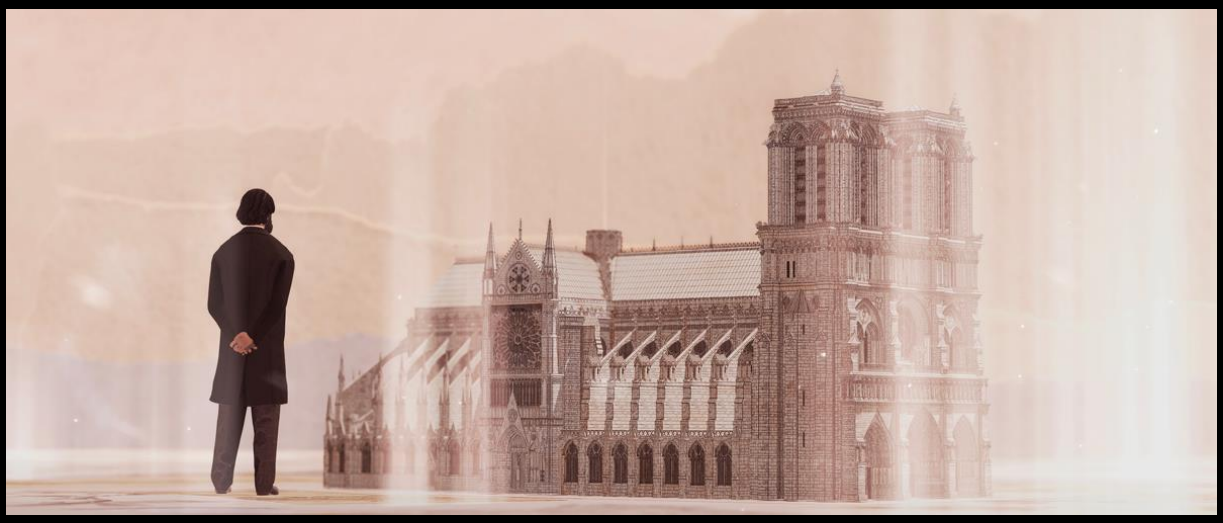
With 5G, XR experiences increasingly inclusive and accessible to all



Monday 28th of February 2022 - Updated on Wednesday 22nd of June 2022

There's still a way to go before most people get to experience virtual reality (VR) and extended reality (XR), due to barriers such as motion sickness and high equipment costs. But using the power of 5G, Orange is helping users to overcome some of these barriers and enjoy optimal immersive experiences.

"Harnessing the power of 5G to offer more inclusive and comfortable extended reality (XR) experiences, using graphical computing power transmitted over networks."

On January 12, 2022, at La Défense in Paris, Orange and Amaclio Productions unveiled Éternelle Notre-Dame, an immersive VR tour of the cathedral, which takes you on a trip through time from its construction in the Middle Ages all the way to the present day. Designed by Emissive, a company that specializes in 3D cultural tours and VR games, this 45-minute experience gives you the chance to dive into the history of this iconic Parisian landmark. Visitors can walk around in a 360° virtual environment, with their friends beside them appearing as avatars.

Harnessing the Power of 5G for VR

This Location-Based Entertainment (LBE) technology still has room for improvement. It relies on a Wi-Fi connection, meaning that the user has to wear a VR headset as well as a backpack containing a laptop, with both connected by a USB cable. This brings the user back to reality, and comfort and freedom of movement are restricted. However, at Mobile World Congress (MWC) 2022, Orange Innovation's teams used a Proof of Concept (PoC) to demonstrate that new mobile networks can help to remove these barriers. "We've decided to capitalize on our progress and work on improving 5G's capabilities, so that we can offer more inclusive XR experiences," says Khalid Oulahal, Project Manager for 5G and XR Services. "The aim is to move the computing power over to networks so that users can ditch the backpack and enjoy the experience with an entry-level headset, without losing any of the quality. This way, the best XR experiences can be streamed directly over the network, all thanks to Cloud XR. Using Cloud XR in this way could be hugely beneficial and applied to many different use cases, most significantly premium VR games, LBE services and augmented technicians for Industry 4.0 solutions."

Computer Processing in the Cloud

5G not only saves us from cumbersome hardware; it also improves the equipment's raw performance. To be visually comfortable and spare users from the infamous motion sickness, VR experiences need very high refresh and frame rates, which new mobile networks have the means to support when it comes to latency and bandwidth.

In terms of Cloud XR, this means "moving computing capacity onto the Cloud," as Maxime Jouin, an XR Software Architect & Developer at Orange Innovation, explains. "The principle is similar to a remote office, where you can use a computer remotely, but instead this is applied to a VR headset. This means that the virtual experience is no longer powered through the headset or backpack, but by a remote computer. This computer calculates the frame rate being transmitted to it and converts it into a video feed, which is streamed live over 5G to the headset, where it is then played back. While this is happening, the headset tracks the user's position and sends it to the remote computer, which recomputes the images. This process is then continuously repeated."

Race to the Best Latency

Thanks to Cloud XR , users can invest in ultra-sophisticated hardware similar to gaming computers. Equipped with next-generation graphics cards, this kind of equipment offers very high-definition visuals and can support advanced optical effects like ray tracing (a technique that simulates how light behaves in the real world to generate digital images).

The solution on display at MWC shows how valuable 5G can be to VR experiences. It will be made available to the public in 2022 as part of the Éternelle Notre Dame virtual tour. Its potential could be even further unlocked in the future, especially in terms of latency, which is critical for users' visual comfort. The PoC developed at Orange's 5G Lab in Rennes has achieved a latency rate of 30 ms on a non-Standalone 5G network. By transitioning to Standalone 5G, it should be possible to increase this by 5 ms. And so the latency race begins.

https://hellofuture.orange.com/en/5g-and-extended-reality-collaborative-meetings-take-new-forms/

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5G and Extended Reality: Collaborative Meetings Take New Forms

Monday 28th of February 2022 - Updated on Wednesday 22nd of June 2022

At Mobile World Congress 2022, Orange, Microsoft and Fracture Reality will demonstrate how several people can collaborate on complex projects, in real time, even with thousands of miles between them.

“You can use the solution to train people through immersive 3D experiences, which are carbon copies of the real thing.”

Visitors to Orange’s stand at this year’s MWC in Barcelona will be invited to try something new. They will be given Microsoft HoloLens smart glasses and be transported into the metaverse. There, they will join experts in a virtual meeting room that is seamlessly connected to the real world. “Participants from all over the world appear as 3D avatars,” explains Richard Loffler, XR Partnerships Manager at Orange Innovation. They can talk to each other, of course, but they can also study complex 3D models together. In this case, an Orange Marine underwater robot, rendered in breathtaking detail. Participants can touch the robot, move it about, zoom in on parts of it, take notes, read its technical specifications, and watch videos. And this is all in real time, with everything running smoothly and naturally.”

A smorgasbord of 5G performance

This solution widens the possibilities for virtual meetings, allowing them to be even more immersive and collaborative. Like all extended reality experiences, it is completely reliant on 5G connection. The 3D model of the underwater robot used in the demonstration is very large, which means processing a huge amount of data. That in turn means it cannot be downloaded onto the HoloLens glasses. It needs to be stored and continuously reproduced in the cloud, leading to constant flow of data between the cloud and the glasses. But thanks to 5G, this can all be done in real time, free of delays or interruptions.

Design, demonstrations, training and other B2B use cases

The benefits of this technology are obvious, and there is no shortage of practical applications. First and foremost, it lets people in different locations work together on the design, modeling and prototyping of highly complex equipment, like engines for planes or boats. The advantages of this are clear, especially for multinational companies where skilled workers are spread across the globe, and in the design stages of projects where regular communication is key.

The solution could also be used for maintenance, particularly in regulated technical industries like nuclear power, where it could be used to train people through immersive 3D experiences, which are carbon copies of the real thing.

Coming to the market soon

As our ways of working are revolutionized, there is no question that the world of immersive collaborative meetings will continue to expand. “We’ve been working with our partners for a long time on integrating an extended reality solution using tried and tested devices,” says Barbara Lucesoli, Head of IoT B2B Catalog and Digital Tools at Orange Innovation. The HoloLens glasses, for instance, are already one of the solutions on our IoT Journey platform. And we’re convinced that, beyond industry, the world of health care and smart cities could easily benefit from this technology when it comes to everyday collaboration.”https://fracturereality.io/

https://hellofuture.orange.com/en/what-if-manufacturers-shared-their-data/

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What if manufacturers shared their data?

Friday 4th of March 2022

The sharing of industrial data is driven by a search for efficiency, productivity and the desire to innovate through their use. It relies on the cloud, the Internet of Things (IoT), big data, blockchain and other digital technologies. This practice is now encouraged by EU countries, as demonstrated by the European data strategy and the Gaia-X project.

“Manufacturers are becoming increasingly aware of the potential benefits of sharing data beyond the walls of their factories.”

As a result of the digital transformation taking place in industry, the digitalization of production lines (use of digital tools, networking of machines, data collection/analysis) and, beyond that, of the entire value chain, is generating growing volumes of data. These are collected by industrial robots, embedded software and all the various components of the IoT.

Manufacturers are seeking to make the most of this wealth of data, thanks in particular to artificial intelligence and machine learning, with the aim of increasing the efficiency, autonomy and adaptability of factories.

Creating value by sharing data

Most manufacturers have so far focused on the data in their ecosystems. Increasingly, they are becoming aware of the potential benefits of sharing data beyond the walls of their factories. According to an estimate by the World Economic Forum and the Boston Consulting Group, this practice could generate additional value of more than 100 billion dollars solely through the optimization of production processes.

Most often, collaboration takes place between a manufacturer and business partners (OEMs, raw material suppliers, transporters, technology companies,

customers, etc.) within its value chain. It can also take place between this manufacturer and its competitors or companies outside its sector of activity to meet shared industrial challenges.

The sharing of industrial data is of interest beyond the value chain, as a basis for innovation, be it new production methods, new products or new services. This is one of the reasons why the European Commission is promoting the creation of "common and interoperable data spaces" to facilitate exchanges between Member States and businesses in key areas such as manufacturing.

Cloud platform, blockchain and privacy enhancing technologies

These spaces represent an essential building block for data sharing, which involves combining data from several sources in a single repository. The organization initiating the project thus creates a platform and services for storing, analysing and exchanging data, relying on generalist and specialist Cloud providers. It then tries to convince other organizations to join.

This can be difficult. The sharing of industrial data faces several obstacles related to trust and security. Some companies are afraid of revealing sensitive information and losing bargaining power or competitive advantage. Others worry about losing control of their data or that the value created will escape them. All of them must respect a cybersecurity imperative and minimize the threats that may result from external dissemination of data.

Blockchain technologies, through the creation of a distributed, transparent, decentralized and secure registry that provides a single, shared version of the truth, can solve some of the problems related to trust. They are particularly useful for establishing product traceability in supply chains.

"Privacy-enhancing technologies" (PETs) can be used in situations where there are important issues of industrial property, business secrets or personal data protection. Aiming to reconcile data protection with data exploitation, they generally allow users to pool their data, without disclosing its content, for analysis. Homomorphic encryption, for example, allows calculations to be performed on encrypted data, producing an encrypted result that only the owner of the data can decrypt.

More broadly, participants in data platforms need to define governance models; common rules for access and use of data that ensure security, interoperability and regulatory compliance, and that guarantee a fair distribution of the value generated. According to some, "data trusts" could be an interesting solution.

The automotive industry provides an example

The automotive supply chain is particularly complex. Spare parts are sourced from multiple suppliers around the world and are shipped to different factories. The automotive industry relies on sprawling networks of transporters and logistics processes that require perfect coordination, such as cross-docking (a method of organizing logistics flows that consists of moving goods from the arrival docks of a platform to the departure docks, without passing through a storage warehouse). For this reason, it already provides several examples of industrial data sharing platforms.

Since 2020, Volkswagen's "industrial cloud" has assembled data from its manufacturing plants and is open to technology service providers and other manufacturing companies. Developed in collaboration with AWS and Siemens on the app store model, this platform is intended to become a marketplace where participants can propose or choose solutions to improve industrial production and logistics. In the same spirit, BMW and Microsoft presented the Open Manufacturing Platform. Built on Azure IoT, the industry standards and open data models of this technological architecture aim to support the development of offerings for the connected factory.

Toyota, Fiat, General Motors and other major car manufacturers are collaborating in AutoSphere, a community of OEMs, suppliers and transport and logistics companies created by Surgere. Acting as a third party, the company provides software and hardware solutions based on sensor technologies, such as RFID tags on returnable containers, that enable the collection and analysis of transactional data at every stage of the supply chain.

Decarbonizing production lines

In 2021, NTT Com announced a successful trial of industrial data sharing between Japan, Germany and Switzerland with a prototype platform using the International Data Spaces (IDS) standard supporting data sovereignty within the GAIA-X ecosystem. The test data, assumed to be highly confidential, was securely transmitted from Switzerland to designated sites in Germany and Japan. The data covered electricity consumption, on the assumption that they would be used by the different parties to calculate CO2 emissions generated by the manufacture of specific products and to review their processes. This experiment demonstrates that sharing industrial data could help minimize the carbon footprint of different sectors of activity.

https://hellofuture.orange.com/en/confidential-computing-fills-a-blind-spot-in-data-encryption/

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Confidential computing fills a blind spot in data encryption

Friday 25th of March 2022 - Updated on Wednesday 22nd of June 2022

Encryption, a key trust issue for businesses, has so far been limited to data at rest and in transit. Confidential computing extends this protection to data undergoing processing.

The need for the confidentiality of sensitive data is an obstacle to the widespread use of the public cloud. So-called “end-to-end” encryption systems are misnamed. While they protect data at rest – i.e. stored in databases – and data in transit over networks, the encryption does not apply to data being processed. To be processed by an application, it must be decoded. This makes it momentarily vulnerable to targeted threats such as the compromising of a server or exploitation of weaknesses in an application.

An airlock to isolate sensitive data

Confidential computing aims to ensure the confidentiality and possibly the integrity of data during processing. It does this by using Trusted Execution Environments (TEEs), i.e. secure areas that isolate data and runtime code from the main operating system. These environments cannot be accessed, modified or compromised by a malicious agent. They incorporate their own encryption keys and authentication mechanisms. If unauthorized runtime code or malware attempts to access the keys, the TEEs abort the processing. Confidential computing is based on both software and hardware. A trusted application running in TEEs must access the hardware resources – the processor, memory, computing power (CPU) – of the server hosting it. Confidential computing aims to persuade companies to migrate their sensitive applications and data to the public cloud.

Removing the last barriers to the public cloud

Confidential computing players want to persuade companies to migrate their most sensitive applications and data to shared public cloud infrastructures to achieve gains in agility and scale. Gartner has identified Privacy-Enhancing Computation (PEC) as one of the technology trends for 2022.

The creation of isolated trusted environments encourages the use of the multicloud by ensuring that data is encrypted during processing, regardless of the cloud chosen, and contributes to the growth of edge computing. With this cloud at the edge, data processing is done as close as possible to connected objects (IoT) without having to transfer data to the cloud. A trusted environment ensures the confidentiality of this local processing. The confidential computing approach can encourage collaboration between companies by protecting intellectual property. ICT Journal cites the example of a hospital sending X-rays to one service provider's cloud to be analysed by another provider's artificial intelligence algorithm, without any of the three organisations having access to the others' information.

A fast-growing market

According to a study by the Everest Group research firm, the market for confidential computing is growing by 90 to 95% per year; representing nearly $2 billion in 2021, it could thus reach $54 billion by 2026. This is likely to be largely driven by the highly regulated sectors of banking, insurance and health. Semiconductor manufacturers (Intel, ARM, AMD, NVIDIA) and cloud giants (Microsoft, Google, Oracle, IBM) are positioning themselves in this market. These players participate in the Confidential Computing Consortium, an open source community at the Linux Foundation that has been working since 2019 to define the standards for confidential computing and accelerate its adoption.

Hyperscalers (the largest cloud providers) are already marketing confidential computing as a service offerings, in the form of "application enclaves". Microsoft Azure began offering confidential virtual machines to protect data during processing in April 2020. A few months later, Amazon Web Services followed suit with its Nitro Enclaves solution based on its EC2 storage service. More recently, Google Cloud launched a beta version of its Confidential VMs based on Compute Engine, its IaaS (Infrastructure as a service) offering. These cloud offerings are based on hardware architectures specifically dedicated to confidential computing. Chip manufacturers have developed trusted execution environments based on an inaccessible key stored in their processors. These include TrustZone, Software Guard Extensions (SGX) and Secure Encrypted Virtualization (SEV) designed by ARM, Intel and AMD respectively. As most cloud providers and semiconductor manufacturers work within the Confidential Computing Consortium, all of these systems must be based on open source building blocks – thereby ensuring sovereignty and interoperability.

https://hellofuture.orange.com/en/parking-just-got-smarter-with-edge-video-analytics/

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Parking Just Got Smarter, with Edge Video Analytics

Monday 4th of April 2022 - Updated on Wednesday 22nd of June 2022

Orange's innovation teams in Poland have come up with a video analytics system, based on a model for processing images at the network edge, which detects the availability of parking in real time. As well as what it allows users to do, the solution's flexibility, security and ease of deployment set it apart.

"This solution doesn't require image storage or transmission over networks and involves local data processing, which means excellent security and privacy."

As powerful as they are, existing video analytics solutions for managing parking lots still have a few road blocks to get past. They may require smart cameras, which do not come cheap, or they may need to use networks to send large amounts of data to the Cloud for processing on a remote server. But by combining edge computing and video analytics technologies, we can improve this model and produce a system that is just as efficient, but more secure and adaptable — one which can be used with the cameras that are there already.

A Local, Closed-Loop Processing System

The solution from Orange's teams in Poland can be deployed in parking lots fitted out with standard cameras. The difference between their system and other services for detecting parking availability lies in its architecture. In this case, the video stream is analyzed at the network edge, on the client side, as close to the cameras as possible. "Image processing takes place on-site," explain Orange R&D experts Wojciech Niewolski and Przemysław Ratuszek. The camera feed is sent over a local point-to-point connection to an on-site edge computing unit, where it is analyzed using advanced algorithms. Nothing is uploaded to the Cloud. The small amount of data that is sent over the networks is raw and anonymized. When this data arrives at our IoT Live Objects platform, it generates parking availability indicators, dashboards and so on. The solution is highly secure and private, as there is no need

for image storage or transmission over networks." It also leaves you with a much better ratio of bandwidth consumption to use.

This solution doesn't require image storage or transmission over networks and involves local data processing, which means excellent security and privacy.

A Flexible and Scalable System

Another major draw for customers, be they companies or local authorities, is how flexible the solution and its underlying architecture are. Hardware-wise, as mentioned above, basic cameras are all you need to implement this solution, which can be extended to multiple use cases if needed, unlike a smart camera, which can only perform one function. The system is also versatile in terms of its "brainpower". Although it is currently based on machine learning algorithms for object detection known as YOLO algorithms, the solution's intelligence can be developed in line with customer's use habits and expectations. The plug-in architecture means new AI modules and building blocks can be added quickly and easily to enhance performance and precision, or even change the nature of the service provided. This means that market or tailor-made video analytics algorithms can be added on request, such as optical character recognition (OCR) processes for detecting cars' license plates.

Many Potential Applications

Orange's teams in Poland are also looking to explore new application areas, besides car parking. They will run a PoC (proof of concept) at the Smart Store in Warsaw to try out using the solution for counting customers and analyzing of areas of particular interest in the store. Niewolski and Ratuszek explain that although "the platform is now focused on video, the research behind it was initially looking into audio processing. The original aim was to detect and locate drones in specific areas, using audio streams from standard microphones, like the ones you find in smartphones."

So, the platform has shifted to a different application area to meet customers' needs, but it can still offer the same type of services for audio and data. And more generally, it is ready to play an active part in the Smart City movement and ecosystem.

https://hellofuture.orange.com/en/luminis-oranges-community-of-inventors/

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Luminis: Orange's Community of Inventors

Monday 4th of April 2022 - Updated on Wednesday 15th of June 2022

Intellectual property is a key issue at Orange. The network, AI and data technologies protected by its patent portfolio are of strategic importance to the Group. In order to support and motivate its inventors, Orange's Intellectual Property and Licensing (IPL) department created Luminis, a community of inventors.

For Orange, intellectual property is a strategic asset that enables it to protect its interests and enhance its inventiveness. Every year, the IPL department protects more than 200 new inventions from Orange employees. At present, Orange has about 9000 patents helping to maintain its competitive advantage. They cover key technologies in everything from wireless connection, codecs, mobile services and infrastructure, to home services, the Internet of Things, security, AI and data. That is why the Group created the community of inventors Luminis. "We're hoping to achieve a number of things here, like inspiring a common culture and helping inventors learn more about intellectual property," says Sandrine Millet, Director of the IPL department.

Luminis, the Orange community of inventors, will allow inventors to discuss their questions and concerns and build the Group's intellectual property culture together.

Emmanuel Le Huérou, an Orange researcher and a member of the community, has worked in voice communication services and now focuses on activities that combine financial services with transactional messaging. He and his team help paint a picture of what the digital world is bringing to the banking industry: "The creation of Orange Bank gave us the chance to come up with innovative solutions that meet users' needs while respecting banking sector regulations." Many patents have been filed in the banking world in connection with concepts invented by Orange as a telecoms carrier. The functionalities of Orange Bank's family offer, the Premium Pack, are an example of this.

A Place for the Meeting of Minds

Luminis aims to create a space where 100 or so inventors, selected for their contribution to the Group's patent portfolio, will have valuable opportunities to discuss the issues surrounding intellectual property. "This community gives us a better insight into the work of the different intellectual property stakeholders, from the patent attorney to the patent analyst," says Le Huérou. "For example, with the benefit of a patent attorney's expertise, an inventor will have a better idea of the advantages and disadvantages of filing a patent."

Better Understanding the Work of Inventors

This community aims to strengthen the close collaboration between inventors and patent attorneys so that they can determine how best to protect each invention. This marriage of expertise—technology on the one hand, intellectual property on the other—means Orange can build a patent portfolio that is suited to its innovations. Félix Henry, a researcher in the video compression industry who works on video coding standards, believes Luminis will help him better understand the work of inventors: "Bright ideas and patents are not enough to reap the all benefits of inventions." They still need to be recognized in standards and regulations. At that stage, researchers have to prove that their patents meet the requirements of the standard. According to Henry, "if you want to achieve this, it's better to know in advance how patent attorneys write patents. The work only ends once a standard is released that includes your technology." This is a lengthy but essential process, and an inherent part of an inventor's job. Orange's community of inventors should help illuminate this standardization process.
In a very tangible way, Luminis lets inventors discuss the problems they face and find ways to overcome them.

A Mutually Beneficial Arrangement

The community will encourage peer-to-peer discussions. Le Huérou hopes they will "lead to the realization, for example, that a lot of us have the same questions, which we can talk about in complete confidence, and maybe even open up new questions that we wouldn't otherwise have thought of."
Millet believes "this community will strengthen bonds and lead to greater collaboration between the patent portfolio's different stakeholders, by facilitating valuable conversations to help them get to know and understand each other even better."

Read more :

Intellectual property, a marker of innovation.

https://hellofuture.orange.com/en/never-too-many-neurons-in-speech-recognition/

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Artificial intelligence | Article

Never Too Many Neurons in Speech Recognition

Friday 15th of April 2022

The field of speech recognition has been the talk of the town for decades and now has numerous applications, from automatic captioning to callbots. And its revolution continues today, with the exploration of end-to-end neural approaches.

“Achieving fully neural processing, covering both the field of acoustic signals and that of transcription in words and text.”

At Orange, speech recognition has been the focus of many research projects over the past 20 years. Projects in this area center around internal solutions, including one originally designed as a platform for audiovisual stream analysis and automated indexing and extraction of content.

Achieving fully neural processing, covering both the field of acoustic signals and that of transcription in words and text.

The Neural Processing Breakthrough

As Henri Sanson, Head of Decision and Knowledge Technology Research, and Benoit Besset, Speech Recognition Research Engineer, explain, “Projects have historically been divided into two technological areas. One relates to the transcription of content, while the other is focused on interactive voice servers. Today, a single piece of technology can meet a wide variety of needs from a common software base. In the mid-2010s, the arrival of neural processing was a major technological breakthrough. The use and development of deep learning methods and systems coincided with a significant qualitative leap, and marked the starting point for a new field of technology.”

Toward Fully Neural Solutions

The speech recognition systems that emerge from this breakthrough favor a hybrid architecture. While neural networks are used for processing acoustic signals and transforming vibrations into phonemes, more traditional layers of software then take the lead, with the use of graphs for matching sounds with words. From 2019, an alternative technological strategy was created, based on an end-to-end neural approach. “The goal is to achieve fully neural processing, covering both the field of acoustic signals and that of transcription in words and text,” says Valentin Vielzeuf, AI Researcher in speech recognition. This single-block architecture would, for example, simplify the model’s training and optimize updates. The fully neural approach effectively simplifies training and removes the need for certain “manual” steps necessary to train a hybrid model (alignment between audio and text, definition of a glossary, noting down of disfluencies). Doing away with these steps makes it easier to process a large amount of data and therefore enables progress toward a better generalization of the model, especially when dealing with certain accents and noises.”

Ubiquitous Technologies

The transition to this new generation of systems will, however, take some time, in order to overcome any technical barriers or issues. The path to using a fully neural approach involves careful consideration of certain issues, such as a relative loss of control over what happens inside the neural network, which could invent its own words, for example.

That aside, the use of voice recognition continues to grow in the tech and digital fields. Popularized through its implementation in interactive voice systems, speech recognition can also, from the point of view of a carrier such as Orange, be used to analyze customer conversations with call centers or to recognize the voice input of reports for field engineers.

Its influence could spread further if combined with other technologies — for example lip reading, for dual audio and visual speech recognition, offering improved performance.

https://hellofuture.orange.com/en/iot-security-requires-strict-monitoring-every-step-of-the-way-from-design-to-operation/

1. Hello Future
2. Internet of things
3. IoT Security Requires Strict Monitoring Every Step of the Way, From Design to Operation

Internet of things | Article

IoT Security Requires Strict Monitoring Every Step of the Way, From Design to Operation

Friday 6th of May 2022 - Updated on Wednesday 15th of June 2022

Internet of Things (IoT) security is a growing concern for customers. However, bit by bit these objects are becoming increasingly secure. In its White Paper on IoT Security, Orange shares the keys to improving this critical aspect of the IoT ecosystem. As an IoT network operator, management platform provider and object distributor, Orange is directly involved in this connected environment and is particularly committed to IoT security. And as long as the IoT remains a prime target for cyberattacks, this will be a necessary prerequisite for user confidence.

The IoT Is Targeted by 10% of All Cyber Threats

According to data published in Security Navigator 2022 from Orange Cyberdefense, 10% of all cyber threats are linked to IoT vulnerabilities. This observation is the focus of Orange's White Paper on IoT Security. The incorporation of security into connected objects—particularly security by design—is still rare and the results we are seeing are inadequate. "The extreme fragmentation of the IoT ecosystem largely explains this lack culture around and ownership of security issues," explain David Armand, Security Expert, and Fabrice Fontaine, Embedded System Security Engineer at Orange. In most cases, object manufacturers do not have the necessary resources or expertise in this field. They are also in a race to be the one with the best offer, to market their objects at the cheapest price possible, as fast as possible. Even when security is integrated into the development process, this is done precariously, right at the end, leading to fundamental vulnerabilities such as the use of basic passwords."

Orange Takes a Proactive Approach

The resulting threats are both generic and common to any digital service, such as malware, and more specific to the IoT ecosystem. Connected objects are installed everywhere, in both controlled environments and public spaces, and they have the ability to affect their surroundings. A perfect example of this risk is the case of a hacker who seized control of a water treatment plant in Florida in an attempt to multiply the amount of sodium hydroxide. Manufacturers of connected objects only incorporate security at the end of the process, and to a limited extent at that.

For many years, Orange has been committed to the end-to-end protection of the IoT service chain, from networks, to platforms and objects. In particular, this proactive approach includes a strict set of requirements and an evaluation process for manufacturers who want to be included in the catalog of connected objects distributed by the carrier.

Action is Required Upstream

But such requirements are far from the norm in the IoT ecosystem. It is necessary to push for best practices to be adopted through standards, or even labeling schemes similar to the Nutri-Score, in order to make consumers more conscious of these issues. The past few years have seen some progress in terms of this awareness. At European level, Orange is actively contributing to the ENISA initiative to define certification schemes dedicated to the security of connected objects, structured around three criteria levels: basic, substantial and high.

The Group also helped to develop the IoT SAFE standard within the GSMA. This standard suggests using the SIM or eSIM, a proven security asset, as a digital safe for storing data encryption keys. In addition to its clear added value in terms of protection, it also allows the carrier to dynamically update keys in the SIM to generate and renew them in a flexible way. The IoT SAFE project is part of an open source approach to ensure that as many people as possible can contribute to this emerging ecosystem.

Research on All Fronts of IoT Security

In conjunction with the standardization effort, Orange is mobilizing its research teams around innovative IoT security projects. This expertise is being put to use in major European projects like 5GCAR and 5GCroco, particularly in the field of connected vehicles. And internally, this expertise is focused on how certain technologies can contribute to solving this security challenge, such as the use of AI mechanisms to monitor and detect abnormal behavior or traffic originating from, or destined for, connected objects.

https://hellofuture.orange.com/en/open-banking-facilities-for-clients-data-for-banks/

1. Hello Future
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Data | Article

Open Banking: facilities for clients, data for banks

Friday 6th of May 2022

Based on data sharing via application programming interfaces, Open Banking is fostering innovation in the banking sector while increasing transaction security. Traditional banks can accelerate their digital transformation and clients can manage their finances better.

Banks have embarked upon digital transformation processes, to remain competitive and to better meet consumers' expectations. New models, such as Open Banking, are now available to them. These enable private individuals and small businesses to share their banking data with third-party service providers, with a view to being offered innovative and personalized services. In such a system, for example, a couple can use an application that analyzes its finances so as to establish a monthly budget; a self-employed person can connect accounting software to their bank account to fulfil their accounting requirements.

One of the promises of Open Banking is to facilitate access to bank financing for people who were previously excluded.

The adjective "open" doesn't mean this model does not come under strict security standards. Open Banking is regulated by the financial authorities of the countries in which it is established: only providers authorized by a regulatory authority can access clients' accounts, clients do not share their user identifications or passwords and they choose the terms for sharing their information. Furthermore, it uses advanced protection software and systems.

APIs at the heart of the open banking model

Open banking is at work in the United Kingdom, Brazil, and other countries across the world. In the European Union, the Revised Payment Services Directive (PSD2) constrains banks to share their clients' account data – with their express approval –

to third parties. This must be done through a secure method of communication, application programming interfaces (API), which are set up by the banks themselves and adhere to a certain number of technical standards.

Instant bank transfers and other services for clients

Open banking introduces a wide range of banking and financial products and services to consumers, who can pick and choose according to their needs. These solutions include:

- Payment platforms that enable instant bank transfers between individuals for example.
- Bank account aggregators, such as Bankin' or Linxo, which consolidate all of a person's accounts from one or several banks into a single interface. These applications enable clients to view their finances all at once and to access several practical functionalities such as transaction categorization.
- Applications dedicated to personal financial management that offer detailed tracking of spending and help people to set up a budget or build a savings strategy.
- "Cashback" offers, whereby a percentage of the consumer's money spent with a given brand is put back into their account. For example, Orange Bank offers its clients a reimbursement of 5 % of their Orange mobile and broadband bills as well as their online or instore purchases.

Refined customer data for providers

One of the interesting promises of Open Banking is to facilitate access to bank financing for people who were previously excluded. Combined with new technologies such as machine learning, it gives third-party providers access to larger datasets (including, in particular, bank statement history) making it easier to report on the client's true behavior and financial situation. This should make it possible to go beyond the usual criteria considered for traditional credit scoring (which calculates credit risk) and to make easier and faster decisions.

New opportunities for banks

Open Banking may have introduced new obligations for banks and financial institutions, but it also provides them with new opportunities. In a highly competitive environment, with the arrival of a multitude of new players, it is essential that traditional banks remain innovative and provide an appropriate response to the changing needs of their clients. Having taken a user-centric approach, technology companies, fintechs and neobanks have brought along new ideas and changed consumers' habits. This ecosystem, and the increasing use of APIs, could help banks to broaden their offering and accelerate the development and market launch

of their new products and services. This results in an improvement in the relationships between a bank and its historical clients, as well as potentially new sources of revenue. Open Banking is an internal lever for innovation for banks. They can use APIs to modernize – without completely redesigning – their information system and transform existing company processes. This can help give them more agility and flexibility as well as reduce costs (for example, by connecting data and allocated resources to the different channels, both web and mobile). In several places across the world, a favorable regulatory framework is fostering the progressive uptake of Open Banking by banks, who are moving forward cautiously. Some countries are at the forefront in the field, such as the United Kingdom who were the first to deploy a true open banking system, with fast uptake by all stakeholders (banks, third-party providers, clients). Others are still in the early stages of this new model which, with the help of new players, is making the most of the opportunities provided by APIs to sustain competition and innovation in the banking sector.

https://hellofuture.orange.com/en/software-heritage-the-software-library-of-alexandria/

1. Hello Future
2. Digital culture
3. Software Heritage: the software Library of Alexandria

Digital culture | Article

Software Heritage: the software Library of Alexandria

Friday 6th of May 2022 - Updated on Wednesday 22nd of June 2022

The Software Heritage project aims to build a software Library of Alexandria: a perennial, universal source code archive to serve society, science, and industry.

In today's information society, software is everywhere. It is at the heart of scientific research, technological developments, and ever more industrial processes. Software plays a pivotal role in the everyday life of our society. It gives us access to humanity's knowledge and cultural heritage, of which it is also a part. However, software is fragile: it can be altered or made unusable.

Software Heritage is also a fantastic tool for examining software that is currently being developed, which should enable developers to build better programs.

"In order to preserve this heritage and to meet the technological and scientific challenges of tomorrow, it is essential to build a universal and perennial software archive today." This is the ambitious objective of Software Heritage. Launched by the French Nation Institute for Research in Digital Science and Technology (Inria) in 2016, and carried out in partnership with UNESCO, this project aims to collect, preserve, and make accessible all software publicly available in source code format. Source code is text that details the instructions of a computer program in a programming language that is readable and usable by humans.

The concept of software heritage

A large portion of the information produced in the world is in digital format. Nowadays, in science, for example, scientific publication systems on the internet (electronic journals, open archive portals, blogs, etc.), side-by-side with paper format scientific publications and journals, play a crucial role in the dissemination of knowledge and the promotion of research.

In parallel, digital technologies are used more and more in the cultural sector for heritage preservation. Large-scale programs have been launched, aiming to bulk digitize the collections of museums, libraries, and archives, as well as historical monuments and sites.

Accessing, handling, and interpreting digital resources, no matter the physical medium they are stored on, requires software. In this sense, software is "the key mediator for accessing all Cultural Heritage", the Rosetta Stone containing both the raw data and the means of converting the information.

Itself an expression of human creativity and intelligence, software is a piece of our heritage that should be protected and passed on to future generations. UNESCO has thus included it in the Charter on the Preservation of the Digital Heritage, which was adopted in 2003. In 2017, this UN agency signed an agreement with Inria relating to the preservation of and access to software source code, taking the Software Heritage project into a new dimension.

A journey back (and forward) in programming time

Anybody can use Software Heritage to find, study, improve, and reuse the code they need. "Our archive is an absolutely unique observatory of the development of the planet's software", states Roberto Di Cosmo, CEO of Software Heritage, in an interview given to "Usbek & Rica" magazine. Keeping track of thousands of programming languages, as well as any resources relating to program development (documentation, articles, comments left by programmers, etc.), is of huge interest to researchers specialized in the history of computing. The archive can be used as a basis for fundamental work, such as that carried out on the history of UNIX or the Apollo Guidance Computer source code.

Beyond being a "time machine" and an archive of past software, the facility makes it possible to examine software that is currently being developed. Developers can use it to build better programs.

A key building block of open science

Software Heritage wants to become the reference for software used in scientific research, thus reinforcing the free access and open data approach, which aims to make scientific data and publications freely available to all.

The reproducibility of an experiment's results is a requirement of scientific method. It enables scientific validation of a piece of research. To guarantee this reproducibility, it is necessary to have access to the articles presenting the results and the research data, but also to the software used during the experiment. In effect, software is now used at every step of research and in all scientific fields. With Software Heritage,

researchers can know exactly on which version of a piece of software the research is based.

Archiving, making accessible, preserving

A mammoth task, the archiving of all source codes – Software Heritage does not make a selection – relies on several mechanisms. Programmers and different bodies who possess what are known as “software artifacts” (any element produced during the development process) can deposit and reference source code themselves, attaching several files (software description, people to be credited, project license, metadata file to help with source code indexing). Internet users can participate in the project by submitting a request to save any “contemporary” source code that is not yet integrated in the archive, or that is not up to date. This complements the automatic exploration (crawling) carried out on the major code hosting platforms to continually discover “software origins” (locations identified by URLs from where a coherent set of source codes has been obtained). They can also contribute to the retrieval and organization of historical source code by following the Software Heritage Acquisition Process (SWHAP), developed in partnership with the University of Pisa.

Work on organizing and indexing the collections, as well as providing research tools within the archive, should enable users to find their way through all this software. A unique identifier is attributed to each software artifact, and it is possible to perform a search from the software metadata collected and extracted by the project. Users can write programs for navigating within the archive, using the Software Heritage API.

Finally, to guarantee the durability of the archives, several precautions have been taken. Today there are three copies of the archive, two are in the Inria’s datacenters, and one is in the Microsoft cloud in another country. The project members are also working on a network of international “mirrors”, full copies of the archive managed by other bodies that are totally independent of Inria. In this way, Software Heritage’s precious pieces of software should not face the same tragic fate as the Library of Alexandria documents.

According to Inria, to date Software Heritage has gathered “over twenty million software projects, two and a half billion unique archived source files and their entire development history”, which would already make it “the richest source code archive on the planet”.

https://hellofuture.orange.com/en/introducing-5g-into-the-operating-theater/

1. Hello Future
2. Networks and IT
3. Introducing 5G into the Operating Theater

Networks and IT | Article

Introducing 5G into the Operating Theater

Friday 13th of May 2022
On April 21, 2022, in partnership with an industry consortium, Rennes University Hospital conducted an experiment using a private 5G network in the operating theater. The first of its kind, this experiment was carried out as part of the European 5G-TOURS project, which aims to develop 5G use cases across sectors as diverse as healthcare, mobility and tourism. It opens up endless opportunities for healthcare professionals and patients.

The experiment is a first in France. It involved simulating a cardiovascular procedure carried out by a cardiologist and followed live by his colleague in Athens. By combining 5G connectivity and innovative applications, ultrasound and X-ray images were superimposed and retransmitted using an augmented reality application and a private 5G network. The transmission was carried out over the 26 GHz frequency band, which is still seldom used in Europe but is used fairly widely in Asia and North America.

The experiment has clearly shown that a 5G network can fully support the throughput and latency required to provide high quality medical images.

The experiment aimed to achieve two technical feats. The first challenge was to perfectly sync up the images, in both time and space, as this greatly improves the conditions for the procedure (the images are usually retransmitted on separate screens). The second was ensuring the performance of available 5G wireless network infrastructure, which needed to offer the very high speeds and very low latency required for augmented reality.

The Challenges Involved in Improving Conditions for Hospital Procedures

According to Nelly Besnard, Head of Partnerships and Innovation at Rennes University Hospital and Coordinator of the 5G-TOURS project for the hospital, the

results of this experiment are promising: “Operating theaters are using image processing technologies more and more often for less invasive procedures. But these increasingly high-performance and often data-intensive solutions are complicated to set up without a wired network. The experiment has clearly shown that a 5G network can fully support the throughput and latency required to provide high quality images.”

Another significant challenge is streamlining or even removing telecommunication cables in the operating theater, with clear benefits for the medical team and for patients. This is because these cables limit how freely practitioners can move around and must be included in disinfection protocols. 5G mobile connectivity supports flexible equipment usage, ensures automatic connection from any operating theater and improves comfort and efficiency during procedures.

A Proven Partnership

Rennes University Hospital, AMA, b<>com, Orange, Nokia and Philips have been working on conducting 5G-TOURS experiments for many months now. In September 2021, they conducted a remote specialist consultation from a connected ambulance.

- **The hospital team and Orange** defined use cases and coordinated the successful implementation of the project.
- **AMA** developed the XpertEye assisted reality application.
- **b<>com** contributed its 5G Dome private core network solution and augmented reality application (image fusion).
- **Nokia** set up the 5G cellular network on the 26 GHz millimeter wave frequency band.
- **Philips** coordinated the “connected ambulance” experiment.

Non-Negotiable Parameters

“This progress is crucial,” explains Besnard. “But it should not come at the expense of data security or the health of patients and medical teams. That is why we defined non-negotiable parameters: uninterrupted connectivity, enhanced cybersecurity and complete safety for patients and healthcare professionals.” Sofiane Imadali, Research Engineer at Orange and Project Manager for 5G-TOURS on connected healthcare topics, confirms that the experiment was conclusive: “From a cybersecurity point of view, a 5G private mobile network is much more secure than a traditional Wi-Fi network. A team at the National Frequency Agency measured the movement of the waves. The results consistently showed an emission rate in W/m2 that was 400 times lower than the limit set by regulations.”

What Are the Future Applications?

There is only one step between experimentation and application. This first step is training young surgeons by using a live or pre-recorded procedure in a university lecture theater. The next step is remote support for complex cases, or to remotely support emergency or non-specialist surgeons so that they can provide a quick and optimal diagnosis as well as making patient care easier.

But we won’t be seeing these real life applications any time soon. It is likely to take three to five years to industrialize a reliable and efficient solution, and further reduce the necessary hardware and wiring. This includes integrating 5G modems into medical devices in the form of a chipset. In the meantime, another experiment has already been planned: opening up a temporary intensive care unit, which will use monitoring devices and a turnkey 5G network to become operational in less than 48 hours. This new project, rolled out as part of the France Relance plan, brings together the same partners and the initial experiments are expected to start within a year.

https://hellofuture.orange.com/en/the-open-source-community-nephio-aims-to-bring-networks-into-the-cloud/

1. Hello Future
2. Networks and IT
3. The Open-Source Community Nephio Aims to Bring Networks into the Cloud

Networks and IT | Article

The Open-Source Community Nephio Aims to Bring Networks into the Cloud

Tuesday 14th of June 2022

The Linux Foundation Embarks on a New Open-Source Adventure. In collaboration with Google Cloud and a team of expert stakeholders (including Orange), project Nephio promises to ramp up automation in telecoms networks.

It All Started With Kubernetes. This “cloud operating system” was developed in-house by Google in 2014 to manage the deployment of software components in its various data centers, as well as enable rapid scale-ups. Published soon after as an open-source platform by the Linux Foundation, this reliable and well-documented technology was picked up by many players across the cloud ecosystem and has since become the industry standard. The Nephio open-source community’s work builds on these foundations and aims to construct networks from cloud-deployed technological components. With Nephio, the goal is to build and deploy a network in the same way as we would a very large piece of software that needs to be distributed across a given region.

A Matter of Automation

This technology has long been an attractive prospect to telecoms operators. According to Éric Debeau, Head of the OSONS (Open and Smart Solutions for Automating Network Services) team at Orange Innovation, “Deploying network functions today still requires a lot of “manual” configuration work. That is, these functions are still being configured locally, in the network adapters of physical servers dotted around the country. Only then can the software components deployed on cloud infrastructures be retrieved. But the rise of virtual network functions brings with it the promise of automation, which will make it much easier to manage the software we deploy in order to optimize our network on a daily basis.”

So How Can We Harness the Full Potential of the Cloud?

Not so fast. Designing networks in this way comes with its own set of peculiarities, configurations and constraints, especially in terms of performance. Legacy network hardware and software suppliers, who lack the right tools, often resort to the code that they create for servers, attempting to simply move this to the cloud. As a result, their solutions are not harnessing the full potential of the tools provided in the cloud environment, even though those tools ensure faster and more secure networks.

Cloud-Native Networks

“With Nephio,” Debeau continues, “the goal is to build and deploy a network in the same way as we would a very large piece of software that needs to be distributed across a given region. We’ll develop a set of software components that facilitate automation. This will enable us to deploy network functions in a more flexible way, to ramp up throughput and to address the challenges posed by the IoT, connected cars, Industry 4.0 and so on. Standardization communities today define specifications and describe how solutions can be implemented but they aren’t giving people the tools to do this. Nephio should fill this gap and in doing so, we hope, get the entire ecosystem on board.”

Nephio: A Community

Managing large and complex applications deployed across multiple data centers is nothing new to Google Cloud. In order to make Nephio a reality, the company has enlisted various service and infrastructure suppliers and stakeholders, including Telecom Italia, Rakuten Mobile and Orange. “As a carrier,” explains Debeau, “we will be able to specify what is needed, carry out deployment tests and use our knowledge of our various businesses to improve the solution. Orange has a wealth of experience working with open-source software, as we are already involved in several Linux Foundation projects.”

Where Interests Lie

Having been officially launched on April 12, 2022, Nephio is now entering its construction phase. The coming months will be an opportunity to define its technical, organizational and governance rules. Google’s interests in such an undertaking are clear: It hopes to develop an ecosystem in which the American tech giant can then monetize add-on solutions. In open-source software, you can do everything yourself. But having the support of this leading technological player guarantees security and solutions that will continue to work over time. In practice, Nephio will still provide users with the essential tools. And What About Orange? “For Orange, the challenge is this: to leverage the power of Google to create a joint solution that can deliver on the promise of cloud-native networks.”

https://hellofuture.orange.com/en/blockchain-uses-5g-to-notarize-work-carried-out-by-augmented-technicians/

1. Hello Future
2. Internet of things
3. Blockchain Uses 5G to Notarize Work Carried Out by Augmented Technicians

Internet of things | Article

Blockchain Uses 5G to Notarize Work Carried Out by Augmented Technicians

Tuesday 9th of August 2022

Orange is designing a solution that combines the strength of new mobile networks, augmented reality technologies and blockchain to simplify the role of Field Engineers and improve efficiency and traceability.

5G has ushered in the “augmented technician” era. Tested across a range of business sectors, this experiment involves providing a technician with a pair of augmented reality glasses that are designed to use 5G to support them in their role, as well as to expand the size and scope of the work carried out. Engie has signed the first co-innovation agreement meaning that its technicians will have their work supported by remote expert assistance.

Remote Expertise Through Glasses

Technicians can call upon a remote expert to guide them through complex jobs. They are given smart glasses (with an HD camera) that are linked to a dedicated app on their 5G smartphone called “Mon Intervention dans ma Poche” (“My Job in my Pocket”). Experts can be consulted via a conference portal on the app, and the camera and 5G technology means they can see what the technician is seeing in real time, with no delays. The experts can then provide assistance and advice using visual indications, as these gestures are immediately shown in the technician’s field of vision. Augmented technicians are already a reality, and the experience is now being enhanced by blockchain building blocks with new features.

This solution showcases how augmented reality can be used in professional contexts, as well as the strength of 5G. Orange is developing this solution in partnership with AMA, a specialist in assisted reality and interactive remote collaboration. To enhance the experience of both technicians and experts, Orange is integrating new blockchain and IoT technology building blocks into the AMA service, which has already been rolled out and is currently operational.

Recordings Stored and Traced

The first usage scenario to be explored focuses on “notarizing jobs,” which means recording and authenticating them as evidence in the event of a dispute, explains Philippe Delbary, Innovation Director in charge of Future of Work program. The video files are hosted on the Cloud and linked to a hash — a unique security key or signature — stored on the Archipels blockchain platform, a new member of Alliance Blockchain France (ABF). Generated at source, this reference hash confirms the authenticity and integrity of the file and, by extension, the job carried out. If even one pixel of the video changes, the hash changes too. This means a comparison can be made to determine whether the file is corrupted. The service was initially developed and tested on the Archipels private blockchain, as part of a partnership with Engie. It is likely that it will eventually interface with other platforms, such as the future ABF open blockchain platform, co-created by Orange and Docaposte.

Other Uses Being Studied

Notarizing is the first example of how blockchain technology can contribute specifically to jobs carried out by technicians. Other applications could follow. Orange Research teams are working on an extension to this solution that focuses on delegating responsibility. This would mean removing the restrictions that subcontractor technicians sometimes face, which prevent them from taking action and can lead to the work being terminated before it is complete. “In this case, it would be possible for a remote expert to give permission to the technician in the form of a token registered on the blockchain and placed into the technician’s smartphone wallet, before the work is notarized.”

Another potential use is to link the work recordings, photos and report to the digital twin of the relevant machine. This helps to maintain a history of the work carried out by ensuring that information is not lost. It can also allow other technicians to practice complex procedures before carrying out the work on site.

https://hellofuture.orange.com/en/mastering-industrial-operations-thanks-to-smart-monitoring/

1. Hello Future
2. Artificial intelligence
3. Mastering Industrial Operations Thanks to Smart Monitoring

Artificial intelligence | Article

Mastering Industrial Operations Thanks to Smart Monitoring

Monday 12th of September 2022

INCTEC's simple, flexible and efficient Smart Monitoring solution aims to bring the benefits of artificial intelligence (AI) to industry. It brings together several technologies that have high added value for Industry 4.0.

Although many companies consider AI to be key to their performance and competitiveness, few actually use it.

Automating to Increase Access to AI

"Only 6% of companies in Germany are currently using AI," says Cyrille Waguet, co-founder and CTO of the German startup incontext.technology (INCTEC). There are a number of reasons for this lack of uptake, such as the difficulty people have in understanding this complex technology, the lack of automation in its deployment and implementation, as well as the significant costs involved for companies. AI is often considered a project to be handled in isolation, a matter for data scientists, but really we should think of it as software, like an enterprise resource planning (ERP) system. INCTEC's goal is to make using this solution as automated as possible, without a major upstream project, in order to support its scaleup.

Two Layers of Technology, Two Levels of Automation

The system is structured around two main technological components, both of which are equipped with automation mechanisms. The virtual model of a plant's machinery or production lines—its digital twin—makes it possible to organize the data flows generated by these systems. The Smart Monitoring software then sends this data to the second layer, AI, made up of algorithms that use unsupervised machine learning, meaning that they do not require any specific expertise or intervention. "The system independently learns what normal industrial processes are like and reacts to

situations that deviate from this norm or equipment behaving unexpectedly. As well as this real-time data monitoring, the solution can also take preemptive action based on trend analysis, which particularly lends itself to applications in the field of predictive maintenance."

Smart Monitoring

This software can be used across multiple industries, business scenarios and use cases, where it enables smart and dynamic operation monitoring. Its benefits include optimized decision-making and planning, enhanced quality control to avoid rejected or recalled products, early detection of weaknesses or production overloads and less downtime, to name a few.

AI is often considered a project to be handled in isolation, but really we should think of it as software, like an ERP.

In the agri-food industry, for example, the system is implemented for the production of food made from fresh fruit, on a multi-stage production line that runs from fruit washing to canning. It is therefore possible to monitor several parameters throughout the entire industrial process, including energy consumption and the amount of water used at the washing stage. In this case, the solution's added value is found in terms of the environment and responsibility, as it allows the resources used to be monitored and optimized. By also using the software to monitor temperatures during the mixing and heating stage, it's possible to guarantee the smooth running of operations and a high-quality end-product.

Flexible Implementation

The simplicity and flexibility of Smart Monitoring can even be seen in its deployment. Depending on customers' needs and operational considerations, the solution can be implemented either in the cloud or at the "edge", be that on site or as close as possible to the site in Customer Edge or Network Edge mode. INCTEC collaborates with Orange on these topics and relies on the Group's Cloud/Edge infrastructures and 5G networks to deliver and implement its solutions.

https://hellofuture.orange.com/en/de-facto-infrastructure-for-smart-industry/

1. Hello Future
2. Networks and IT
3. DE Facto: Infrastructure for Smart Industry

Networks and IT | Article

DE Facto: Infrastructure for Smart Industry

Monday 17th of October 2022

At the Orange Research and Innovation Exhibition, DE facto will demonstrate its integrated platform for leveraging connectivity and business solutions within factories of the future.

When manufacturers want their factories to be both intelligent and fast, they call upon specialized providers to fulfill their needs, each coming with their own computers, sensors and cables. All these new tools need to be linked to an IT infrastructure. Servers host the business applications that are used to manage tasks on-site. These servers also use algorithms to understand the large amounts of data produced by the sensors. To be able to communicate both internally and externally, “this whole little world” must be connected to the network. This means that a factory’s infrastructure often requires the use of various interlinking solutions each with different interfaces. The teams at Orange and the company’s partners b<>com and IMT Atlantique have come together to bring all of these solutions onto one single platform by developing their Smart Industry infrastructure project: DE Facto, the Digital Edge Factory.

Edge Computing and 5G: A Match Made in Heaven

For its presentation at the Orange Research and Innovation Exhibition, the project team(*) has created an entire demo factory, which includes a conveyor belt, robotic arms, cameras and dedicated servers. According to the team: “It is an end-to-end solution. We’re proving that we can automatically deploy services from multiple partners in an integrated way, which makes cross-referencing their data much easier. Software and connectivity infrastructure is deployed in the factory using edge computing, and it can also be extended to the cloud.” The aim is to also show how 5G connectivity can be beneficial for Smart Industry, as it can automate areas subject to severe constraints, requires the use of very few cables, increases IoT and AI use, and can closely monitor performance. With its twin advantages of

connectivity and low latency, 5G responds to the industry's new requirement for flexibility.

Related Research Programs

The project started in 2021 within the Industry of the Future Research Program. "We were all focused on the same question: How can we bring together our expertise to meet new business needs? To be able to offer an end-to-end solution, we needed to come together with other research programs focused on infrastructure and connectivity, and join up with strong partners." b<>com, the French Institute of Research and Technology in which Orange has invested resources and people, has contributed by automating and deploying the software infrastructure, including virtualizing the 5G core. The Engineering School from the prestigious French technological university IMT Atlantique is also involved in the radio connectivity side of the project.

Finding an Industrial Partner

An early version of the project was presented at two fairs earlier this year, generating interest from at least one industrial solutions provider, with whom the team is discussing carrying out tests. By showcasing a fully operational version at the Orange Research and Innovation Fair, the team wants to attract even more partners. "This stage is essential for gaining visibility, both on the operational side among players such as those deploying cloud infrastructures, as well as among IoT solutions and Computer Vision developers and other key players. We want to team up with partners to test DE Facto's industrial robustness, but also to test adherence to our deployment model, as this model is completely different from what is currently being used in the industry."

* The demonstration is being led by Yvan Picaud, Head of the Industry of the Future Research Program at Orange, Nabil Ditini, in charge of this Research program's Wireless Factory project, Ivan Meriau, Project Manager at both Orange and the b<>com Research Institute on the Supra project and Stéphane Tuffin, Research Project Manager for the Network Service Quality Program.

https://hellofuture.orange.com/en/save-even-more-energy-with-cooperative-ai/

1. Hello Future
2. Artificial intelligence
3. Save Even More Energy with Cooperative AI

Artificial intelligence | Article

Save Even More Energy with Cooperative AI

5G base stations
Monday 17th of October 2022

With cooperative AI (artificial intelligence), it is possible to simulate multi-agent exchanges in order to evaluate the suitability and feasibility of collaboration. At Orange, research is focused on applying this technology to negotiations between networks to optimize the energy efficiency and impact of their access networks. These challenges are all the more critical given that RAN (Radio Access Network) infrastructure represents between 80% and 90% of the total energy consumed by a mobile carrier's networks. Efforts are already being made to mitigate carriers' energy footprints, for example, Orange is only using one frequency band at night when there is less traffic. However, other avenues can be explored to take this a step further.

A Cooperative Solution

For example, different carriers could work together to pool their resources, resulting in a significant reduction in the energy load of networks. In the scenario studied by Orange and presented at the Research and Innovation Exhibition, each carrier could alternate and host the others' traffic for a one-night shift. That way, only one RAN would remain active, rather than two, three, four, or however many there are, depending on the number of carriers involved in the collaboration. The theory is promising on paper, but it must meet certain conditions in terms of fairness and incentive to contribute before it can be put into practice. Put simply: Will carriers

want to take part? “To answer this question, we came up with some rules and launched cooperative trials,” explained Xavier Marjou, Network Research Engineer at Orange. “By experimenting with AI according to different sets of rules, it is possible to ensure that the proposed system of cooperation is reliable, fair and beneficial to all parties.”

Simulated Negotiations

Negotiations are simulated between carriers and we try to get everyone to get involved and take turns doing their “shift.” “We instantiated software agents representing the interests of each carrier, and the carriers learned to negotiate with each other over the course of the trials. It is a reinforcement-based learning model: The agent gets involved and performs an action toward an environment which, in return, feeds back the result of this action with an associated reward, positive or negative. By carrying out a series of actions, the agent ultimately finds the combination that is most favorable to them. In our use case, the agent/carrier offers to take a shift and in return receives a reward proportional to the amount of kWh saved. Over time, the agent realizes that certain negotiation sequences are more suitable than others and yield a profit, and they are therefore encouraged to continue taking part.”

AI learns the negotiating sequences that are favorable to them, and they are therefore encouraged to continue taking part and cooperating. This application falls within the scope of cooperative AI, a relatively untapped sector due to significant computing power being required to be able to understand all combinatorial hypotheses in a multi-agent exchange.

The Best Rules to Encourage Cooperation

Many rounds of negotiations were simulated, producing various results. Certain rules are conducive to cooperation and a good level of alternation in shifts. Others, more biased, can lead an agent/carrier to exploit a loophole to the detriment of the other players. The system studied shows the diverse range of possible situations and proves that ethical cooperation is possible based on four evaluation metrics: efficiency (the amount of kWh saved), security (measures the risks for an agent when others do not cooperate), incentive to take part (encourages cooperation by showing the benefits) and fairness (each player saves the same amount of kWh). By modeling the interactions between carriers, it is possible to define the best negotiation parameters and limit exchanges to those strictly necessary, for optimal replication in “real life.”

The work carried out already demonstrates the benefits of having the largest number of carriers possible cooperating and pooling their resources, namely during periods of low activity

https://hellofuture.orange.com/en/ialerting-protecting-customers-from-online-piracy/

1. Hello Future
2. Artificial intelligence
3. IAlerting: Protecting Customers from Online Piracy

Artificial intelligence | Article

IAlerting: Protecting Customers from Online Piracy

Tuesday 18th of October 2022

The IAlerting system unveiled at the Orange Research and Innovation Exhibition evaluates connection legitimacy upstream to protect customers from identity theft and notify them of suspicious behavior. Whether you are logging in to a website, subscribing to an online service or making a purchase on an e-commerce platform, every time you establish a new connection to an Internet service, you are presenting an opportunity to cyberattackers. Hackers use techniques such as password theft, data leakage and phishing attacks to steal the identity of an individual with malicious intent.

A Radar to Detect Account Fraud

Orange teams have developed IAlerting to protect Orange customers and users from the consequences of such acts. This system for detecting compromised accounts uses artificial intelligence (AI) to process billions of authentication events, detecting connection anomalies and, therefore, potential cyberattacks. The objective is to evaluate connection legitimacy upstream in order to make the customer experience more secure. “With each authentication attempt, the system analyzes the identification data and assesses whether it needs to notify the customer of suspicious or abnormal behavior,” explains the project team*. “IAlerting calculates the risk score based on statistical modeling of previous connections.”

An Adaptive and Responsive Tool

The system is the result of extensive work to centralize the management of connection sessions. Using centralized data such as the date, time and place of the connection and the device and login used—this data being a mixture of legitimate and illegitimate connections—the project team ran machine learning and AI algorithms to spot suspicious or abnormal behavior patterns. With 100 events to score per second, 20 million customers and 42 million users, the technical

challenges were substantial. In spite of this, everything went very smoothly, with the project shifting from the research laboratory to the field in just three weeks! This rapid execution was the result of a user-focused pragmatic approach and collaboration between research and development teams from the outset. To counter the threat from increasingly inventive hackers, the teams opted for a reactive system rather than hard (embedded) coding. “Our real-time scoring tool is flexible and efficient,” the team comments proudly. “It means our researchers can analyze and search in real time for fraud and ways to circumvent it, and our developers can work with actual data and volumes from the development phase.”

A Secure Customer Journey

The booth at the Research and Innovation Exhibition features a demonstration simulating three scenarios based on converting a physical SIM card to an embedded eSIM: a first user who converts their SIM without any problem; a second whose behavior is flagged as suspicious by IAlerting; and a third user, a hacker, who is denied access to the SIM conversion functionality. “In the second example, the user is connected to their company Wi-Fi,” the team explains. “They enter their password but historical analysis reveals suspicious logins, indicating that it is not always them. We then ask for further proof of identity — in this specific case, to log in with the SIM card from their phone. Unless the user’s mobile phone has been stolen, this will confirm that it is actually them!”

Toward Broader Deployment and Greater Effectiveness

Already rolled out in France to professionals and the general public (specifically for accessing the orange.fr site), IAlerting should gradually become more widespread. “Deployment in a new country or on new services is very fast: operational teams can be supplied with a complete platform, ready to integrate local data, within an hour.” On the corporate customer side, Orange Cyberdefense is preparing to start an experiment. “Today, we protect someone who connects behind a web app or a mobile phone,” the team explains. In the future, with Orange Cyberdefense, we will be able to protect a network infrastructure. For example, making sure streaming platform customers do not have their accounts hacked.” Alongside this broader deployment, the Orange Innovation IAlerting team continues to add new features to make the solution more effective. The fight against online piracy never ends!

*The IAlerting project team includes: Erwan Diverrez, Project Owner and Solution Architect for the IAlerting project; Benoit Hérard, Research Engineer for Digital Identity; Christophe Naudin, Head of B2B Identity Enablers providing authentication and access protection to Carrier or Corporate Customer Areas; Maxime Petesch, Orange’s Director of Consumer Security Privacy.

https://hellofuture.orange.com/en/behind-the-scenes-of-ai-the-challenges-and-methods-of-explainability/

1. Hello Future
2. Artificial intelligence
3. Behind the Scenes of AI — The Challenges and Methods of Explainability

Artificial intelligence | Article

Behind the Scenes of AI — The Challenges and Methods of Explainability

Wednesday 19th of October 2022

AI systems have become so complex that most experts are unable to understand the intricacies of how they work. Explainability is the foundation of transparency, making it a key requirement for being able to trust algorithms.

“A company that uses algorithms should not be a black box company,” explained Cédric Villani in his 2018 report on AI ethics. In fact, AI systems have become part of our daily lives, even in critical areas such as health, mobility and education. Some very advanced Machine Learning or Deep Learning models are similar to black boxes — the input and output data is known and clear, but how the data is processed in between is unknown.

Explainability, the Foundation for Transparency

This can be in response to different needs and use cases. For example, an algorithm designer who wishes to correct or improve their model, a customer who would like to know the reasons that led to a credit refusal based on an automated decision or a publisher wishing to ensure their tool is compliant.

Various Research Approaches

As the regulatory environment becomes increasingly restrictive, this subject is all the more essential. GDPR already sets out specific transparency requirements for fully automated decisions, while a new framework is being prepared in Europe that will stipulate general requirements for risk management, transparency and explainability for the riskiest systems.

Explainability is key to AI transparency — being able to provide the right information or explanation to the right person at the right time.

In recent years, a dynamic research ecosystem has developed around the explainability of AI, resulting in the emergence of various techniques and implementation approaches. Among the most well-known are the variable-based tools Shap and LIME. LIME offers an explanation of a specific decision by analyzing its environment and establishing which variable(s) had the most impact in the final prediction.

Proof by Example

As part of Orange's research, a thesis project focuses specifically on the explainability method through counterfactual examples, a preferred method compared to the previous and sometimes unstable approach. For a given decision, this involves looking for an example as close as possible to the case studied, but one that has reached a different decision. The expert or customer themselves can then identify what the differences are between their case and another, as well as which parameters should be used in order to reach the same decision. "As part of our work, this method has been applied to a marketing use case — predicting churn (termination) and determining which variable values to modify in order to retain a customer. There are many advantages to this, including being able to provide an explanation at the same time as the decision. It is also an advantage to have an explanation that is both intelligible to a non-expert and actionable, as the actions needed to change the decision are clearly identifiable. As well as addressing the issue of trust, transparency should help people to regain control over the decisions that are impacting their lives."

In addition to providing a technical solution that supports the explainability method, the research project also includes work on ergonomics to ensure the usability of the solution and the relevance of the explanations.

https://hellofuture.orange.com/en/how-virtual-reality-is-increasing-safety-in-the-workplace/

1. Hello Future
2. Digital culture
3. How virtual reality is increasing safety in the workplace

Digital culture | Article

How virtual reality is increasing safety in the workplace

Friday 2nd of December 2022

Virtual reality is gradually being integrated into the set of tools available to companies for workplace safety training and awareness. Combining operational and cognitive benefits, it offers interesting perspectives in terms of crisis management on sensitive industrial sites.

How to increase the quality of training on good professional practices or that of crisis management practices in companies? How to improve learning while simplifying the setting up of such facilities? Combining operational and cognitive benefits, virtual reality offers many possibilities for workplace safety. Here we talk with Frederick Benaben, a teacher-researcher at the Albi École Mines-Télécom engineering school's Industrial Engineering Center and head of the joint laboratory EGCERSIS (Training for Crisis Management in Representative Environment of Sensitive Industrial Sites), about his work in the area of crisis management on sensitive sites and about the implications of virtual reality.

Repeat access procedures in nuclear facilities

What is meant by virtual reality for workplace safety?

In the field of workplace health and safety, virtual reality can make it possible to address several levels of training. The first is

that of skills, where participants are taught to handle a tool or piece of equipment bearing in mind the quality of the action. How to use a fire extinguisher for example. In the second level, procedure, we aim to teach a sequence of actions to carry out in a specific situation. The third level is that of the collaborative process, with a new sequence of actions but this time to be performed by several people together. In the fourth level we introduce uncertainty, whereas the previous three levels were completely deterministic. We add a gamemaster who can evaluate the participants' performance and adjust the scenario in real time, for example by increasing the level of difficulty (intensifying a fire, closing a door, etc.). Beyond knowledge of the action or the procedure, we call upon the players' expertise and their ability to improvise.

What is the state of the art of immersive technologies? Are they mature and affordable enough? Are companies really starting to use them?

Regarding the equipment, immersive technologies are in a maturity paradox, in the same way that computer technology was in the 1960s. At the time, a computer took up a whole room, cost hundreds of thousands of dollars, and was mainly used for calculations. As soon as its size was reduced enough to fit on a desk, its cost lowered, and office software installed, it could enter the professional realm. In the same way, virtual reality is at a crossroads. Nowadays, nobody wants to wear a 1 kilo-helmet with wires around it. The day virtual reality devices weigh as little as a pair of glasses, cost less, and offer more than 24 hours autonomy, there will be a much wider take-up. However, as far as technology maturity is concerned, I believe we have reached a more than good enough level of computing power and visual appearance for a large number of applications, including those for workplace safety.

How is virtual reality complementing the traditional training and awareness tools to which companies have access today?

Securing an electrical device before an intervention

Virtual reality is an excellent complement for training methods, be these theoretical courses or life-size exercises. It opens up many possibilities. Today, if we wish to set up a safety drill within a Seveso classified site [establishment with risks linked to the manufacturing, handling, or storing of dangerous substances, ed.], we must bring all or part of the site to a standstill and install an extremely complex setup for the participants to actually go through a realistic experience.

And from a cognitive point of view, what are the benefits of virtual reality?

Although I do not work on the cognitive side, the studies we refer to tend to show that we learn better when immersed in a 3D environment, especially in the scope of learning involving the body. The fact of living and feeling an exercise is much more efficient than that of dealing with it theoretically. They are not mutually exclusive, but users probably assimilate more when their senses are being tricked.

About ten years ago, there was a lot of talk about “serious games”. What’s the difference in the end? Is it the degree of immersion?

Both technologies share the same parentage and aim to provide a fictitious yet realistic situation. However, “serious games” call much more on the participants’ imagination as well as their ability to become engaged in the facility. Whereas, in workplace health and safety, we are not in a fun activity in which people want to become involved. The challenge is therefore to make the system sufficiently attractive to get participants’ imaginations to work and achieve a good level of involvement and uptake of the exercise. Virtual reality and immersive technologies in general don’t give you the choice. Whether you are interested or not, you are projected into the environment.

Could you present the work you are carrying out in the EGCERSIS laboratory around crisis management?

EGCERSIS is a joint research laboratory bringing together the Industrial Engineering Center and the firms Immersive Factory and Report One, which receives an ERDF (European Regional Development Fund) grant from the French Occitania region. Its ambition is to show that virtual reality is a very high performing tool for crisis management training on sensitive sites. In this context, we are developing a demonstrator that can cover up to the fourth level of training (uncertainty) and which revolves around three iterations – three different exercises – and various functionalities that we wish to provide.

Virtual reality makes it possible to collect a lot of data so as to evaluate both the players’ performance and the educational quality of the exercise.

The first exercise took place in a virtual underground station in which three players (a firefighter, a police officer, and a doctor) had to fulfil a mission. The aim was to plunge them into a realistic environment, connect them to a crisis unit providing them with instructions, and to collect data on the exercise. A second exercise took place in a 3D replica of part of the IMT Industrial Engineering Center building which we had set on fire. The exercise, which included civilians and firefighters, introduced uncertainty and variability with a player who could choose from several predefined locations where to start a fire. The third and most accomplished iteration enabled us to bring into play the following four functionalities:

- The realistic environment, with a terrorist attack simultaneously combining an arson attack in the Albi cathedral and a shooter in the Albi École des Mines.
- The gamemaster tool, a player sharing the same virtual space as the players, who is invisible and almighty.
- The crisis unit, whose players were also immersed in the virtual environment. Gathered around a 3D map augmented with data and assisted by artificial intelligence tools that suggested actions, they could make decisions and transmit information and instructions to the firefighters.
- Finally, the dashboards enabling visualization of the data on the progress of the exercise. This project won the Laval Virtual Awards 2022 in the “industry” category.

What are the essential parameters to take into account when carrying out this type of project within a company?

Learn how to handle dangerous equipment

The first question to ask is that of equipment: what to choose and when is the right time to invest? Immersive technologies are evolving fast, it is important to be cautious so as to avoid the risk of buying equipment that will be obsolete after two years. The second question: how easy is it to obtain a 3D model of my building? This stage takes time and requires a minimum of resources (2D plans, 3D scans, etc.). The crucial point is that of the double take-up by the company’s safety manager on the one hand, and by the people requiring training on the other. To maximize the chances of take-up, it is necessary to make sure the exercises are made well and that users are accompanied.

What are the most interesting perspectives offered by virtual reality in the field of safety?

We have talked about the ability of immersive technologies to copy reality, but we have not mentioned their ability to be freed from it… Imagine being projected into an environment in which spheres representing risks are floating around you. The closer they are, the more likely they are to occur. The bigger they are, the bigger the reach of their action. The redder they are, the more dangerous they are. And they also have connections… This way of representing risks is much more explicit than diagrams. The ability to provide new services relating to immersive data visualization and, especially, facilitated interaction with artificial intelligence tools that today are generally very difficult to access, are fascinating perspectives of virtual reality.

Frederick Benaben
Frederick Benaben is a teacher-researcher at the Albi IMT Mines engineering school's Industrial Engineering Center and head of the joint laboratory EGCERSIS.

IMT Mines Albi
IMT Mines Albi is the youngest of the seven Mines schools. True to the Mines model, it is a place of high-level training, scientific research and technological

https://hellofuture.orange.com/en/creating-more-efficient-and-environmentally-friendly-transport/

1. Hello Future
2. Research
3. Creating More Efficient and Environmentally Friendly Transport

Research | Article

Creating More Efficient and Environmentally Friendly Transport

Monday 17th of October 2022

Orange is teaming up with companies from different industries to develop an innovative mode of collective mobility. The goal? To turn transport time into a useful and valuable experience, which would encourage people to leave the car behind.

The “SmartShuttle” project is led by a Movin’On Lab community of interest that brings together several partner companies including Orange, Saint-Gobain and Bertolami. These companies are pooling their varied yet complementary expertise to create a mobility service for employees that encourages rest, concentration and collaborative work. Its aim is to reinvent employees’ transport time by making it more useful, which will encourage people to leave their personal or professional vehicle in the parking lot. “We need to travel better with smarter, more considered transport,” explains Alexis Offergeld, Director of Movin’On Lab. “On the SmartShuffle, travel time is no longer lost or wasted, instead, it’s time well spent working, relaxing or socializing.”

Demonstrating that transport can generate both economic value and help the environment by tackling solo car use.

The stakes are high. According to data from the CGDD (*Commissariat général au développement durable* — the French General Commissariat for Sustainable Development), transport is France’s primary source of greenhouse gas emissions and caused 29% of total emissions in 2020 (road travel alone accounted for 95% of these emissions, and more than half of that was from private cars).

Creating Value

The initiative stems from a simple observation: “Today, traveling is simply seen as the time spent getting from A to B, not as useful time,” explains Cédric Seureau, Research Program Manager at Orange. “With this project, we want to show that

traveling can be a useful activity, which generates both economic value due to its innovative collective framework and helps the environment by tackling solo car use."

The first step was taken in 2019 when Orange put forward an experimental protocol to study how users could come to understand and embrace this new type of transport. A route was set up for the Group's employees to travel between the Rennes and Lannion sites on the first prototype coach. The feedback was positive, confirming the relevance of the idea and the importance means of making travel time more valuable. The modeling of the estimated amount of greenhouse gas emissions avoided through this collective mode of transport is also encouraging.

Providing Comfort and Digital Connection

The lessons learned from this initial trial led to the coach being split into three zones according to passengers' needs: a space for people to chat, a concentration/quiet zone and a section for meetings at the rear of the vehicle. The vehicle's design incorporates three key features for users: connectivity, comfort and services. "The project is an opportunity to test two high-performance and innovative window panes, which provide an improved on-board experience," says Bénédicte Vignon, Head of Marketing & Communication at Saint-Gobain Sekurit Transport. The 4 Seasons glazing used in all the windows aims to provide optimal thermal comfort, all year round. This glazing provides better insulation and reduces the energy consumption linked to heating and air conditioning. Within the SmartShuttle, users can project documents onto a Transparent Screen, which cannot be seen by people on the other side of the wall, thus ensuring documents remain completely confidential."

The services aspect is being explored by other teams. "Professional transportation is not just about transport, it's also a matter of experience and services. So, Bertolami is working on a use case that brings together all the approaches developed in recent years," adds Benjamin Beaudet, CEO of Bertolami. "For the past year, we've been experimenting with all the features for professionals who all have different uses and needs, but who all want comfort and connectivity, as well as uses surrounding the stillness of the vehicle."

Seamless Connectivity

Finally, connectivity is “essential to make collaboration and working on board this mobile coworking space easier,” says Patrick Duclos-Montagne, R&D Engineer at Orange and co-leader of the community of interest. “Passengers’ digital experiences are supported by very high-speed connectivity, via an external antenna system combined with a router that connects to 4G and 5G networks and shares the connection inside the vehicle via Wi-Fi.”A second version of the prototype vehicle is available. The partners are already looking at other functionalities, such as acoustics, while continuing to collect data for future experiments. By making collective transport more attractive, the project is charting the course for more profitable and sustainable travel, which can optimize passengers’ journey times and reduce the use of private cars.

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https://hellofuture.orange.com/en/a-digital-twin-for-better-ocean-governance/

1. Hello Future
2. Data
3. A digital twin for better ocean governance

Data | Article

A digital twin for better ocean governance

Monday 21st of March 2022 - Updated on Wednesday 22nd of June 2022

The construction of a digital twin of the ocean, which represents a powerful tool for scientific research and operational oceanography, should help advance our knowledge and support the development of a sustainable blue economy.

“Observation networks feed and update the digital twin, which in turn can inform and optimize them, thus creating a virtuous circle.”

The European Union (EU) and the United Nations (UN) have both launched Digital Twin of the Ocean (DTO) projects to develop innovative oceanographic solutions.

Modelling possible futures for the ocean

The aim is to create a high-resolution virtual representation of the ocean or part of it by combining all available resources related to seas and oceans. The use of high-performance computing, data analysis and artificial intelligence (AI) technologies should make it possible to integrate a wide variety of data and models and to transform them into usable information with a view to providing decision support tools.

The purpose of the DTO is to provide an accurate and comprehensive description of the current state of the ocean and to help predict its evolution. It is therefore both a continuous, real-time monitoring (from the coasts to the deep sea, at the surface and at depth) and a simulation environment. It is used to create models of possible futures and to develop “what if” scenarios to analyse, for example, the influence of climate change and human activities on marine ecosystems or the impact of measures to reduce climate risks.

By pooling data and models from different sources in a single, accessible and interactive framework, it facilitates scientific collaboration, interdisciplinary approaches involving natural sciences, economics and humanities and social sciences, and the co-creation of solutions.

A digital framework for using marine information

In September 2020, the European Commission published the call for proposals entitled "Transparent and Accessible Seas and Oceans: Towards a Digital Twin of the Ocean" under the Horizon 2020 programme. This European DTO should contribute to the commitments made by the Commission in the Green Deal and the digital package to develop a very high precision digital model of the Earth (Destination Earth Initiative). The European Commission estimates that a first version should be operational by 2024.

Furthermore, the United Nations proclaimed 2021 to be the start of the Decade of the Ocean. The creation of a comprehensive digital representation of the ocean is one of the ten challenges of this resolution, which aims to help the global community implement Sustainable Development Goal 14: "to conserve and sustainably use the oceans, seas and marine resources".

In this context, the DITTO programme ("Digital Twins of the Ocean"), managed by GEOMAR, an oceanographic research centre in the German city of Kiel, aims to establish and advance a single, open, shared digital framework. Within it, modelling and simulation as well as artificial intelligence algorithms and other technologies will enable ocean professionals to visualize, manipulate and analyse all types of marine data.

Consisting of a basic digital twin, this framework will offer users (scientists, governments, the UN system and civil society) the possibility of creating their own local or thematic twins and testing their own scenarios to address specific issues, such as the impact of the increase in the number of commercial ships on the degree of acidification of an area of the ocean over a given period of time, and the effects on coral reefs.

As an initial step, several prototypes of digital twins based on use cases of interest for research and operational oceanography will be developed.

The DITTO programme is already hosting the Caspian Sea digital twin project until the end of 2027. A "Caspian Sea Data Centre" will centralize an up-to-date archive of data, hydrodynamic models, atmospheric reanalyses, electronic atlases, scientific publications, etc.

The components of the digital twin of the ocean

The construction of the DTO is based on several technological building blocks and shared data management principles.

Firstly, observation systems in the sea and space provide in situ and satellite data, and ocean models. The observation networks feed and update the digital twin, which in turn can inform and optimize them, thus creating a “virtuous circle”.

Secondly, a data infrastructure ensures open and equitable access, interconnection between ocean observatories and integration of all available data – in situ measurements from ships or autonomous systems at sea, satellite observations, historical data from several scientific disciplines, and data from industry or citizen science, etc. This infrastructure relies on high-performance computing capabilities, partly in the cloud, and a governance framework defining standards and protocols for data exchange. This infrastructure relies on high-performance computing capabilities (partly in the cloud) and on a governance framework defining the standards and protocols for data exchange.

The DTO also integrates predictive analysis and modelling tools, based on AI and machine learning, to process data and test different scenarios. Finally, an interface allows users to view, interact with and customize the data and models according to their requirements.

The future European DTO will therefore have to be compatible with the current EU ocean observation capabilities (Eurofleets+ research vessels, EuroArgo autonomous systems, etc.) and the marine data, modelling and forecasting infrastructures built by the Member States. The latter are mainly based on the European Marine Observation and Data Network EMODNet and the Copernicus Marine Service (CMEMS).

It should also allow the implementation of standardized data, respecting principles recognised by the EU such as the FAIR principles (findable, accessible, interoperable and reusable).

The digital twin of the ocean is helping to improve our knowledge of the sea and our ability to monitor it on a continuous basis. It allows us to forecast its evolution and manage its resources in a sustainable way, by providing a unique framework facilitating international and scientific collaboration. It is a unique future governance tool for this vast area of the planet that is crucial in terms of climate, economy, biodiversity and food.

https://hellofuture.orange.com/en/the-digital-workplace-is-standardizing-collaborative-working-practices/

1. Hello Future
2. Digital culture
3. The digital workplace is standardizing collaborative working practices

Digital culture | Article

The digital workplace is standardizing collaborative working practices

Friday 15th of April 2022 - Updated on Thursday 16th of June 2022

The growth of teleworking, accelerated by the health crisis, has led an increasing number of companies to set to work on managerial and organizational restructuring. The integrated digital workplace they are acquiring brings together all the tools for remote collaboration.

The health crisis linked to the COVID-19 pandemic has drastically accelerated the uptake of the “digital workplace” concept, a unified working environment that, according to the definition provided by research company Markess by exægis, enables “staff to access applications that are useful in everyday work, to communicate, collaborate, and manage knowledge”.

During the first lockdown of spring 2020, for want of a better solution, many companies turned to disparate solutions to set up widespread teleworking. Videoconferencing solutions thus saw triple-digit growth.

In a hybrid working organization, the digital workplace makes it possible to provide a seamless employee experience.

Two years later and it is time to streamline. Rather than pile tools on top of one another, organizations want to acquire a platform that brings together all the features of remote working: videoconferencing of course, but also business telephony, instant messaging, shared calendar, file-sharing, collaborative document editing, and project management.

Increasing productivity, reinforcing security

The aim of this integrated workplace is to standardize collaborative working practices in the hope of increasing team productivity. It reinforces collaborative tool security by providing a single gateway.

In a hybrid working organization, the “digital workplace” makes it possible to provide a seamless employee experience by guaranteeing a continuum of work. At home and in the office, employees have access to the same tools and data sources on their computer or in the connected meeting room.

For the time being, this digital workplace is mainly the privilege of large companies and organizations that are mature in terms of the uptake of new collaborative working practices. During the first quarter 2021, only 39 % of decision-makers surveyed by Arctus in their latest observatory had access to a complete internal digital space including “information and communication, collaborative, and social functionalities”.

A market of 2 billion euros in 2023

This market is profiting from a favorable context. According to Markess by exægis, it is expected to have sustainable growth of 5 % per year in France, reaching 2 billion euros in 2023. This market is attracting a variety of players. Alongside Microsoft and Google, who dominate the segment with their collaborative suites Microsoft 365 and Workspace (former G Suite), feature historical intranet and social networking specialists such as Jalios, Jamespot, Talkspirit, or Whaller. By giving a collaborative glaze to their offerings, these French software companies are playing the national sovereignty card against the American digital giants.

Other providers in this marketplace come from workstation virtualization (Citrix, VMware), unified communications (Mitel, Alcatel-Lucent Enterprise), videoconferencing (Zoom, Cisco WebEx), team messaging (Slack), cloud document management (Dropbox, Box), or visual collaboration (Klaxoon, Mural, Miro).

Starting off from its historical position, each player is enhancing its offer so as to keep the promise of a unique window for employees to open in the morning and close only at the end of the day. Videoconferencing specialist Zoom has, for example, enriched its offer with screen-sharing and whiteboard functionalities.

Telecoms operators also hold a key role. The digital workplace can only exist if it is based on robust networks. Indeed, workers must have access to continuous and secure connectivity to be able to work from any place, at any time.

For it to happen, change must be accompanied

A digital workplace is however not just a matter of tools. It is not enough to simply provide users with a platform in order for them to take it up and give up their old habits. In answer to the question “What are the main communication and collaboration tools with your colleagues?”, 60 % of French employees replied

“email”, according to the latest “State of the art of the internal transformation of organizations” by Lecko consulting firm.

Then follow personal cell phones (43 %), business messaging (36 %), videoconferencing (29 %), instant messaging (24 %), or collaborative spaces (19 %). The digital workplace only comes in seventh position with 7 % of responses.

Evolving management practices

A structuring project affecting even the organization of work, the deployment of a digital workplace must be accompanied by a change management program. It is a matter of creating awareness of good collaborative practices and recalling in which situations to use email, chat, audio call, or videoconferencing.

Management practices must evolve hand in hand with digital practices. Indeed, it is up to the manager to set an example by coediting a document online rather than making changes in an avalanche of emails. It is also for middle management to define collaborative practices. Used badly, a digital workplace can produce the opposite effects to those aimed for. “Videoconferencing has increased the number of meetings and the time spent in meetings but without increasing team efficiency, quite the opposite, Lecko warns. Infobesity keeps on growing to the detriment of productivity.” As for continuous connection, it “increases working time and creates work fatigue in the long term”.

https://hellofuture.orange.com/en/air-quality-the-challenge-of-data-interoperability/

1. Hello Future
2. Internet of things
3. Air quality: the challenge of data interoperability

Internet of things | Article

Air quality: the challenge of data interoperability

Wednesday 29th of June 2022

Air quality is important for several reasons. For measuring it, smart micro-sensors are on the increase. However, this technique has stumbled at the lack of a common format for data exchange.

The composition of ambient air is a health and climate issue. The recent travel restrictions have brought the question of indoor air quality to the forefront. New technologies can provide some answers to the questions raised by this public health issue.
The general public is familiar with smart devices for measuring air quality in the home, such as the Netatmo weather station or the Temtop and Airthings monitors (Wave Plus). On top of carbon dioxide levels, they can analyze fine particles and chemicals in the air. On its website, startup IQAir, which offers professional versions of this type of equipment (AirVisual Enterprise), explains the improvements in wellbeing in the workplace and in productivity that can result from the control of air quality: “it has been proven that bad ventilation (high levels of carbon dioxide) changes cognitive ability and decision-making, and can cause headaches as well as fatigue”.
These measurement tools can be paired with professional air cleaners (NatéoSanté, JVD or Pureaéro, for example), the aim of which is to combat polluting particles, allergens, bacteria, and viruses.
As for the Flow sensor by Plume Labs, it offers to measure outdoor air quality and, depending on the ambient level of exposure to pollution, provide a real-time recommendation of a better itinerary to places where the air is purer. Via a crowdsourcing system similar to mobility applications such as Waze, this type of sensor gathers and consolidates data from voluntary contributors. Plume Labs are thus mapping atmospheric pollution across the globe.

Smart cities at the forefront

On the scale of a city or local community, air quality measurement can be one of the benefits of the smart city, with a real-time dimension. The city of Grenoble communicates on the air quality tracking system that has been set up in daycare centers and schools and publishes the monitoring results for each institution.

The city of Angers' is to regulate urban traffic using real-time analysis of air quality and traffic.

Concerning the outdoors, Air Pays de Loire, part of the "Société d'aménagement de la métropole Ouest Atlantique" (Samoa, the West Atlantic metropolis urban planning company), launched an experiment on the Island of Nantes in May 2022 that is to last for five months. A connected billboard for motorists live streams the air quality index – from good to extremely bad – and offers alternatives for using cars differently or for changing mode of transport. Another billboard is for cyclists. Depending on the air quality, it suggests one of three possible routes.
Presented as a world first, the city of Angers' "5G Green Mobility" project, as press agency API explains, is to enable regulation of traffic in urban areas thanks to the real-time analysis of air quality and traffic.
With a budget of 4.8 million euros, over half of which comes from state subsidies in the scope of the France Relance program, this work brings together Toulouse startup WaltR, telecoms operator Alsatis, and the Nantes Lacroix group, an Internet of Things (IoT) specialist.
The system proposed calls upon "spectral cameras that detect and evaluate air pollution in high resolution and a private 5G microcell network that gathers data such as greenhouse gas emission rates or meteorological variables". As for the IoT infrastructure, it tracks "data coming from vehicles, peaks in traffic, and the types of road signaling in place so as to offer micromanagement of road traffic in real time".
The private 5G network for the Angers smart city is planned for the first half of 2022 . Integration of the first pollution measurement sensors is to follow in the summer and the platform should be up and running by the end of 2023.

Protocols and interoperability

The smart microsensors used by individuals, cities, or businesses have a downside. Due to a lack of shared protocols, they do not offer a single data format, which would make it possible to transform and aggregate this data as well as make these devices interoperable.
"Smart microsensors are not yet mature enough at the metrological level for them to be used for regulatory supervision", says Pierre Pernot, communications manager of Airparif, a body approved by the public authorities for monitoring air quality in the Île-de-France region. "The results on air quality should not depend on the equipment."

On the contrary, Airparif and other approved bodies use the same rules for data collection, storage, and aggregation. “Although we use various brands of sensor, we measure air quality in the same way in Dunkirk as in Paris.”
Airparif has roughly seventy measurement stations, of which around fifty are permanent. True static mini laboratories, they enable continuous measurement of a large number of pollutants. However, this automatic analysis is not possible for some of them, like polycyclic aromatic hydrocarbons (PAH). Collection is performed using a filter or diffusion tube for “posteriori” analysis in a laboratory.
In the case of automatic collection, the data is sent to the Airparif headquarters via a broadband link. “There are no volume or real-time dimension issues, which would require the use of 5G, Pierre Pernot states. If it was necessary to instantly compare data with large traffic streams, that would make sense.”
Collection takes place every hour except during pollution peaks when frequency is every quarter of an hour. The data are saved and put into a database. Before studying these data, the association ensures they are valid. “A technical operation on a station could cause incorrect measurement for example”. Airparif uses XR, the environmental data gathering, processing, and reporting software published by ENVEA.

A microsensor challenge

Despite their lack of interoperability, Pierre Pernot believes that smart microsensors constitute a tool for raising public awareness of the current stakes. “This reduces the distance between the citizen and public stakeholders.”
The game could evolve positively. In 2020, the French National Institute for Industrial Environment and Risks (Ineris) and the French National Laboratory of Metrology and Testing (LNE) created the CIE association (Instrumentation certification for the environment) so as to establish an Air Quality Sensor certification for sensor systems measuring outdoor air quality. A standard is also being developed at the European level.
In the meantime, Airparif is carrying out monitoring and technical integration work on market solutions. Via its Airlab Solutions cell, the association organizes a microsensor challenge every two years. It tests manufacturers’ devices in real conditions and publishes the results, highlighting the advantages and limits of each model. The next edition of this comparator will take place in 2023 in France and in Thailand.

The issue of data rendering

Beyond the question of interoperability, the processing of microsensor data poses two questions. Unlike permanent or semi-permanent stations, these sensors are ever more mobile. “It is therefore necessary to geolocate the data, work on trajectories, and use correction systems”, Pierre Pernot specifies. And what about the carbon footprint linked to data collection and storage if the number of smart measurement objects is to increase exponentially?

Finally, the last element to be considered: data rendering. Since 2018, Airparif has offered the data produced as open data for economic players and data scientists. For these data to be understandable by the general public they must, however, be formatted and contextualized (regulatory thresholds, limit values, history).

Thus put into perspective, the data can be published by the media and local authorities, in particular via billboards. On its website, Airparif provides a map of the pollution in the Île-de-France region, with a resolution of around 10 m for Paris, 25 m for the inner suburbs, and 50 m for the outer suburbs.

In France, on a national scale, Ineris publishes Geod’air online, an interactive map to track the real-time evolution of different pollutants (ozone, carbon monoxide, nitrogen dioxide, particulate matter, sulfur dioxide). As for Prev’Air, another Ineris website, this produces forecasts.

https://hellofuture.orange.com/en/automi-automates-large-scale-visual-inspections/

1. Hello Future
2. Internet of things
3. Automi Automates Large-Scale Visual Inspections

Internet of things | Article

Automi Automates Large-Scale Visual Inspections

Wednesday 14th of September 2022

Factory task automation at the heart of production processes has never been easier. In partnership with Orange, Automi demonstrates how this is done at Sido 2022.

You might not think it, but 70% of factory tasks are still performed manually and 90% of them involve a visual component. The majority of these control and monitoring tasks do not often add value for operators and could be automated most of the time. However, until now machine vision technologies have been complex and costly to implement. Automi, a startup co-founded in 2021 by Galem Kayo, has devised a solution that now opens the way for large-scale automation of visual inspections thanks to artificial intelligence.

A Visual Inspection Automation Platform

“We’ve chosen a ‘no code’ approach,” says Galem Kayo. “We give operators access to artificial intelligence through digital tools that are very easy to use. This means they can train their own robot without having to write a single line of code.” For example, to train a quality control algorithm, the platform uses images of non-compliant parts. The operator circles their defects, as if using a sheet of paper, and adds a descriptive label to distinguish them. The robot gradually learns to recognize all faults automatically. “One of our customers, an aircraft part manufacturer, checks an additional 3 million parts every year, without hiring or training any operators.”

One of our customers, an aircraft part manufacturer, checks an additional 3 million parts every year, without hiring or training any operators.

Automi also helps to automate production line performance levels. A leading European baker uses the platform to assess production pace in real time. The trained algorithm measures the production output and raises the alarm if it detects any anomalies, increases or decreases. It is an effective way to produce the right amount without generating waste.

5G and Edge Computing: The Ideal Combination

Automi processes large volumes of data (mostly high-resolution images) that need to be transferred via broadband with high bandwidth and no latency to allow decisions to be made instantly. 5G comes into its own here, as it makes it easier to process mass data in real time.

Similarly, to train and guide its robots, the startup is interested in edge computing — decentralized cloud technology that can process large volumes of data with low latency, thanks to how close the computing power is to the customer's installations. "We currently work from embedded computing systems on our customers' premises, which forces us to manage the configuration and maintenance of these devices. In future, we will process data locally, at the edge of the network — a solution that should save us time and reduce costs." Edge computing is also a real asset in providing tailored solutions for industrial customers who consider privacy and data protection to be essential prerequisites. These manufacturers prefer to have their data processed as close as possible to its source, on their sites.

Urgent Needs in All Sectors

It's clear that there is a great need for this. In barely a year, Automi has already reached double digits for the number of pilot projects that it has converted into sustainable devices in the aeronautical, automotive, food processing, textile and pharmaceutical industries, etc. Its accessible solution quickly becomes operational in all companies that need to increase their throughput and improve their performance but struggle to recruit and retain operators.

https://hellofuture.orange.com/en/earthquake-alerts-a-convolutional-neural-network-is-monitoring-the-earths-gravity-field/

1. Hello Future
2. Artificial intelligence
3. Earthquake alerts: a convolutional neural network is monitoring the Earth's gravity field

Artificial intelligence | Article

Earthquake alerts: a convolutional neural network is monitoring the Earth's gravity field

Friday 25th of November 2022 - Updated on Monday 28th of November 2022

In the current state of seismology, it is impossible to predict when an earthquake will happen. However, artificial intelligence (AI) can help to be better prepared and to limit the damage caused by these destructive phenomena. Seismologists have recently discovered a field of application for AI by giving it the objective of helping seismic risk prevention to make progress. Researchers from the IRD (French National Research Institute for Sustainable Development), in the Géoazur laboratory, and from the Kyoto University DPRI are developing a deep learning algorithm using gravitational waves to estimate the magnitude of great earthquakes (magnitude greater than 8) faster and more accurately. This work was the subject of a publication in the journal "Nature" in May 2022. Explanations with Quentin Bletery, a geophysicist and co-author of the study.

Where are we up to in terms of seismic forecasting? Is it possible to "predict" an earthquake?

Quentin Bletery: No, today we do not have access to a way of forecasting an earthquake. Efforts are being focused more on earthquake alerts, which aim to detect an earthquake as early as possible, locate it, estimate its magnitude, and inform the authorities and population. When an earthquake happens, there is a short window of time – around several seconds for seismic alerts and between thirty minutes and two hours in general for a tsunami –, during which a certain number of measures can be put in place.

How do current alert systems work? What are their limits?

Q.B.: Seismic waves travel at a speed of several kilometers per second (6.5 km per second for P waves), whereas telecommunications are transmitted at the speed of light. Therefore, a sensor placed near the epicenter of an earthquake can potentially record signals and transmit them to a control center before the population feels the first tremors. This information is analyzed and makes it possible, when necessary, to identify a radius inside which people will receive an alert (by SMS, for example). These relatively recent systems have two limits. The first is that they are not fast enough: they do not leave enough time to react (only a few seconds) because seismic waves still travel very fast. The second limit is that they do not provide reliable information on the magnitude of very big earthquakes. For instrumental and fundamental reasons (it's impossible to have knowledge of the evolution of an earthquake before it is over, for example), estimates generally saturate around magnitude 7. For a magnitude 9 earthquake, a standard alert system will produce an estimate of 7.

You explain that this causes a problem for estimating tsunamis…

Q.B.: Yes, because the size of the tsunami will depend on the magnitude of the earthquake. However, magnitude is a logarithmic scale, which means that a magnitude 9 earthquake is thirty times greater than a magnitude 8 earthquake. For a tsunami, that means thirty times more water displaced with a wave that can be ten times bigger and therefore have much more devastating effects on the coast. The objective of the algorithm we are developing is to improve tsunami and earthquake alert systems based on a new signal that precedes seismic waves and that is more sensitive to very great magnitudes.

Could you describe how this algorithm works and how it was trained?

Q.B.: It's a CNN – a convolutional neural network. It is based on signals that were identified very recently called PEGS for "Prompt Elasto-Gravity Signals". When a major earthquake takes place, a large mass of rock moves suddenly. During the Tōhoku earthquake in Japan in 2011, an area 200 km by 500 km moved several meters. The movement of this huge mass of rock generates a disturbance to the Earth's gravity field that seismometers are able to measure. This disturbance is very weak, but it travels instantly, at the speed of light. What's more, we noticed that PEGS are much more sensitive to high magnitudes than seismic waves, which makes it possible to solve the saturation problem of current alert systems. The

algorithm was trained using synthetic data (we simulated hundreds of thousands of possible earthquake scenarios) to which real noise from seismological stations was added. A seismogram is never flat; there are always oscillations because the Earth is constantly moving. We therefore had to add this noise to put the algorithm in plausible configurations. Using this entry data, the algorithm was trained to produce an estimate in real time of the magnitude and location of an ongoing earthquake.

The low amplitude of PEGS makes them difficult to detect and therefore exploit. How has your algorithm made it possible to overcome this difficulty?

Q.B.: There are other methods of detecting PEGS, but one of the advantages of AI is to be able to rapidly extract signals that are drowned out in noise. When an earthquake happens, the algorithm retrieves the signals emitted – which are very weak but are present on all seismometers –, extracts them from the noise and associates them with a magnitude.

How could this tool be integrated into the current seismological network?

Q.B.: We are working on integrating it into a new earthquake alert system under construction in Peru. This system is based on another algorithm developed in the Géoazur laboratory in partnership with the Geophysical Institute of Peru (IGP), which should be efficient and very fast for earthquakes with a magnitude lower than 7. However, we believe that it will not work so well for earthquakes with a higher magnitude for the reasons previously given. We are therefore trying to implement the algorithm in this system so it will trigger when the first algorithm detects an earthquake that is potentially greater than 7, so as to refine the estimate, especially that of a tsunami. Concretely, the data are collected in real time and fed into our algorithm, which produces an estimate every second.

What perspectives does AI offer to earthquake and tsunami forecasting and prevention?

Q.B.: There are many! For example, the European EARLI project uses AI to detect low amplitude signals and examine the possibility of predicting earthquakes. It is made up of two parts. The first consists in setting up an early warning system based on PEGS, using the algorithm published in “Nature”. The second more exploratory part seeks to develop an AI algorithm capable of detecting even earlier signals that precede the triggering of great earthquakes. Many researchers have tried to analyze seismograms recorded before a great earthquake to attempt to identify earl warning

signals. Unfortunately, all attempts have been in vain, undoubtedly due to the lack of data on great earthquakes. It is possible that there is no early warning signal. But if such a signal does exist, AI probably has the best chance of identifying it.

Quentin Bletery

Quentin Bletery is an IRD researcher within the Géoazur laboratory's earthquake team at the Université Côte d'Azur Earth sciences department.

French National Research Institute for Sustainable Development (IRD)

IRD is a French public science and technology establishment (EPST). The IRD operates under the joint authority of the French Ministry for Higher Education, Research and Innovation and the French Ministry for Europe and Foreign Affairs.

Kyoto University Disaster Prevention Research Institute

Attached to Kyoto University, the DPRI's current priorities include enhancing the fundamental understanding of natural hazards, development of integrated methodologies for disaster reduction and the education of students in related fields.