SCIENCE FOR MOBILITY
Have you ever stopped to add up just how much time you spend commuting over the course of a year? What about the last time you were stuck in bumper-to-bumper holiday traffic? For better or for worse, the need to get from one place to another is a fact of life. But imagine what mobility would be like without all of the congestion, inefficiencies, accidents, environmental impacts, and expense!

By 2050 around 70% of the world’s people will live in cities. Population growth could add another 2.5 billion people to already-crowded urban areas. And urbanization has some major consequences on the transportation of both people and goods. Given the growth of e-commerce, urban freight traffic will continue to rise steadily. The World Health Organization estimates that ambient air pollution causes 4.2 million premature deaths every year. Awareness of the health impacts of air pollution (and exposure to fine particles) is growing—and transportation is a significant contributor. In fact, road transportation exhaust is responsible for up to 50% of particulate emissions in OECD countries. Population growth, urbanization, and the climate crisis have made transportation the target of increasingly stringent regulations to curb greenhouse gas emissions and are spurring cities to come up with infrastructure models that encourage new behaviors and improve city dwellers’ lives.

The transportation industry is now facing three major challenges. First, the regulatory landscape is forcing automotive manufacturers to deliver affordable, environmentally-friendly vehicles, which means costly investment in electric and other alternative powertrain (plug-in hybrid, fuel-cell) technologies. At the same time, consumers’ appetite for new technology—connectivity and automation—is virtually insatiable. Finally, digital technology is enabling new kinds of mobility services like shared mobility, on-demand mobility, and app-based mobility-as-a-service. These challenges are creating new opportunities in the form of new markets. Other markets are consolidating: Conventional automotive OEMs are forming alliances to increase synergies, protect their margins, and innovate. To stay ahead, today’s major market players will need to seize emerging opportunities, bring disruption, and be flexible enough to rapidly adapt their business models. One winning strategy is to invest in R&D and innovation partnerships with the capacity to substantially shorten time to market.

CEA is a leading government research organization with programs spanning low-carbon energy, technology research for industry, and basic research in the physical and life sciences. CEA’s 16,000 research scientists and engineers cover a broad range of disciplines, taking a multidisciplinary approach to developing technologies capable of addressing major societal challenges. The transportation industry is crucial to global economic development and job creation.

CEA researchers are developing key enabling technologies that will make tomorrow’s mobility safe, sustainable, connected, autonomous, shared, and accessible to everyone. CEA leverages collaborations with key players across the transportation value chain, from materials suppliers, component manufacturers, and systems integrators to public transportation operators, electric utilities and energy companies, the digital technology industry, and policy makers. Our researchers successfully bridge the gap between research and industry with world-class R&D facilities staffed by experts with proven experience transferring new technologies to industrial-scale manufacturing facilities. We are addressing tomorrow’s mobility challenges through programs targeting:

- **Green mobility**: innovative materials, solid-state batteries, fuel cells, low-carbon energies, battery management systems, lifecycle management, material recycling...
- **Smart mobility**: connectivity, human-machine interfaces, head-up displays, innovative sensors, sensor fusion, new computing architectures and vehicle information systems to support artificial intelligence, deep neural network design and deployment...
- **Shared mobility**: data intelligence, in-car monitoring, navigation and positioning, augmented reality, predictive maintenance...

Come and meet with our experts at CES 2020 in Las Vegas to learn more about how CEA is effectively contributing to the environmental, social, technological, and economic transformations that will shape the future of mobility.

Yann GALLAIS
Mobility program manager, CEA
CES 2020 : An unprecedented performance for artificial intelligence technologies from the CEA-Valeo joint laboratory: "Deep Perception"

"These innovations are embedded in Valeo's Cruise4U and Drive4U demonstrators.

Ground transportation of the future is the subject of numerous partnerships between academic research and Industry, with the CEA and Valeo at the forefront with a partnership on artificial intelligence applied to vision.

The CEA List's DeepManta technology, a deep learning-based multitasking algorithm adapted to Valeo's fisheye Surround View cameras, now makes it possible to detect and locate vehicles and pedestrians in 3D. Deep Manta also identifies the navigable space for autonomous vehicle in order to plan their trajectory, by distinguishing the road from obstacles.

The main differentiator of DeepManta is its sobriety in terms of computing power, thanks to a unique multitasking neural network and an optimized architecture using the N2D2 platform, developed by the CEA List.

Today Deep Manta runs on an embedded hardware target at 30 frames per second. Integrated in Valeo's Drive4U and Cruise4U demonstrators, CEA List's DeepManta technology provides state-of-the-art detection performance and computation time ».

ANTOINE LAFAY
Driving Assistance Research Director – CDA Bus Group Valeo
The CEA is a French public research organization, working in four main areas: energy transition (nuclear and renewable), digital transformation for industry, future health technologies, defence and security. Based on an excellent fundamental research, the CEA participates in the organization of cooperation projects with a wide range of academic and industrial partners. It also carries out sovereign missions, entrusted by the French State. The CEA is the only French research organization in the Top 100 of the innovation players in the world, according to the Clarivate ranking (2018) and the leading research organization filing patents in France and Europe.

With its 20,000 employees and its research centers with impressive infrastructures, the CEA is a major player in European research and is strengthening its international presence where it supports the deployment of French innovative companies.

**TECHNOLOGICAL EXPERTISE**

The CEA has a key role in transferring scientific knowledge and innovation from research to industry. This high-level technological research is carried out in particular in electronic and integrated systems, from micro to nanoscale. It has a wide range of industrial applications in the fields of transport, health, safety and telecommunications, contributing to the creation of high-quality and competitive products.

For more information: [www.cea.fr/english](http://www.cea.fr/english)
The CEA has been creating tech startups for more than 20 years.
CEA STARTUPS POLICY

CREATING SUCCESSFUL, LONG-LASTING STARTUPS TO BRING OUR TECHNOLOGIES TO THE MARKET IS ONE OF OUR CORE MISSIONS.

For more than 20 years the CEA has pursued an active startup policy that has earned the organization recognition for its support for new tech companies. Today, startups—the right choice for disruptive, high-risk technologies that address emerging market segments—are a key pillar of the CEA’s technology transfer strategy.

Most CEA startups bring hardware (microelectronics and integrated systems) and/or software (artificial intelligence) to the energy, medtech, digital technology, cybersecurity, cleantech and biotech markets.

And CEA startups play a key role in developing new industries. One particularly noteworthy example is the development of the silicon-on-insulator (SOI) industry by Soitec, a CEA startup that is now a publicly-traded company that employs some 1,200 people. The company’s SOI substrate, which was initially developed in CEA labs, is well on its way to becoming the standard for IoT.

The CEA can also serve as a valuable accelerator for tech startups, especially in the early stages of their development. For growth-stage startups, the CEA can become a long-term partner, providing a broad palette of technical services (access to R&D platforms), innovation services (intellectual property/patents, strategic marketing, and market intelligence), and a vast network of industrial companies and financers from the public and private sectors.

In 2017, the CEA and Amundi founded Supernova Invest, which manages a total portfolio of €250 million in support of startups from bootstrapping through to venture capital.
DEMONSTRATORS
Artificial intelligence is gradually making inroads into many of the technologies people use every day. This spread of AI has brought with it new risks. Hackers are now coming up with techniques that take advantage of some of the most vulnerable aspects of deep learning models to alter the system’s decisions. Ultimately, hackers could target systems using AI-based sound or image recognition models, which could negatively impact their security. While it is still very tough to come up with attacks that are both robust and undetectable, hackers are getting better every day, and it gradually becomes possible to produce attacks using disturbances that are simultaneously difficult to detect for humans and effective in various real world contexts, e.g. variations of the scene luminosity or sound reverberation in the environment.

CEA researchers explored the latest theories on how neural networks function to come up with security technologies capable of protecting AI against these emerging threats. Our demonstrator uses vision and speech recognition systems to show just how powerful attacks on neural networks can be—and just how effective our technology is at protecting systems against these attacks.

WHAT IS AI VS WILD?

Artificial intelligence is gradually making inroads into many of the technologies people use every day. This spread of AI has brought with it new risks. Hackers are now coming up with techniques that take advantage of some of the most vulnerable aspects of deep learning models to alter the system’s decisions. Ultimately, hackers could target systems using AI-based sound or image recognition models, which could negatively impact their security. While it is still very tough to come up with attacks that are both robust and undetectable, hackers are getting better every day, and it gradually becomes possible to produce attacks using disturbances that are simultaneously difficult to detect for humans and effective in various real world contexts, e.g. variations of the scene luminosity or sound reverberation in the environment.

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AI VS WILD @ CES 2020

How easy do you think it is to tell whether or not a sound or image has been altered to “trick” an AI?

Our interactive animations will give you a better understanding of how neural networks function, their current weaknesses, and how to effectively protect them against attacks.
Artificial intelligence is gradually making inroads into many of the technologies people use every day. This spread of AI has brought with it new risks. Hackers are now coming up with techniques that take advantage of some of the most vulnerable aspects of deep learning models to alter the system’s decisions. Ultimately, hackers could target systems using AI-based sound or image recognition models, which could negatively impact their security. While it is still very tough to come up with attacks that are both robust and undetectable, hackers are getting better every day, and it gradually becomes possible to produce attacks using disturbances that are simultaneously difficult to detect for humans and effective in various real-world contexts, e.g., variations of the scene luminosity or sound reverberation in the environment.

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**WHAT’S NEW?**

This technique is based on a defense strategy that allows AI to function more robustly in adverse conditions. It is particularly effective against hackers that utilize “noise” to “trick” an AI into making a wrong decision, or even worse, a maliciously chosen decision. This technology is the first, which relies on strong theoretical guarantees. Practically, this means that the precision/robustness compromise of the defense strategy can be precisely chosen to fit application needs.

While the initial objects do appear very similar to humans, the disturbance introduced takes advantage of certain disorganized aspects of the neural network’s decision-making process, leading to an incorrect perception of the model.

While the initial objects do appear very similar to humans, the disturbance introduced takes advantage of certain disorganized aspects of the neural network’s decision-making process, leading to an incorrect perception of the model.

**APPLICATIONS**

- Background noise recognition
- Speaker recognition
- Speech transcription
- Signage recognition
- Artificial vision
- Anomaly detection

**KEY FIGURES**

- 100% of neural networks are vulnerable to attacks
- 100% error rate in the event of a targeted attack
- 3,000+ scientific publications on adversarial attacks since 2015

**WHAT’S NEXT?**

Developments are currently underway to:

- Simplify the integration and implementation of the technology by the customer
- Leverage the unique features of certain applications to strike the best possible balance between precision and robustness
- Make the theoretical results that guarantee the effectiveness of this type of defense more reliable
- Adapt the technology to specific applications like signage recognition and voice assistants

**AI VS WILD & MOBILITY**

AI is a major driver of transformation in transportation and mobility. Yet, for AI to be widely adopted, autonomous vehicles must be able to guarantee robust operations even when under attacks. Besides AI applies to much more than just driving—AI must be able to offer a sufficient degree of security in all of the areas in which it will affect mobility. These include embedded transportation services, personal safety, smart city solutions, and any other services likely to use customer data.

**PUBLICATION:**


**INTERESTED IN THIS TECHNOLOGY?**

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For over ten years, CEA teams have been developing and implementing advanced reasoning methods to perform software analysis. Born to keep up with the demanding requirements of safety-critical control systems, these technologies carry out complex verifications over both source and binary codes.

Our approach was initially focused on providing strong guarantees towards the resilience of critical software components against cyber-attacks, while automating a large part of the tedious tasks of cybersecurity audits.

Our technologies are now sufficiently mature to consider moving beyond critical embedded systems, towards large-scale digital systems with extended applications covering the entire supply chain. Such tools provide unprecedented assistance to software developers and integrators across all industries, enabling them to consistently deliver high-assurance bulletproof systems.

WHAT IS DEEPRED?

DEEPRED @ CES 2020

Through a digital game, you will be invited to carry out powerful attacks on an IT system, or chose to defend its assets. Will you find attack paths? Will you overcome them and secure your system.

This experience will raise your understanding of cybersecurity threats, and illustrate the need for next-generation digital assessment tools.
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**WHAT’S NEW?**

Binsec and Frama-C are innovative software analysis platforms that leverage the latest advances in symbolic reasoning.
- Using evolved value analyses guarantee the absence of common vulnerabilities such as buffer overflows or invalid pointers.
- Symbolic reasoning and functional verifications formally ensure that implementations conform to a clean-cut security model.
- Code generated with runtime monitors surveys the flows of complex data manipulations and checks for unwelcome interferences.

**APPLICATIONS**

Cyber-attacks largely rely on software exploits. Digital trust is now a cornerstone of business requirements and normative compliance in many fields such as finance, cloud services, industrial systems, and healthcare devices.

**KEY FIGURES**
- 40-person team
- 30m.yr investment in tooling and infrastructure
- Expertise contracts starting at 300k€
- Bespoke digital tooling 1.2 M€/year

**WHAT’S NEXT?**

We’re looking for partners interested in:
- The design of tomorrow’s secure software components
- Emerging challenges in supply-chain issues for digital systems
- Next-generation software assessment, evaluation, and auditing processes

We will provide the tools and reasoning expertise, and relentlessly work to apply them towards your goals.

**DEEPRED & MOBILITY**

Software performs a large amount of functions in modern mobility systems: from communications to entertainment, to drive-by-wire and autonomous decision-making. DeepRed shows how these complex digital environments and their supply chains are difficult to secure without extremely powerful reasoning capabilities, backing the industry’s cybersecurity experts.

**PUBLICATIONS**
- Arnaud Ebalard, Patricia Mouy, and Ryad Benadjila, "Journey to a RTE-free X.509 parser", SSTIC (2019)

**INTERESTED IN THIS TECHNOLOGY?**

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Kiwee is a car sharing system that brings compact electric passenger vehicles to users either at dedicated pickup points or on a free-floating basis. Vehicles parked at a pickup point can be stacked like shopping carts and towed train-style for easy delivery by road to the pickup points where they are needed. A trained operator does the delivering; users drive individual cars only.

Kiwee is ideal for users in downtown and suburban areas seeking a non-polluting “first mile/last mile” solution for their public transportation or carpooling journeys. Kiwee is also suitable for other mobility needs, such as at airports or industrial facilities.

Because the vehicles can be stacked and towed, a single operator can deliver an entire “train” of vehicles, ensuring that pickup points are always fully stocked. Kiwee can deliver availability rates of 90% for high service quality.

The system was co-designed by Liten with the cooperation of List, CEA institutes, and other European partners (under the H2020 EC Research Program).
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**WHAT’S NEW?**

Kiwee’s main innovation is stackability. Up to eight vehicles can be stacked to form a road train. This has several benefits:
- A single trained operator can drive and deliver an entire train of vehicles
- All vehicles in a train can be charged at a single charging point at the pickup point
- A streamlined business model
- A smaller carbon footprint
- More efficient use of space in city centers

Users also benefit:
- High availability at all pickup points
- A guaranteed parking spot at pickup points
- On-demand delivery for free-floating scenarios

**KIWEE & MOBILITY**

The Kiwee mobility concept is a clean alternative to the individually-owned vehicle in urban and suburban areas, where it can help reduce pollution and traffic congestion while:
- Providing “first-mile/last-mile” transportation between public transportation networks and users’ homes or places of work
- Increasing transportation services in areas with low coverage by other modes of transportation
- Offering a solution for activities that currently require individual vehicles, such as shopping or picking up parcels

**APPLICATIONS**

- Commutes
- In-town driving (shopping, postal/delivery)
- On-site mobility (industrial facilities, tourist attractions, theme parks)
- Airport parking-lot-to-terminal transportation
- “Last mile” service for public transportation users in suburban areas

**KEY FIGURES:**

- 10 patents
- 3 successful test rollouts in France, Scotland and Spain
- 100 European cities in the target market
- > 5,000 vehicles/year
- At least 30 minutes: the estimated amount of time saved by users compared to public transportation alone for suburban destinations

**WHAT’S NEXT?**

- Two test rollouts (Greater Lyon, France, with 1.4 million inhabitants) in 2019 and 2020
- Representative-scale rollout under development for “Chemical Valley” (a 500-hectare chemical industry park south of Lyon, France) in 2022
- Startup to manufacture and commercialize the Kiwee system

**INTERESTED IN THIS TECHNOLOGY?**

Valery Cervantes
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Thanks to its extra-wide field of view and compact footprint, CEA-Leti’s lensfree imaging allows healthcare professionals to perform point-of-care tests that previously were done in the lab.

In addition, the technology is more than 10 times less expensive than an optical microscope and can image up to 10,000 microscopic biological objects at a time. This innovation is protected by 25 patents.

**HOW DOES IT WORK?**

The near-infrared light emitted by a LED is diffracted by the biological object being analyzed to generate a holographic pattern that is captured by a CMOS image sensor. Holographic reconstruction algorithms digitally recreate the image of the object on a display. Artificial intelligence software can then detect, analyze, and even classify biological objects by tracking metrics of interest. All of these steps are automated and, therefore, non-operator-dependent.

**WHAT IS LENSFREE?**

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**LENSFREE @ CES 2020**

Test the power of lensfree imaging to count and identify a variety of biological objects.

Move the slide under the lensfree microscope and see the image being digitally reconstructed in real time by the microscope’s powerful algorithms.

Watch as the embedded AI algorithms count and classify the objects being observed (eukaryotic cells, sperms, colon or lung tissues, plankton, neurons, etc.) in real time.

**WHAT'S NEW?**

Point-of-care testing:

- Complete Blood Count (developed in partnership with Horiba)
- Meningitis screening from spinal fluid (developed in partnership with Marseille-Méditerranée University Medical Center)
- Blood coagulation test (developed in partnership with startup Avalun)

Other healthcare applications:

- Monitoring of bioprocesses in bioreactors for the pharmaceutical industry: cell counts, cell viability (developed in partnership with startup Iprasense)
- 2D imaging for standard biological research and drug screening: cell counts, motility, viability, dry mass, cell-cycle duration, etc.

**WHAT'S NEXT?**

- Further system miniaturization and development of a patient self-testing kit
- 3D microscopy for basic biological research and drug screening: spatial organization of cells, interaction of cellular and extracellular matrices at a large scale, cell migration
- Coupling with microfluidics for organ-on-chip imaging

**APPLICATIONS**

LENSFREE & MOBILITY

Currently patients (or their samples) must go to medical labs for tests. In the future, lensfree imaging will bring testing labs to patients. These new compact portable labs can be used by specialist physicians in hospitals, by general practitioners in their offices, and by nurses and nurses’ aides in nursing homes or during home-care visits. Point-of-care diagnostics will help patients receive the treatment they need faster.

LENSFREE @ CES 2020

Compact, robust, low-cost, automated system suitable for point-of-care analysis.

Large field of view of approximately 30 mm² covering more than 10,000 cells per image.

Multi-scale observation of the main morphological characteristics of cell tissues (> 100 \(\mu m\)) and cells (>5 \(\mu m\)) & bacteria detection (1 \(\mu m\)).

**Interests**

Sophie Morales
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**CEA**

French Alternative Energies and Atomic Energy Commission

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**WHAT IS LENSFREE?**

**LENSFREE IMAGING TECHNOLOGY FOR POINT-OF-CARE ANALYSIS AND PATHOLOGY SCREENING**

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**INTERESTED IN THIS TECHNOLOGY?**

Sophie Morales
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Tel.: + 33 6 35 51 73 08

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Multi-scale observation of the main morphological characteristics of cell tissues (> 100 µm) and cells (>5 µm) & bacteria detection (1 µm).

“I would like to offer this to my patients. This small microscope could be very helpful at the time of pre-diagnosis.”

Professor M. Drancourt
Microbes, Evolution, Phylogeny and Infection
Timone Hospital (Marseille, France)

**LENSFREE & MOBILITY**

Currently patients (or their samples) must go to medical labs for tests. In the future, lensfree imaging will bring testing labs to patients. These new compact portable labs can be used by specialist physicians in hospitals, by general practitioners in their offices, and by nurses and nurses’ aides in nursing homes or during home-care visits. Point-of-care diagnostics will help patients receive the treatment they need faster.
LiFi is a great alternative to WiFi. But there is still a technical challenge to address before being massively deployed: interference management between light sources.

At CES 2020, CEA-Leti will showcase the first-ever multi-cell solution with centralized management of interference between lighting zones.

This solution offers a number of advantages that promise to give LiFi the boost it deserves:

• The ability to cover large infrastructures
• Uninterrupted connectivity on the move
• High data-transmission rates: 150 Mb/s over distances up to 3 meters by LED
• Fair allocation of resources between interfered and non-interfered users

WHAT IS LIFI-MULTICELL?

LiFi-multicell is the first-ever technology to enable massive rollout of LiFi, making it the ideal solution for:

• Lighting manufacturers
• Internet service providers
• Smart-home stakeholders

APPLICATIONS

LiFi-multicell proposes a smart LiFi network orchestrator that can be hosted on any commercially available lightbulb. It automatically detects all situations of interference and optimizes data transmission rates for each peripheral. The system also manages—asymmetrically and independently—uplink/downlink interference.

CEA-Leti researchers are working on additional smart-mobility management features for LiFi-multicell. These will further increase data transmission speeds for users on the move and allow users to benefit from the best access point.

The goal is to work with a manufacturer to develop a solution fitting perfectly to market demand.

WHAT'S NEXT?

KEY FACTS

• Embedded software technology
• Full configurability of the maximum number of supported access points
• Very low reconfiguration latency
• Asymmetric management of uplink/downlink interference
• Automatic network discovery when adding/removing access points
• Facilitation of network operation by providing network map

CHARACTERISTICS LIFI-MULTICELL SINGLE-CELL SOLUTIONS

Detection and management of interference +++ --
Latency ++ +
Mobility ++ -
Ease of implementation +++ --
Aggregated network transmission speeds ++ ---
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**WHAT’S NEW?**

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- Lighting manufacturers
- Internet service providers
- Smart-home stakeholders

**APPLICATIONS**

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**WHAT’S NEXT?**

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The goal is to work with a manufacturer to develop a solution fitting perfectly to market demand.

**INTERESTED IN THIS TECHNOLOGY?**

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**KEY FACTS**

- Embedded software technology
- Full configurability of the maximum number of supported access points
- Very low reconfiguration latency
- Asymmetric management of uplink/downlink interference
- Automatic network discovery when adding/removing access points
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Haptic refers to the modality of touch as well as to complementary sensory feedback. Haptic interfaces allow human operators to sense and manipulate computer-generated or tele-operated environments through mechanical actuators, ideally with maximum transparency. Active or passive haptic devices, depending on the nature of the actuators (motors or brakes), generate different haptic stimuli according to application’s needs (forces and velocities, force dissipation, stability and safety).

MAXENS has been designed as a two-degree-of-freedom hybrid interface using magnetorheological fluid (MRF) brakes and motors. Subjected to a magnetic field, the fluid greatly increases its apparent viscosity, becoming a viscoelastic solid. Importantly, the yield stress of the fluid in its active state can be controlled very accurately by varying the magnetic field intensity. The fluid’s ability to transmit force gives rise to many possible control-based applications.

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MRF-based haptic systems offers unique performance in terms of high transparency (low friction), high blocking force (virtual wall effect), high reactivity and dynamics (real-time applications), robustness (compatibility with temperature and vibration environment), all this in compact designs.

**WHAT IS MAXENS?**

Haptic refers to the modality of touch as well as to complementary sensory feedback. Haptic interfaces allow human operators to sense and manipulate computer-generated or tele-operated environments through mechanical actuators, ideally with maximum transparency. Active or passive haptic devices, depending on the nature of the actuators (motors or brakes), generate different haptic stimuli according to application’s needs (forces and velocities, force dissipation, stability and safety).

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MRF-based haptic systems offers unique performance in terms of high transparency (low friction), high blocking force (virtual wall effect), high reactivity and dynamics (real-time applications), robustness (compatibility with temperature and vibration environment), all this in compact designs.

**MAXENS @ CES 2020**

Let’s take a haptic walk through a virtual maze: experience contacts and collisions with virtual walls, strong blocking effects, spring effects, as well as a variety of textures! The haptic feedback will guide you throughout your exploration.

*MAgneto-rheological fluid-based SENSorial interface*
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**WHAT IS MAXENS?**

- High blocking force which efficiently simulates virtual walls
- Texture rendering (e.g. clicks, notches) based on a variety of low- and high-frequency profiles
- Full reprogrammability and, hence, a large variety of sensations simulating typical interactions with mechanical systems (e.g. spring effect, latching)
- Vibrations to alert users

**APPLICATIONS**

- « Augment » electrical commands in different cockpits
- Feel remotely contacts, collisions and stiffness
- Enhance remote control operations
- Enhance immersion in simulators and games
- Facilitate virtual assembly and prototyping

**KEY FIGURES**

- 4 successful industrial transfers
- 9 patents
- 21 publications

**WHAT’S NEW?**

- Miniaturize the system for applications requiring compactness and portability
- Increase the number of functions to be controlled by the user, as well as the stimulation transmitted by the same haptic device

**APPLICATIONS**

- « Augment » electrical commands in different cockpits
- Feel remotely contacts, collisions and stiffness
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- Facilitate virtual assembly and prototyping

**MAXENS & MOBILITY**

MAXENS is a new-generation multifunctional haptic controller that can be used as a driver/operator assistance system in a variety of vehicles, e.g.:
- trains,
- trams,
- boats,
- airplanes,
- helicopters,
- tractors.

It can also be used in control rooms for monitoring future urban air mobility.

**INTERESTED IN THIS TECHNOLOGY?**

Moustapha Hafez
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Tel.: + 33 1 69 08 01 89
STARTUPS
Anteneo is bringing precision GNSS to the mass market. We customize our antenna designs to meet specific requirements (radiation pattern, frequency, antenna placement), and then license these turnkey designs out to manufacturers. Our designs are backed by product integration support services.

**WHAT IS ANTENEO?**

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**ANTENEO @ CES 2020**

Leti startup Anteneo will present the first all-metal dual-band GNSS antenna for automotive applications at CES2020.

**NEW ANTENNA DESIGNS**

*FOR PRECISION GNSS EVERYWHERE*

**WHAT'S NEW?**

THE AOP35 & AOP40 ARE SLATTED FOR RELEASE IN EARLY 2020.

**COMMERCIALIZATION**

Anteneo antenna designs are based on a patented micro-array technology that combines small metallic radiating elements with a special pattern-matching process. This architecture delivers enhanced performance and allows the antenna to be fine-tuned to mitigate interference with other colocated antennas in the vicinity.

Anteneo designs are suitable for all applications that require a compact, lightweight, precision geolocation solution. The antennas can be manufactured using standard processes (sheet metal, PCBs, etc.), and Anteneo can provide the users of its designs with support at every stage of their project (integration, qualification testing, scale-up), whether it is for in-house manufacturing or for transfer to a third-party supplier.

Our ambition is to set the new standard for high-precision GNSS for mass-market applications. We plan to develop a library of new designs to address a wide range of needs and bring high-precision GNSS—an enabler of high-added-value services—to the masses.

**KEY FIGURES**

- 23% of GNSS systems shipped will be multi-frequency by 2023 (source: ABIresearch).

**ANTENEO IS A CEA SPINOFF.**

**AOP35 AOP 40**

**Radiation pattern RHCP boreside RHCP boreside**

**Bands L1 E5b L2 L1 L5 E5ab**

**Size 35x35x9mm3 40x40x9mm3**
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<th>AOP40</th>
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<tr>
<td>Radiation pattern</td>
<td>RHCP boreside</td>
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### WHAT’S NEXT?

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**KEY FIGURES**

- 23% of GNSS systems shipped will be multi-frequency by 2023 (source: ABIresearch).

**ANTENEO & MOBILITY**

Multi-frequency GNSS is a stand-alone precision geolocation solution, making it an effective response to mobility-related needs, from ADAS and asset tracking, to free-floating shared vehicles and driverless cars. Anteneo takes the headaches out of antenna integration, one of the major hurdles to the widespread adoption of high-precision GNSS.

**INTERESTED IN THIS TECHNOLOGY?**

Vincent Roger
vroger@anteneo.fr

ANTENEO is a CEA spinoff.
ISORC

BECAUSE YOUR SECURITY MATTERS.
ISORC IS A ONE-STOP PROVIDER OF SECURITY SOLUTIONS FOR VARIOUS MARKET

WHAT IS ISORC?

A Liten startup, Isorg was founded in 2010 by a team of senior managers and technical experts from the high-tech and electronics industries. The company’s core technology successfully integrates printed photodiodes on different substrates to enable large-area image sensors for the smartphone, security markets and extended applications in medical X-ray imaging and non-destructive testing (NDT).

Isorg is present in Grenoble, France (technology and application development), Limoges, France (manufacturing), and Asia (sales and application support). The company offers its customers a complete solution from a single provider.

The company plans to leverage its strong know-how of sensor technology to become the leading provider of printed-electronics-based optoelectronic systems and also complete large-area-image-sensor solutions for the markets the company serves.

ISORC @ CES 2020

Isorg’s OPD technology and innovative thin optical filter design constitute a breakthrough in terms of increasing security to support large-area-sensors up to smartphone full display size. The technology enables multiple-finger authentication to deliver more fingerprint data for each user ID.
Isorg's sensor, with a thin optical filter and integrated Gate-on-Array sensor architecture is easy to be integrated into smartphones. The thin plastic substrate is compatible with the full curved OLED displays on high-end phones.

The company's OPD technology, which enables multiple fingerprint authentications on large area of Smartphone display delivers a breakthrough increase in security over the current one-finger authentication systems in the market.

**WHAT'S NEW?**

Isorg's sensor solution will be ready for sampling to customers for product development in Q1 2020.

The company will offer customers 1-stop complete solution for target markets of smartphone and security.

**APPLICATIONS**

- Smartphone and tablet
- Access control
- Border Control
- Police
- Inventory management

**ISORG'S SENSOR & MOBILITY**

Isorg's sensor system can be built on a plastic substrate, which means that the product can be shaped to facilitate integration into a variety of products. This makes it ideal for mobility applications that require authentication with a high degree of security. These include smartphones and mobile police scanners, automotive systems, ID verification for electric bike or scooter solutions, and more.

**KEY FIGURES**

- 60+ patents
- Finger print module < 300 µm thick
- 6” diagonal display size and up
- One technology for any size of display

**WHAT'S NEXT?**

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The company will offer customers 1-stop complete solution for target markets of smartphone and security.

**INTERESTED IN THIS TECHNOLOGY?**

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cliff.lau@isorg.fr
www.isorg.fr
Tel.: +33 438 881 836

ISORG is a CEA spinoff.
Internal Combustion Engines (ICE) have been at the center of human mobility for more than a century with a lot of improvements. But today we enter a new age of motorisation based on batteries or fuel cells and electric motors, coming back at the first ages of automobile. Lithium batteries or Fuel cells are seen as the two best competitors to power these new cars but they are lacking in power and suffer from safety or environmental issues.

NAWACAPs, in combination with a battery or fuel cell will play the role of a double “turbo” in an ICE, harvesting energy and providing a boost of power.

The performance of our NAWACAP cells makes it easier to integrate into a hybrid system with no need for DC/DC converters. It opens new ways to optimize power and energy and can double/triple a vehicle’s range and the lifetime while reducing the size/weight of the main battery pack.

The manufacturing and use of NAWACap cells is better for the environment as well, reducing battery sizes, thus loading and mining issues, recycling and waste.
**NEW ADVENTURE, NEW SOLUTIONS**

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**WHAT’S NEW?**

**THE FASTEST ELECTRODE IN THE WORLD**

NAWA Technologies’ solution is based on a new concept of anisotropic electrode for energy storage. It looks like a tooth brush but with hundreds of billions of nano bristles all in carbon.

The structure of the electrode reduces both ionic resistance (more ions can move faster) electronic resistance (carbon nanotubes are 1000 times more conductive than any powders) and safety (high thermal dissipation capacity reduces risks of thermal runaway). All of this makes our electrode the fastest in the world.

NAWA is the first company able to bring such a material to industry. NAWA proposes higher Power and Energy ultracapacitors with unsurpassed performance (in terms of temperature range and frequency response). In addition, costs and environmental impacts will be reduced (less loading, no mining, no rare earth material, easy recycling).

**APPLICATIONS**

NAWACAPs are used across a wide range of applications:

- Electromobility (HEV, LEV, autonomous vehicles, KERS, Trucks, buses, logistics)
- IoT data-transmission (remote sensors, beacons, smart monitors and meters)
- e-Tools (nail guns, tighteners, saws, jump-starter)

**WHAT’S NEXT?**

NAWA has demonstrated the potential and the manufacturability of the technology.

- 2019: First production line, NAWACap cells from 1 F to 500 F available in 2020.
- 2022: Bigger cells for automotive in 2 years.
- 2025: NAWA’s technology capabilities makes it a strong candidate for the next generation of solid-state or air-lithium batteries technologies even the so-called “structural batteries” by combining the benefits of vertically aligned carbon nanotubes for storage and composite materials.

**PUBLICATIONS:**


**NAWACAP & MOBILITY**

The combination of a NAWACAP cell and a lithium-ion battery or fuel cell can, today, trickle down across many mobility sectors, from E-bikes to Urban Transportation. Fast recharge, better energy management, KERS (Kinetic Energy Recovery System), decentralised power will benefit from NAWACAP cells. As well as greatly improving the overall life of the system and its ability to recover energy, this ‘hybrid’ battery has the potential to be lighter and more compact, improving range and efficiency further.

**KEY FIGURES:**

- 1000x more conductive
- 5x more Energy
- 10x more Power
- 2-3x more lifetime
- 5x less CO₂ emission

**INTERESTED IN THIS TECHNOLOGY?**

Dr. Pascal Boulanger (Founder – CTO)
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Tel.: + 33 670 933 929
Today's consumers use an average of four different types of chargers for their electronic devices.

Leti startup wise-integration will be at CES 2020 to present the world's first universal USB charger capable of powering any device up to 100W. The USB Power Delivery protocol automatically adjusts the power to the device being charged.

User benefits:
• 6x faster than a conventional 15W charger
• Multiport: Charge up to 4 devices at once with its dynamic USB C HUB
• Universal: thanks to USB PD protocol: use to charge smartphones, tablets, laptops, and more.

WHAT IS ENERGYSAVER 100?

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ENERGYSAVER 100 @ CES 2020

Test the power of the EnergySaver 100 charger! Plug in up to four devices...your phone, laptop, tablet, or any other USB device and see just how much power this pocket-sized charger packs in. A display lets you track how much power is being delivered to each device, from 5W to 100W and the breakdown of total power, device by device.
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**WHAT IS ENERGYSAVER 100?**

**ENERGYSAVER 100**
A FASTER, MORE COMPACT, ENVIRONMENTALLY-FRIENDLY 100W UNIVERSAL CHARGER (USB C POWER DELIVERY)

**ENERGYSAVER 100 & MOBILITY**
Soon users will only need a single multiport charger for all of their electronic devices, the EnergySaver 100. This pocket-sized USB charger is compact enough to go anywhere, even overseas (no international plug adapter required). The EnergySaver 100 will help reduce the amount of electronic waste and lower energy spending worldwide.

**WHAT’S NEXT?**
-wise-integration is working actively with charger and wall outlet manufacturers to bring consumers the EnergySaver 100 by year’s end. The company is also developing a similar 100W USB-C solution for wall outlets.

Once the EnergySaver 100 has been released, wise-integration plans to develop a 500W power supply for OLED 8K TVs. In a more distant future, the company would like to develop power supply solutions for data centers.

**INTERESTED IN THIS TECHNOLOGY?**
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Thierry.bouchet@wise-integration.com
www.wise-integration.com
Tel.: +33 6 65 17 38 29

**CHARACTERISTICS**

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>wise-integration</th>
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<td>System architecture range of power</td>
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<tr>
<td>Cost</td>
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**COMMERICALIZATION**
The EnergySaver 100 is slated for release in late 2020.

**KEY FEATURES**
- 6x faster
- 6x smaller
- 98% efficiency
- Remains cool
- Multiport capability

wise-integration is a CEA spinoff.