IRRB Webinar on CES Trends
what are the possible applications for the rail sector
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CES LAS VEGAS 2023
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VIDEO BY Mr REVEILLON

CES LAS VEGAS - A FEW FIGURES

UIC PRESENCE AT CES LAS VEGAS

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Gilbert REVEILLON
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UIC Digital
CES LAS VEGAS – A FEW FIGURES

In 2023, the CES took place from 6 to 9 January.

It expected:
- More than 170,000 visitors
- Including more than 4,500 exhibitors and more than 1,700 start-ups

The fair welcomed more than 3,600 media from all over the world.

Over 20,000 different products and technologies were displayed at the exhibition.
Over 1,800 conferences and presentations took place during the event.

Additionally, CES 2023 hosted:
- More than 500 business executives
- More than 2,000 investors.

Finally, CES 2023 was the largest consumer electronics show ever with over 2 million square feet of exhibit space.
UIC PRESENCE AT CES LAS VEGAS
BEFORE AND NOW

2017: first participation at CES Las Vegas
Active participation in CES Government

2017 – 2022
Present every year
Advocating and enhancing the position of Rail in the mobility panel

2023
For the very first time, UIC has a booth at CES Las Vegas
UIC invited two startups to join

2024
UIC will have its own booth at CES WEB 3.0 village
Invitation to UIC Members to visit us and to join
CES LAS VEGAS
MAIN INNOVATION TRENDS IN 2022 (1/2)

From a railway sector point of view

- Growing contribution of 5G
- Increased Cloud Infrastructure

- Deeper AI Innovations
  - Natural Language Processing (NLP)
  - Computer Vision
  - Machine Learning (ML)
  - With AI Applications on:
    - Conversational AI-Humans
    - Autonomous Systems
    - Metaverse seemed to become unavoidable

The Enterprise Experience

- Virtual meetings
- Remote collaboration
- Immersive Design
- Simulations / Digital Twins
- Marketing and Sales
From a transport point of view

- Electric Vehicles
- Luminar and lidar: useful for ATO (Automatic Train Operations) for detecting of obstacles on railway tracks
- Self Driving trucks
- Urban Air Mobility

Nothing about public transport
Except for bikes and freight logistics of the last mile

Nothing about railways

The other main trends

- Space technologies
- Sustainable technologies, notably smart cities
- Digital health, with a specific focus on wearables, which could be useful for occupational health for railway staff
CES LAS VEGAS
MAIN INNOVATION TRENDS IN 2023

Steve Koenig, VP Research of the Consumer Technology Association, opened CES Las Vegas 2023 with his “CES 2023 Tech Trends to Watch”.

Industries are still confronting global challenges

- Supply chains remain vulnerable
- Semiconductor demand stubbornly inflation softening
- Labor shortages
- Stubborn inflation and rising interest rates

Key technology themes of CES 2023

- Entreprise Tech Innovations
- Metaverse / Web 3.0
- Transportation and Mobility
- Health technology
- Sustainability
- Gaming and services

Innovations which could be applied in railways
CES LAS VEGAS
INNOVATIONS WHICH CAN BE APPLIED IN RAILWAYS (1/2)

Of all these main trends, the railway sector should carefully monitor potential transfers to railways

- 5G use cases and industrial IoT applications
- Connected intelligence
- Autonomous systems
- Quantum computing
- Cybersecurity
- Artificial Intelligence (AI)
- Robotics
- Metaverse of the Things (MoT)
- Immersion experience

Of all these main trends, the railway sector should carefully monitor potential transfers to railways:

- Electrification ecosystems
- Smart grids
- Transformation of the in-vehicle experience
- Applications for supply chain
- Solutions for clean air and water
- Alternative energies
- Recycling technologies
- Drone technologies and applications

Innovations which could be applied in railways
Security
Drop Free Glass (DFG)

"is the world’s first electronic self-cleaning technology for optical sensors.

DFG can promptly remove various contaminants on the surface of the sensors using an advanced microfluidic technology based on electrowetting-on-dielectric (EWOD) principle. The EWOD-driven DFG has outstanding advantages including fast operation speed (1s), low power consumption (1mW), and high durability (>1,000,000 cycles).

For the first time, the DFG is applied to AI surveillance cameras for daily life safety and future industries such as smart cities and factories.

DFG-aided outdoor AI surveillance camera can always guarantee clear camera images even during rainfall”

⇒ Security
⇒ Train windows
⇒ Locomotive windscreens
⇒ Fight against virus
Cybersecurity & Personal Privacy

DeCloakFace is a trustable AI obfuscated image processing technology for facial recognition, which allows the user to conduct secure identity verification without leaking personal information.

DeCloak, the developer of DeCloakFace is a privacy computing company, which aims to make personal data privacy easy and manageable.

This innovation could accelerate the access to the trains while improving the respect of the passengers’ personal data.
Night watch by Nexion Solutions

“As a solution designed to prevent further violence and injury, NightWatch is a GPS-enabled smartwatch that allows its users to access emergency help from specialized operators, who triage crisis events, and then dispatch police or emergency personnel as needed.

Through its proprietary platform, operators receive detailed information on the specific case for each victim or witness, which allows for better-informed police response.

In addition, an automatic recording of the event provides an additional piece of evidence, which can be used in court to increase the likelihood of a successful conviction.”

Security for front-line staff
(railway stations, trains, railway police)
"Safee is a phone case that conceals an anti aggression device that can be activated in less than 3 seconds and offers up to 5 self-defense features:

1 - The user activates the Safee case by pressing the push button 3 times in a row
2 - The 130 Decibel alarm presents in the case is activated
3 - Start recording with your phone camera and microphone
4 - The application sends an alert to the emergency contacts who can follow live cameras, microphones, & position
5 - Police are on their way, called by the emergency contacts, with all the information needed

Security for front-line staff
(railway stations, trains, railway police)
Innovations which could be applied in railways
Operations & Safety
PMCAC by GLOphotonics

“Precision-timing atomic-clocks are at the heart of human-activities with vital and ubiquitous significance in multi-trillion-dollar markets like cyber-security, geopositioning, secured 5G telecommunications and quantum sensors

Transcending 20-years of world-leading research in quantum photonics based on its proprietary technology, GLOphotonics unveils Photonic-MicroCell-Atomic-Clock (PMCAC): a compact and shapeable quantum device that unlocks a paradoxical and overdue situation and sets the pace for trillion-dollar market and multi-paradigmatic changes. PMCAC is designed to bring the historical and unequaled scientific laboratory- atomic-clock performances to the consumer’s finger tips”

Numerous rail applications relies on atomic precision for their accuracy

Impact of 5G communications

Could be used for geographical positioning
Spatial Touch Automotive By Vtouch, Inc.

“SpatialTouch™ makes it easy and precise to control many in-car functions by simply pointing at them.
It offers a truly touch-like interface for a 3D space.
With SpatialTouch™ you can make any real-world objects interactive and you can directly select and control them as well as set them as hyperlink shortcuts.
Single SpatialTouch™ system covers everything in the vehicle, such as the display and buttons, as well as the air vents and sunroof.
A hygienic contactless solution for passengers in taxi and ride-sharing services.
Drivers don’t need to look away from the road (just look into peripheral vision or glance).

Potential applications in train driver’s cab to be investigated.
“BHTCs’ Driver Monitoring System (DMS) allows for observing the drivers’ degree of distraction while driving.

It also monitors drivers’ awareness like eye openness to detect potential degrees of fatigue.

Our target is to decrease fatal accident rates.”

Potential impacts for staff in charge of safety (train drivers, signalling boxes, dispatchers)
Made of a nano-infused paper composite, Somalytics carbon-nanotube paper composite (CPC™) capacitive sensor - SomaCap™ - is the world's smallest nano- based capacitive sensor. Miniature and highly sensitive to the human body, they can be used for eye tracking, gesture control, touch and fluid monitoring. SomaCap sensors are designed to improve the human experience through innovations in eye tracking, consumer electronics, AR/VR, the Internet of Things, health and wellness, and transportation.

Potential impacts for staff in charge of safety (train drivers, signalling boxes, dispatchers)
Aeries II by Aeva

“It leverages 4D sensor data to deliver new capabilities such as Ultra Resolution, which provides up to 20 times the resolution of legacy.”

LiDAR sensors, enabling automated vehicles to detect objects like small road hazards at highway speeds from up to twice the distance of 3D LiDAR sensors.”

Technology to be considered for the development of ATO and the detection of obstacles
Eyeonic Vision System By SiLC Technologies

“The Eyeonic Vision System is the first ever commercially available FMCW LiDAR based on a fully integrated silicon photonics chip (The Eyeonic Vision Chip) solution targeted to applications that use machine vision.

The Eyeonic Vision Chip integrates all photonics functions needed to enable a coherent vision sensor, offering a tiny footprint while addressing the need for low-cost and low-power.

An ultra-low linewidth laser, a semiconductor optical amplifier, Germanium detectors, and meters of optical circuits are integrated onto a silicon photonics chip.

The fully integrated solution provides high sensitivity which translates to a LiDAR solution with longer range and better precision.”

To be considered for the development of ATO
And detection of obstacles
Innovations which could be applied in railways
Infrastructure inspections
Smart Early Warning System for Predicting Slope Failure By Smart Geotech Co., Ltd

"a smart measurement system that consists of a rod-shaped displacement sensor, IoT client, and gateway to measure the slope displacement in the vicinity of the slip surface. It is an intelligent sensor-based slope failure early warning system that transmits a real-time warning to the users if the rate of displacement exceeds the standard value set by the algorithm."

This innovation could be applied to the embankment monitoring along the tracks
DROW 4D Lapse By CLROBR

“is a web-based application where any drone can be autonomize to take photos of objects or buildings for 3D mapping, facility management, or inspection. Instead of manually setting waypoints, the drone’s flight path is automated using AI and a 3D point cloud of the object.

We capture 4D data, meaning 3D data plus a timelapse of all previous data to note any changes in the object over time.”

This innovation might lead to an automatization of:
- Buildings’ inspection
- Tracks inspections
- Artworks inspections
by drones
Innovations which could be applied in railways
Rolling Stock
Aircore EC By Infinitum

“The Infinitum Aircore EC is disrupting the motor industry with its innovative patented PCB stator and integrated Variable Frequency Drive (VFD). Using lightweight, reusable materials and modular design, Infinitum’s motor generates power in half the weight and size, at a fraction of the carbon footprint and noise of traditional motors. With no iron and 66% less copper, the Aircore EC can sustainably power commercial and industrial applications, such as HVAC fans, pumps and materials handling equipment.”

Could be of interest to:
- Reduce weight of engines, noise in rolling stocks and therefore to increase the performance and reduce noise
- Improve HVAC efficiency and reduce noise
“Hyundai Electric & Energy Systems completed the development of a high-voltage circuit breaker (HVCB) for the rating of 170 kV, 50 kA, and 60 Hz using CO2 and C4F7N. The HVCB, part of a Gas Insulated Switchgear (GIS) bay of the same voltage rating, is a three-pole operated in one tank encapsulated design that has fulfilled all the IEC 62271-100 tests. Its performance equals that of SF6 gas counterpart but shows a more than 99% reduction of the Global Warming Potential (GWP) of the gas mixture.”

This high-voltage circuit breaker could be of interest for:
- Electrical substations
- And possibly rolling stocks
SF (SuperFast) Battery By SK

“This battery is manufactured by SK On, using Nickel 83% Cathode which is the highest nickel content.

With the help of SK On’s fast charging protocol, this battery is charged from 10% to 80% within 18 minutes.

Quick charging technology could cause vehicle fires. However, SK On’s has achieved zero number of vehicle fire

To be considered for battery trains
Innovations which could be applied in railways
Energy Management
INTEGRICT Industrial Complex Energy Management System By HYUNDAI ELECTRIC & ENERGY SYSTEMS CO., LTD.

“INTEGRICT Industrial CEMS (Complex Energy Management System) is a cloud-based smart energy platform that provides total energy management and energy services for factories in industrial complexes. Unlike the existing Factory Energy Management System (FEMS), CEMS not only analyzes energy consumption by plant, process, and facility of each plant but also performs energy management from the perspective of industrial complexes. Furthermore, it serves as an energy platform and provides various services such as energy trading, facility maintenance service, and RE100 consulting through the participation of third parties in the energy sector.”

This realization is applicable for the management of large industrial centers.
EnergyScrum - Energy Management System for DERs By 60Hertz

“Energy Scrum is an energy management system for Distributed Energy Resources (DERs)

It can integrate various DERs, including PV, ESS, fuel cells, and EV chargers, into integrated screens and accurately forecast overall energy supply and demand using AI.

Energy Scrum can orchestrate DERs without cumbersome processes and allows users to achieve the goal, such as maximizing eco-friendly electricity use through applying user-specific operation scenarios.

For example, EnergyScrum can be applied to an old gas station to transform it into an eco-friendly energy station with DERs

To be considered for managing a mixed rolling stock fleet (battery, hydrogen, electric, alternative fuels, and diesel, etc.)
Innovations which could be applied in railways
Railway Stations
Incheon Airport (South Korea)

Incheon Airport’s booth presented a new paradigm for the airport industry.

The Smart Pass was described. Starting in 2023, any passenger at Incheon Airport can fly safely and securely with a single biometric ID, without the need for paper documents.

Thus, seamless journey with biometric ID will be possible. Indeed, once registered, no additional registration is needed from passenger for 5 years. In addition, a 99.9% accuracy of facial recognition based on Deep Learning technology will enhance security.

The remote baggage drop-off available at homes and hotels will be facilitated by biometric information. The wait time at the check-in counter will then be minimized. In addition, a smart tracking of luggage will be available on smartphones, based on electronic tags and biometrics.

Virtual Incheon Airport is a digital replica of Incheon Airport which allows passengers to explore and experience various virtual interactive contents simply using smartphones.

Incheon Airport’s navigation app. for indoor parking along with innovations in indoor positioning technology provides accurate traffic information and vehicle routes. Thus, it provides the real-time status of parking lots and the location information of an empty parking space. It also provides route information based on optimal path finding and driver’s preferences.

AR Wayfinding utilizes 3D spatial information and AR technology to enhance the passenger experience. Thus, it is possible to benefit real-time tracking of passenger location based on visual data, allowing personalised guide for passengers.

Metaverse and robotic technologies are at the heart of the digitalization of the airport, based on 3D spatial information.

A 3D air traffic control has been developed.

The future of railway stations?
“Multi-user data platform ClimaticsTM is leader in Next Generation Building Intelligence by a unique approach to Building Installation & Property Management through Digital Twin Technology and Machine Learning Algorithms.

Our proprietary Smartbase is a powerful gateway to access building Construction & Operations Data, to digitally visualize building installations, integrating them in an easy to use interface and creating fully automatic controls for optimal energy performance, saving a substantial 15 to 40% in energy consumption in both new and existing buildings, as most effective Sustainable and Circular solution for meeting worldwide energy reduction goals requiring minimal deployment of scarce technical personnel.”

To be considered for
- real estate departments
- railway station managers
Flexible Solid State Electrochromic Thin Film
By Ambilight Inc

"Electrochromic (EC) thin films assembled with proprietary EC advanced materials can modulate light and heat transmission rendering properties such as visual comfort and energy savings.

The material design and fabrication with solid electrolyte achieve chemically, and electrochemically stable high performance electrochromic devices produced in large scale by cost effective roll-to-roll technique. Thin film-based EC devices can be easily cut and encapsulated into a glass with any curvature and irregular shapes, which makes it possible to be applied into a wide “variety of applications”

Could be of interest for buildings (stations and offices) and carriages
First green biomass low carbon solvent PnP water filter is an industry-leading product and the lowest carbon emission filter in the world that is unique in its ability to block out bacteria and microplastics reduce carbon emissions by more than 50~70%.

- Green biomass solvent is an excellent solvent that can be made from sustainable materials (plants or biomass), non-toxic, environmentally friendly, sustainable low-carbon solvent;
- The water flow rate of the PES (polyethersulfone) hollow fiber hydrophilic membrane PnP water filter is up to 3 L/min, but only weighs 20g. Users can get clean, drinkable water anywhere and anytime.

Applicable to water supply in trains, railway stations and maintenance workshops
HOPE HydroStation  By HOPE Hydration

“The HydroStation is a cutting-edge bottle refill system offering users free, filtered water and premium drinks like sparkling water or electrolytes, among others.

The WiFi-enabled HydroStation features technology and sensors providing tracking and real-time analysis of water quality, usage, pollution levels and more.

HOPE’s HydroStation is the answer to the global search for cutting-edge solutions to eliminate plastic bottle waste.”

Could be considered for supplying water to clients in railway stations
Hi-Bot (Hologram Image, Guide Robot) By Hills Robotics & KAIST

"Hibot is an AI-based self-driving docent/ guide/ disinfection robot with an advanced hologram feature. The robot can be deployed at various places including convention centers, exhibition centers, hospitals, negative pressure isolation room. The robot is an advanced intelligent universal guide / docent / disinfection robot that is useful in the contactless era. It is equipped with a safe disinfection function which can safely stop the spread of coronavirus that is globally transmitting. Moreover, Hibot has a hologram and contactless control function for global remote conference call."

Potential application for cleaning up railway stations
Wellness Monitoring & disinfection in public facilities By Xandar Kardian

“The recent pandemic was a wake-up call for paying attention to "wellness" factor when it came to public buildings and facilities around the world. Masks provided a certain level of protection, but unfortunately it was widely politicized, leaving many to be exposed to airborne viruses.

Beyond viruses, the world also continued to suffer from increased substance abuse, including Fentanyl in public locations such as bathrooms and elevators.

Xandar Kardian has created a radar technology that can discretely, continuously and autonomously monitor the vital signs of occupants in closed spaces for possible rapid deterioration and also help automate disinfection controls.”

Of interest for toilets in railway stations and in the trains
AirDeep by AirDeep Co., LTD.

“AirDeep, the AI Air Quality Sensor with IoT, analyzes indoor air quality in real-time and detects air pollution state: dust, fine-dust, smoke, abnormal air condition, etc. Furthermore, AI algorithms of AirDeep distinguish smoking types (tobacco or e-cigarette) and recognize abnormal air condition like fire accident in the vehicles and rooms.”

To be considered for:
- Air monitoring in railway stations, trains
- Fire alarms
- and even more for maintenance works in tunnels
MetatwinBot by BrainBot

"MetatwinBot is a robot that maximizes communication for users with low accessibility to metaverse environments.

Its machine vision and visual interaction devices allow users to communicate and engage in a virtual environment without requiring any of the devices used in conventional metaverse environments, such as VR glasses.

MetatwinBot was built based on the “digital twin” concept. It executes commands and connects the metaverse to the real world, enabling people in digital blind spots such as the elderly and disabled to communicate with family, friends, medical professionals, and social workers, allowing them to receive vital medical and health care wellness services.

To be closely watched for interaction with disabled passengers."
Autonomous Model A By WHILL, Inc.

“Utilizing advanced mapping technologies combined with the latest in sensors and collision avoidance, Autonomous Model A is designed to significantly change how individuals with limited mobility and reduced sensory or fine motor skills navigate large venues, such as airports, theme parks and hospitals, creating a new era for safe and reliable transportation in crowded areas.”

Could be applied to people with reduced mobility in railway stations.
Ashirase by Ashirase, Inc.

Ashirase is a wearable navigation system that assists the visually impaired with walking.

The system consists of a smartphone app and an in-shoe vibration device including a motion sensor. The app receives data from the sensor and puts it together with map and satellite positioning information to generate navigational instructions, which the foot device communicates to the user through vibrations. Ashirase’s intuitive instructions via vibration can guide users to their destinations more safely without obstructing their hearing – a sense that is critical to the visually impaired.

To be studied by Railway Station Managers for visually impaired passengers.
Innovations which could be applied in railways
Night Trains
“This product consists of a pillow and a drive unit called the Motion System. When the user snores, the Motion System recognizes this and injects air into the airbag built into the pillow.

Snoring can be stopped naturally from the user’s head being turned or the cervical spine being lifted due to the inflated airbag or securing the airway by applying a mild level of tension to the muscles around the airway.

This product can prevent snoring even if the user is in a non-supine position. Even if there is another person, it only responds to the user’s snoring sound.”

To be considered for Night trains
Innovations which could be applied in railways

Maintenance in Workshops

Warehouses
“Aloception is a visual software sensor addressing mobile robots' full autonomy. Aloception is providing the core components of the scene: navigable area, obstacles & robot localization. Free space & obstacles are provided with descriptors to address final robotics applications. The solution is solely based on cameras & intelligence with the flexibility to run one or multiple cameras and lenses at the same time from various positions.”

To be considered for cobots
ADTF3175 by Analog Devices, Inc.

“The ADTF3175 module is the industry’s first high-resolution, industrial quality, indirect Time-of-Flight (iToF) module for 3D depth sensing and vision systems, fully calibrated for depth data and ready to image a scene.

It enables cameras and sensors to perceive 3D space in one-megapixel (MP) resolution.

The module offers highly accurate +/-3mm iToF technology available for machine vision applications ranging from industrial automation to logistics, healthcare, and augmented reality. It provides an image resolution that is double or triple the pixel count of competitive solutions.

Useful for:

- Logistics in warehouses
- Augmented reality
Innovations which could be applied in railways
Occupational Health
Cray X by German Bionic Systems GmbH

“The Cray X is a fully-connected, powered exoskeleton for use in industrial environments such as in the fields of logistics, production and construction. It protects the lower back area by giving up to 66 lb (30 kg) of support per lifting movement as well as providing active walking assistance to prevent fatigue.

The human-machine system thereby combines human intelligence with machine power.”

To be considered for:
- Staff in warehouses
- Track maintenance workers
"Designed to protect those working at heights, the wearable airbag automatically inflates within 0.2 seconds in case of an accident, absorbing the fall impact and protecting all crucial body parts such as the head, neck, spine and chest area.

Additionally, the airbag is connected through BLE to an accompanied smart phone application, through which an automatic alert is sent and an emergency call is dialed to pre-recorded emergency contacts.

This ensures that not only the body is protected during the fall, but that first aid and a timely rescue is guaranteed."

Of interest to catenary workers
Skinetic by Actronika

“Skinetic is a haptic vest that allows the user to feel different life-like sensations according to the interactions within the virtual environment.

The Skinetic vest is equipped with 20 highly innovative voice-coil motors all over the torso, this technology allows us to dissociate the intensity from the amplitude of the vibration, thus allowing us to reproduce an infinite range of sensations.

The vest also provides localized sensations and can actively track the user position in real time to provide realistic haptic feedback.”

Not easily transferable but to be considered
Innovations which could be applied in railways

Telecom
Illum transparent antenna for metaverse applications By Sensorview (Yonsei University)

Existing antennas utilize glasses’ frames or separate spaces to implement electronic components and antennas. As a result, it has a low antenna efficiency and difficult to secure coverage.

By implementing the antenna in the glass part of the glasses where information is displayed, it is possible to increase the radiation efficiency of the antenna and secure the coverage.

Additionally, we have secured both manufacturing technology and antenna implementation technology, that can implement both sub6 and WIFI antennas onto the front glass of devices, including AR/VR devices.

Could be of interest for stations
FOR FURTHER INFORMATION

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