



TraffiClair Monthly Updates

2025.02

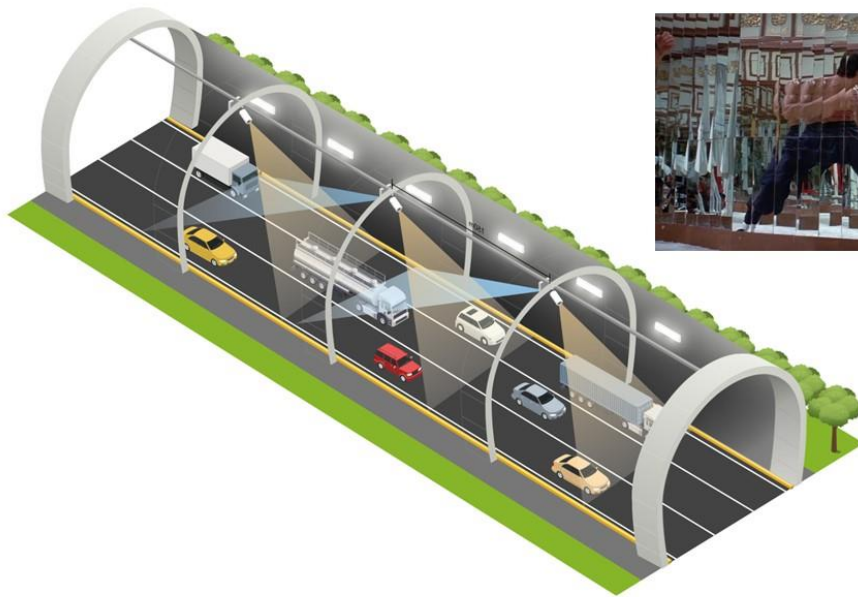
Kevin Gu

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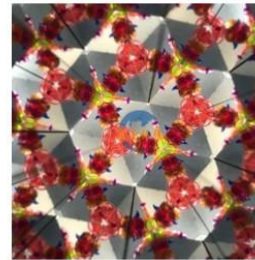
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What Is “Tunnel Multipath Effect”?

Tunnel Radar mitigates the "Tunnel Multipath Effect"



Tunnel Multipath Effect



Tunnel Multipath Effect refers to the phenomenon in which wireless signals (such as radar or communication signals) propagate through multiple paths in a tunnel environment due to reflection, refraction, and scattering. These multipath signals superimpose at the receiving end, potentially causing signal distortion, attenuation, or interference, which can affect the accuracy of communication or detection.

- Causes of Tunnel Multipath Effect
- Impacts of Multipath Effect
- Characteristics of Tunnel Environments
- ClairWav-U24 Tunnel Radar mitigates the "Tunnel Multipath Effect"

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How does tunnel radar overcome the “tunnel multipath effects”?

ClairWav-U24, a dedicated tunnel radar, effectively overcomes tunnel multipath effects, enabling the reliable use of radar detectors in tunnel applications.



The ClairWav-U24 tunnel radar is a cutting-edge radar system specifically engineered to address the unique challenges of tunnel environments, particularly the pervasive issue of multipath effects. To combat these challenges, the ClairWav-U24 employs a combination of advanced technologies:

- **MIMO Antenna Arrays:**
- **Super-Resolution Angle Estimation Algorithms:**
- **AI Machine Learning Algorithms**

By leveraging these technologies, the ClairWav-U24 effectively minimizes the distortions caused by multipath effects, ensuring precise and reliable detection of vehicles and other objects within the tunnel. Furthermore, the radar's ability to continuously track target trajectories and analyze traffic data in real-time provides valuable insights for traffic management and safety alert systems.

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Case Video of ClairWav-U24 Tunnel Radar

A game-changer in tunnel safety and traffic management!



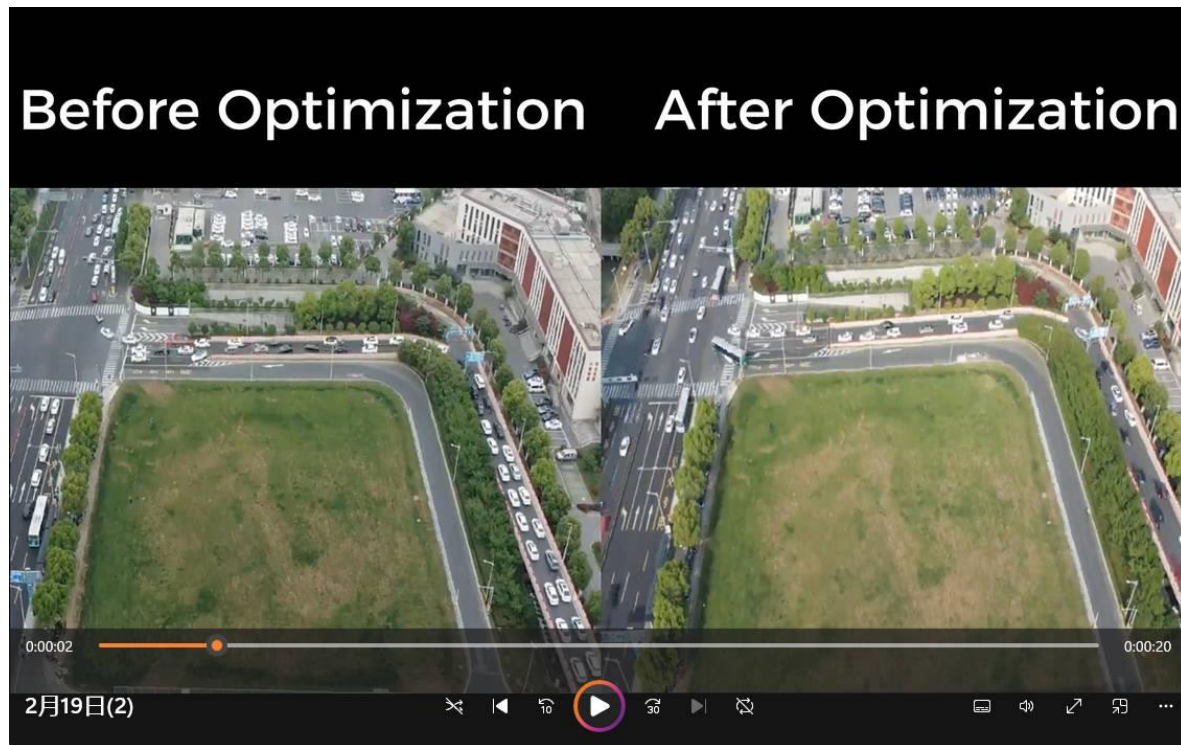
Using cutting-edge MIMO antenna arrays, super-resolution angle estimation, and AI machine learning, the ClairWav-U24 is designed to combat multipath effects and deliver unparalleled detection accuracy. Whether it's circular, square, or curved-lane tunnels, this radar excels in real-time vehicle tracking, speed monitoring, traffic density analysis, and incident detection within seconds! 🚨

Enhance tunnel safety, optimize traffic flow, and stay ahead with the ClairWav-U24. Perfect for modern tunnel scenarios, it's your all-in-one solution for smarter, safer transportation. 🌐

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ClairWav Radar Case Study

High Random Traffic Flow at the Train Station



Background:

Location: Major city in China.

The project is at a key intersection near a major train station in a new first-tier city. The station is along a main city artery and experiences high passenger flow. Despite fixed timing schemes, occasional surges in random traffic flow led to oversaturation and reverse overflow, impacting traffic on the main road.

Solution:

To address the high traffic demand and random congestion around the train station, we have developed specific scenario algorithms. These algorithms utilize ClairWav radar real-time traffic information collected from the train station to dynamically adjust traffic signals with millisecond-level control.

Result:

Average reduction in congestion throughout the entire weekend: 2 hours

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ClairWav Radar Case Study

The Intelligent Traffic Signal Control Optimization System in Fuzhou City

**Case Name:**

The Intelligent Traffic Signal Control Optimization System in Fuzhou City

Location:

Yingbin Avenue, Nanmen Road, and Menghudan in Fuzhou City

Benefit:

ClairWav Radars help the traffic control system realize accurate measurement, fast calculation, and optimal control.

Key Features:

- Real-time adaptive control single points.
- Dynamic arterial coordination
- Regional intelligent coordination

Improvements:

The average number of secondary stops at intersections is reduced by approximately 1,680 vehicles per hour, and the average hourly traffic volume at intersections can increase by about 8% compared to the original baseline. The average congestion time at intersections during peak hours is reduced by 43.5%, with a 44.9% reduction during the morning peak and a 43.1% reduction during the evening peak.

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ClairSRS Smart Road Stud Installation Video



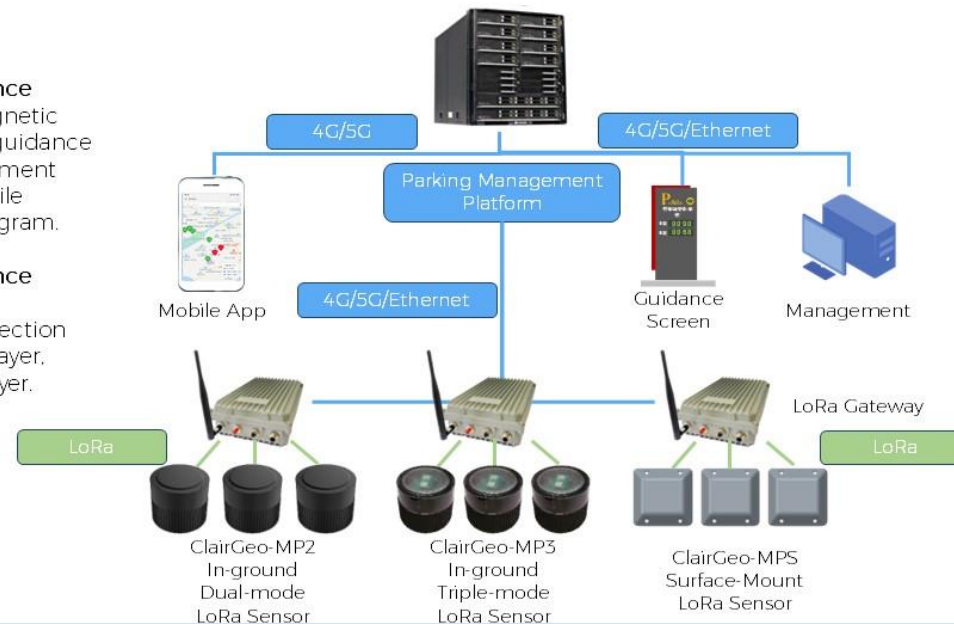
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Smart Parking Guidance System with LoRa Geomagnetic Sensors



System Architecture

- The **Smart Parking Guidance System** consists of geomagnetic vehicle detectors, parking guidance screens, a parking management cloud platform, and a mobile parking guidance mini-program.
- The **Smart Parking Guidance System Solution** is mainly composed of the Data Collection Layer, Data Management Layer, and Information Display Layer.



The **Smart Parking Guidance System** consists of geomagnetic vehicle detectors, parking information display screens, a parking management cloud platform, and mobile parking guidance apps. The system uses geomagnetic vehicle detectors as parking space status collection devices to perform real-time detection of parking space occupancy. The real-time parking status information is then collected and transmitted to the cloud platform of the smart parking guidance system via the operator's network or Ethernet.

System Benefits:

- **Wireless:** Cost-effective installation, real-time data access, scalability, remote monitoring, and seamless integration with smart technologies.
- **Reliability:** Fault tolerance ensures stable operation, adaptive modes extend battery life, multimodal technology reduces false alarms, and high sensitivity improves detection speed.
- **Compatibility:** Supports multi-band access for various networks, multiple protocols for seamless data flow, and quick installation to minimize hardware costs.
- **Efficiency:** Leverages big data for actionable insights, provides detailed analytics, shares processed parking information, and features a modular design for fast customization.

Confidential

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ClairGeo-MP Series

Multi-Mode Detection for All-Weather High-Precision Parking Monitoring



Model	Product	Sensor Mode	Communication Mode	Installation
ClairGeo-MP2		✓ Radar Sensor ✓ Geomagnetic Sensor	✓ LoRa ✓ NB-IoT ✓ CAT.1	✓ In-Ground
ClairGeo-MP3		✓ Radar Sensor ✓ Geomagnetic Sensor ✓ Photosensitive Sensor	✓ LoRa ✓ NB-IoT ✓ CAT.1	✓ In-Ground
ClairGeo-MPS		✓ Radar Sensor ✓ Geomagnetic Sensor	✓ LoRa	✓ Surface-mount for indoor usage

The ClairGeo-MP series wireless magnetic parking detectors are advanced devices designed for front-end data collection and real-time monitoring of parking space status. Utilizing a sophisticated dual or triple-mode detection system, these detectors integrate highly sensitive magneto-resistive sensors, 24GHz millimeter-wave radar, and photosensitive sensors to accurately capture vehicle information. By analyzing changes in the Earth's magnetic field, microwave pulse signals, and photosensitive resistance values, the system effectively determines the occupancy status of parking spaces.

The collected data is seamlessly transmitted to an intelligent parking management cloud platform, supporting robust communication protocols such as LoRa, NB-IoT, and CAT.1. This ensures reliable and efficient data transfer even in challenging environments.

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Case Study

- **Application Case – Beijing Yizhuang Industrial Park Project**
- The ground-level parking areas of the Yizhuang Industrial Park are divided into four zones: East, South, West, and North. Vehicles enter the park through the West Gate. To guide drivers in quickly finding available parking spaces, geomagnetic vehicle detectors are installed in each parking space within these zones. The system monitors the occupancy and availability of parking spaces in real-time, providing rapid guidance for parking and reducing the time spent searching for a spot.
- Solution Configuration:
 - LoRa Geomagnetic Vehicle Detectors: Installed at individual parking spots to detect vehicle presence.
 - Control Gateways: Serve as communication hubs, gathering data from the detectors and sending it to the cloud.
 - Induction System: Displays real-time parking availability, guiding drivers to available spaces effectively.
- This solution enhances operational efficiency by enabling real-time monitoring and reducing the time needed for parking, contributing to a smoother parking experience in the industrial park.

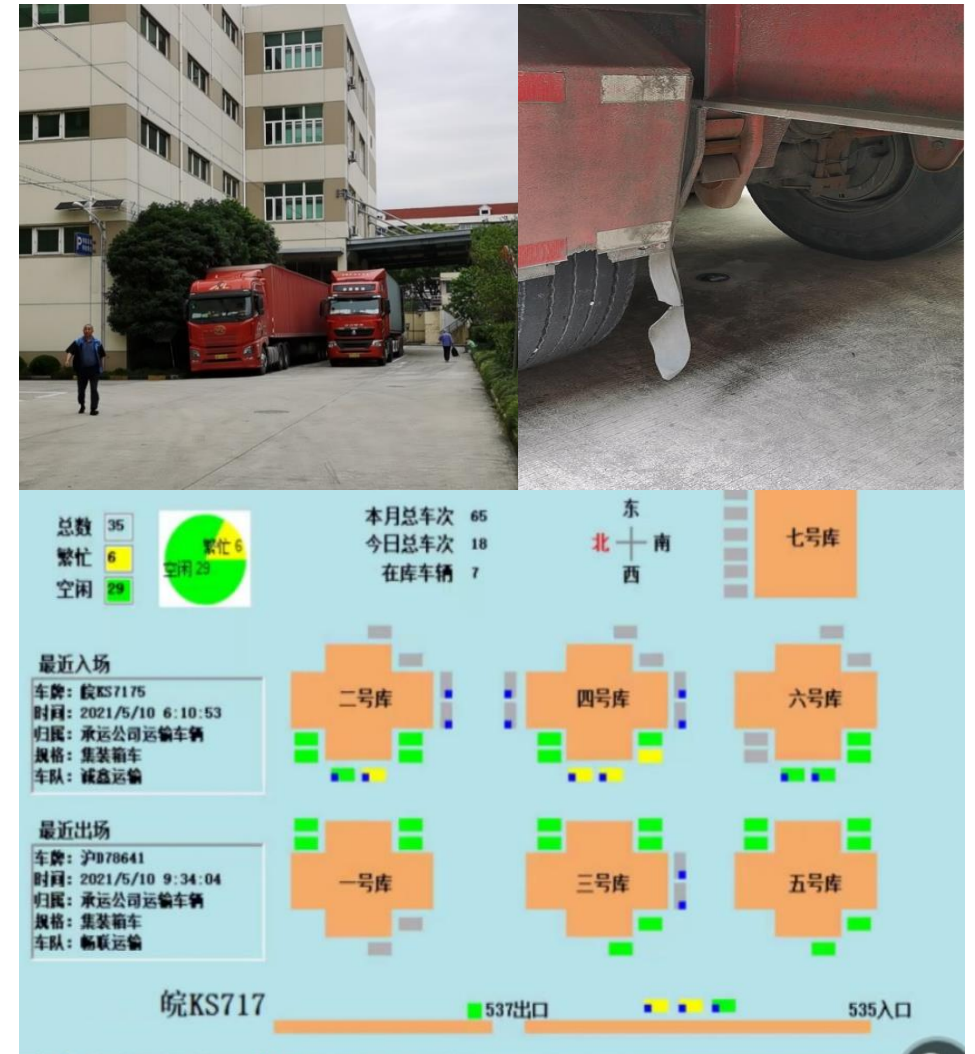


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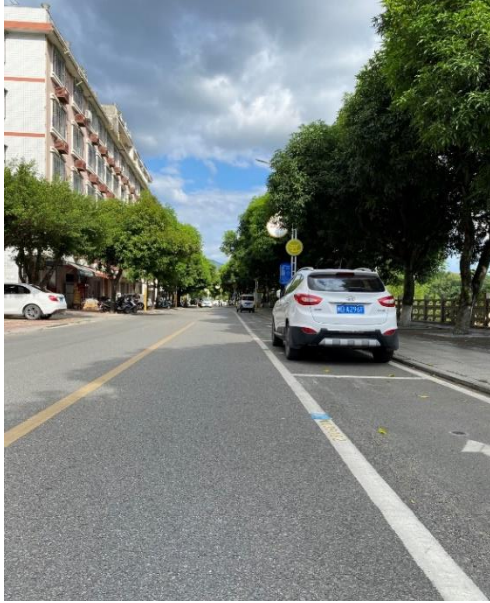
Case Study

- **Application Case: Shanghai Tobacco Company Logistics Park Project**
- The logistics park is divided into unloading zones, loading zones, and waiting areas. When vehicles enter the logistics park, geomagnetic detectors are installed at each parking space in these areas to quickly guide vehicles to the appropriate zone. These detectors monitor the occupancy and availability of every parking space in real time. Management staff can use a large display to see which spaces are available and swiftly assign parking spots to drivers. This reduces congestion in the logistics park and enhances personnel safety.
- **Solution Configuration: NB IoT Geomagnetic Vehicle Detectors, Guidance System.**

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Case Study: Roadside Parking



Quanzhou's Yongchun County Smart Parking Project covers 5,673 parking spaces across 55 key road sections in the county town.

The smart parking system in Yangzhou now covers all on-street parking spaces in the urban area, with over 9,000 parking spaces deployed across the city.

Case Study: Highway Service Area Parking

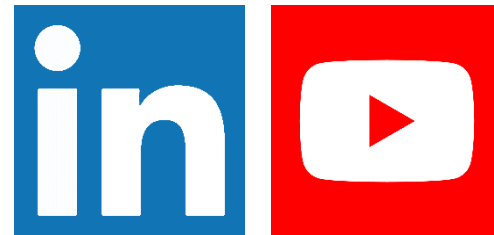


As one of the host cities for the Beijing 2022 Winter Olympics snow events, Zhangjiakou has installed magnetic vehicle detectors in parking spaces at service areas such as Chicheng South Station, Dahaituo Station, Huailai North Station, and Taizicheng Station.

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Thanks

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