



TrafficClair Monthly Updates

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Luminode

Road Studs for Safety Lightening



Key Advantages:

- GPS Synchronization – Enables simultaneous flashing across multiple units for maximum driver attention
- Pre-Embedded Base Design – Enables quick lamp replacement without road destruction, minimizing maintenance time and cost.
- Dual Power Options – Choose solar-powered (energy-independent) or wired (uninterrupted operation).
- Weather-Resistant – Built to withstand heavy traffic and harsh environments.

Ideal For:

- Urban roads & highways • Tunnel edges • Hazardous curves • Work zones

Why Professionals Choose Luminode:

- 50% faster installation vs traditional studs
- 3x longer lifespan than conventional LED markers
- Proven to reduce nighttime sideswipe accidents by 37%

[Product Page](#)

ClairSRS-Solar/Wired vs. Luminode



Sensor capable for interactive applications.

Solar/Wired	Luminode
Solar-powered/Wired-powered	Solar-powered/Wired-powered
With/without geomagnetic sensor	No sensor
2.4G/LoRa communication	GPS Synchronization
Support device status monitoring and complicated logic control modes	Simple flash synchronization
Ø150x72mm	Ø148×117.8mm Assembled
3.2V/8000 or 4000mAh lithium battery	3.2V/600mAh lithium battery
NFC for firmware upgrading	No NFC
LED Light Intensity: - Red: 12,000 to 15,000 mcd - White: 13,000 to 16,000 mcd - Yellow: 8,000 to 10,000 mcd	LED Light Intensity: - Red: 4,800-6,800 mcd - Yellow: 4,500-6,500 mcd - Green: 8,500-10,500 mcd - White: 16,000 mcd



Unmonitored studs for simple safety application.

CatEye: Bright Guardians of the Night Highway



- **Solar-Powered & Wireless:** No external power needed—harnessing the sun's energy for sustainable operation.
- **High-Impact Visibility:** Ultra-bright LEDs + reflective tape ensure 24/7 warning, even in heavy rain or fog.
- **Smart Synchronization:** Wireless 2.4G communication enables perfectly timed flashing (60x/min) across multiple units.
- **Built to Last:** Industrial-grade components, UV-resistant PC housing, and a staggering 280,000-hour LED lifespan.
- **Where It's Needed Most:** Ideal for sharp curves, steep slopes, intersections, and low-visibility areas—visible from 300+ meters away!
- **Safety never sleeps.** Equip your roads with CatEye and drive change, one flash at a time.

[Product Page](#)

Enhance Road Safety with CatEye Solar Synchronized Warning Light!

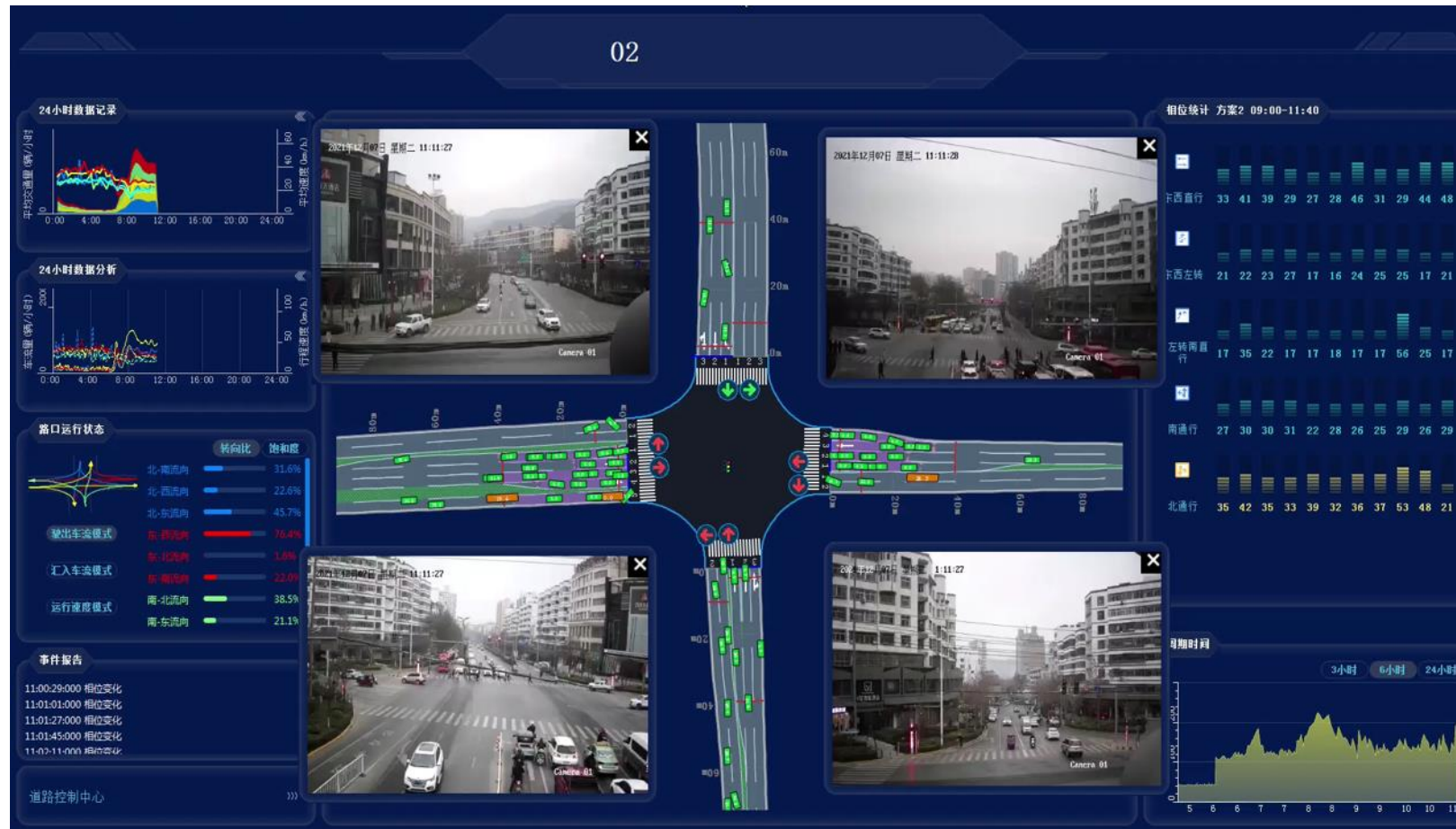


Why Choose ClairSaf-CatEye?

- ✓ Easy Installation – Quick setup with sleeve base or U-bracket mounting.
- ✓ Synchronized Flashing – Wireless sync with <50ms response for coordinated alerts.
- ✓ Auto Brightness Adjustment – Optimizes light intensity based on ambient conditions.
- ✓ High Visibility – Combines ultra-bright LEDs with reflective tape for 24/7 warning.
- ✓ Industrial-Grade Durability – Weather-resistant, corrosion-proof, and built with surge protection.
- ✓ Zero External Power – Fully solar-powered for eco-friendly, cost-effective operation.

[Youtube Video](#) [LinkedIn Introduction](#)

Digital Twin for Smart Intersection



Revolutionizing urban mobility with a holographic digital twin—powered by 24GHz radar, IP cameras, and edge computing.

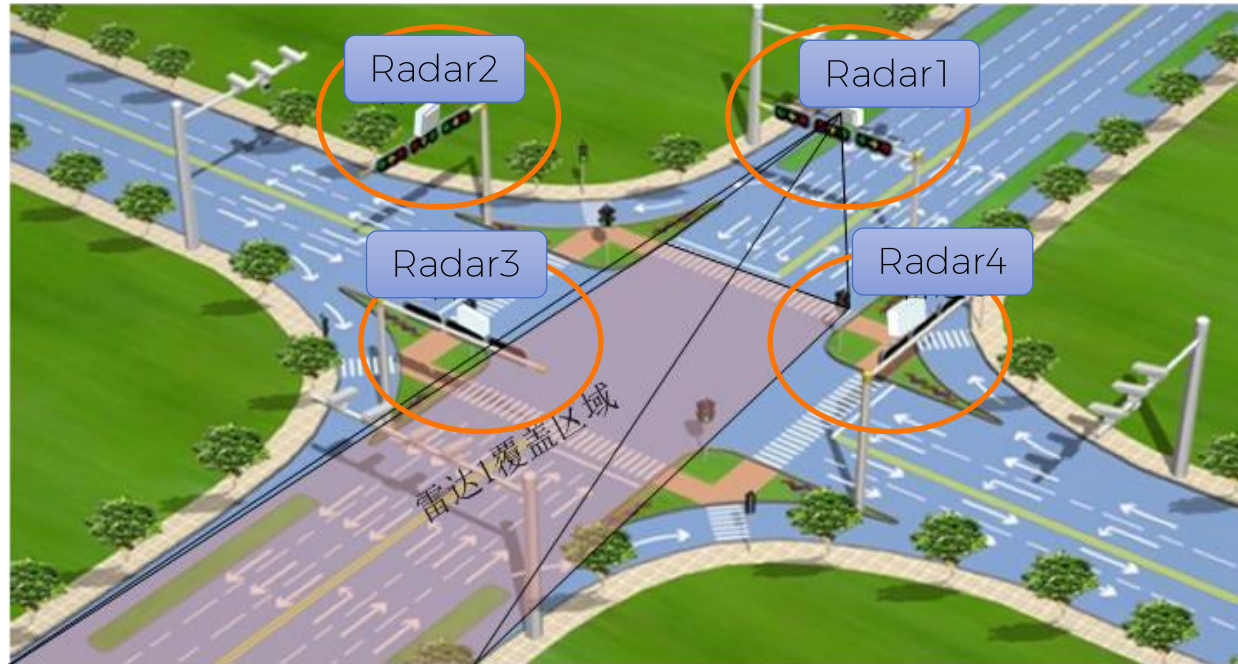
- Multi-sensor fusion creates a live 3D replica of the intersection, capturing every object with millimeter-wave precision and visual verification.
- On-device AI processes data at the edge—zero cloud latency, instant decisions, and privacy-preserving analytics.
- Dynamic signal optimization reduces congestion by 30% and cuts emergency response times—proactively preventing collisions.

[Youtube Video](#)

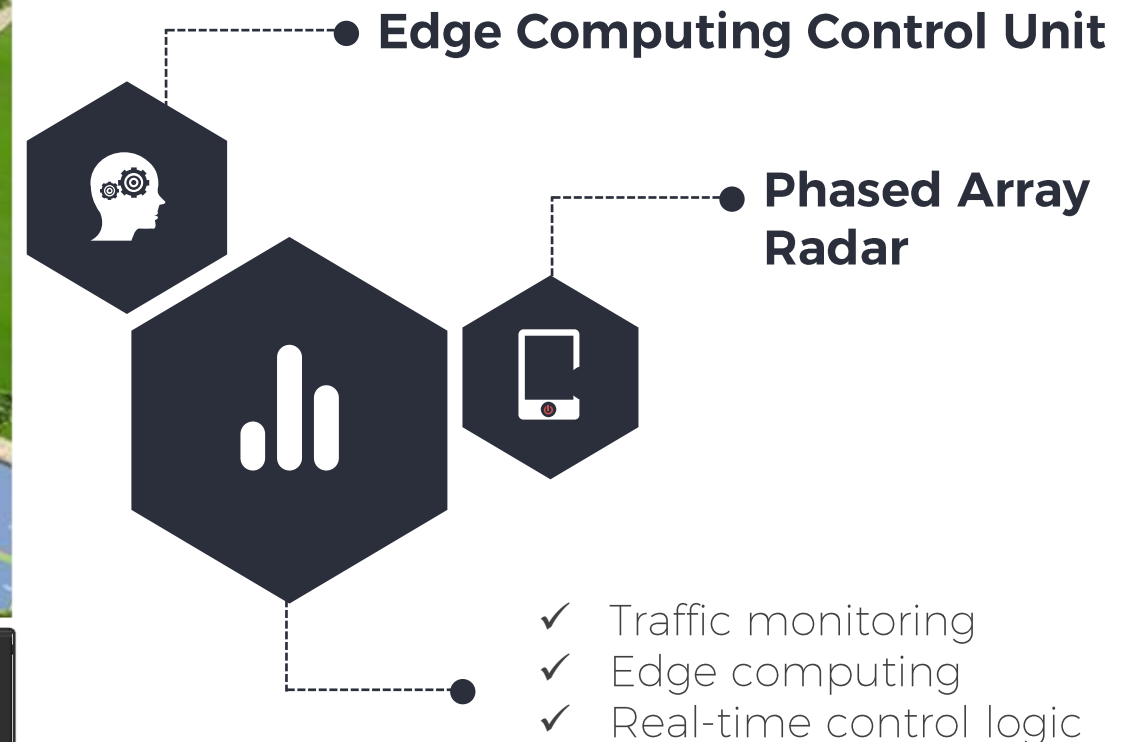
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System Architecture

Powered by 24GHz radar, IP cameras, and edge computing device.



ECCU Edge



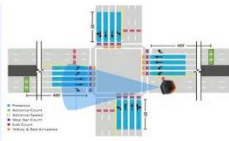
Mastering TraffiClair Signal Control Algorithms

A Step-by-Step Guide

High-resolution Perception and Control Data

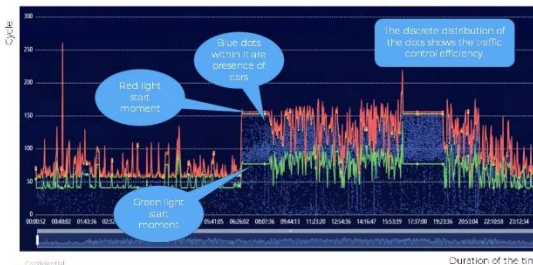
100-millisecond precision timestamp + event + status, more than 100 status and events

0	Phase On	01	Detector Off
1	Phase Begin Green	02	Detector On
2	Phase Check	03	Detector Reserved
3	Phase Max Compulsory	04	Detector Fault - Other
4	Phase Gap Out	05	Detector Fault - Working
5	Phase Max Out	06	Detector Fault - Open Loop
6	Phase Force Off	07	Detector Fault - Shared Loop
7	Phase Green Transition	08	Detector Fault - Locking
8	Phase Begin Yellow Clearance	09	Change Fault
9	Phase Begin Red Clearance	10	RedDetector Off
10	Phase Begin Red Clearance	11	RedDetector On
11	Phase End Red Clearance	12	RedDetector Faulted
12	Phase Inactive	13	RedDetector Reserved
		14	Vehicle Class
		15	Queue
		16	Detector events reserved for future use



Our algorithm (based on Phase, Step bar count and Yellow Red clearance) which scales to mid-sized and large intersections, which also support easy installation and investment saving.

High-Resolution Phase-Based Traffic Flow Arrival Analysis



Automatic Control Mode Selection

According to phase saturation & vehicle arrival characteristics

Traffic flow	Low & discontinuous	High	Not saturated	Saturated and oversaturated
Targets	Min delay	Max capacity	Max capacity	Equilibrium traffic computer integration
Control mode	VA control	Fixed cycle	Adaptive	CLP Coordinated control

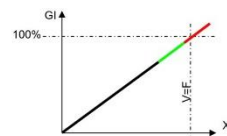


Algorithm Control Model

Phase

Optimal Control Objective: **Maximization of Phase Green Index (GI)**

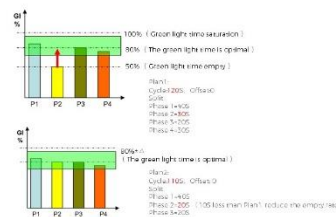
- Green Index (GI) Definition:**
 $GI = \frac{G_{eff} \times T_g}{T_g + T_r}$ where:
 G_{eff} : Effective green utilization time (seconds) incorporating:
 • Platoon arrival convenience (temporal alignment score 0-1)
 • Saturation flow compliance ratio (actual vs theoretical)
 T_g : Allocated effective green time (seconds)
 T_r : Design capacity (veh/h/line)



Algorithm Control Model

Cycle, Split

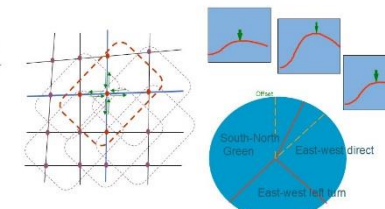
By analyzing the Green Index (GI) of conflicting approaches at an intersection, we can compare the GI values of all conflict directions under any signal control scheme. By examining the variation in Green Index across different time periods for the same movement direction, we can evaluate the impact of signal timing adjustments on intersection capacity at different times.



Algorithm Control Model

Offset

Identify a key intersection and coordinate adjacent intersections along the corridor to achieve synchronized corridor control while determining the practical maximum capacity for each approach direction.



Algorithm Advantages

1	2	3
High Resolution & Easy Detection	Automatic Control Mode Selection	Automatic Dynamic Control Plan Generation
• High-resolution perception and control data (100 millisecond timestamp) • Set up a control model relies on the detection data of 50 meters around the stop bar which perfectly fit the video detection • Detection has easy installation without the cut of pavement and low cost	• Control mode (VA/CLF/Adaptive) automatic selection according to the traffic flow arrival and phase saturation analysis • Beyond SCATS preset plans automatic selection, we can support control mode automatic selection	• Under the unsaturated traffic flow situation, adaptive control is used, and it automatically generate dynamic control plan adjusting the split, cycle and offset. • Beyond SCOOT dynamic plan generation, we use similar model but can shift the control mode while traffic is saturated

Signal Control System Benchmark

	TraffiClair	SCOOT	SCATS
Adaptive Control	√	√	√
Optimizes Split	√	√	√
Optimizes Cycle	√	√	√
Optimizes Offset	√	√	√
Control Mode Selection	√	X	Preset
Plan Generation	Support by EdgeBox	√	X
Cameras for Detection	√	X	Partial
Sensors Used	√	√	√
Central Processing	√	Central computer	Decentralized
Green Wave Coordination	√	√	√
Machine Learning	Support by EdgeBox	X	X
Vehicle Tracking	X	X	X
Journey Time Data	X	X	X
Origin-Destination Data	X	X	X
Open Standard	√	√	X



Case Study

Easing traffic congestion around Xi'an's Ming Dynasty City Wall Region through ClairGeo-M geomagnetic sensor system

Major Challenges



1. Core Importance: The Ming City Wall area is Xi'an's economic, cultural, and administrative center, located on the historic site of Tang Chang'an.
2. Key Facilities: Hosts 38 schools, 5 top hospitals, major commercial hubs (Bell Tower, Railway Station, etc.), and tourist spots (Muslim Quarter, Yongxing Fang).
3. Traffic Volume: 500,000+ daily vehicle trips (15.6% of Xi'an's total), but limited roads, dead ends, and parking shortages worsen congestion.
4. Bottlenecks: Gate tunnels act as natural chokepoints.
5. Congestion Levels:
6. Weekdays: 7-hour rush hours, congestion index ~2.2.
7. Holidays: Jams from 11 AM-midnight, peak index >3.5.
8. Hotspots: Bell Tower roundabout deadlocks and North Street slowdowns are common.

Solution

Automated Perception, Automated Identification,
and Auto-triggered Adaptive Regional Control

Resolve traffic bottlenecks and optimize urban road network efficiency.

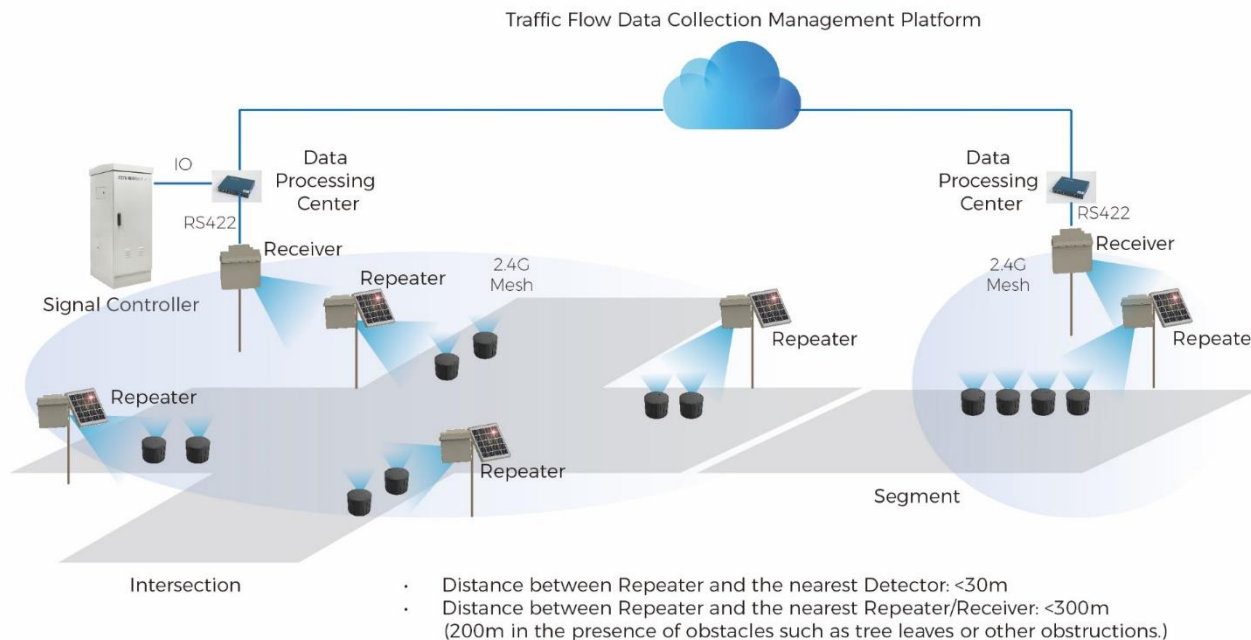
- **Data Collection & Integration**

- **Comprehensive traffic sensors + real-time fusion of internet-based traffic data.**

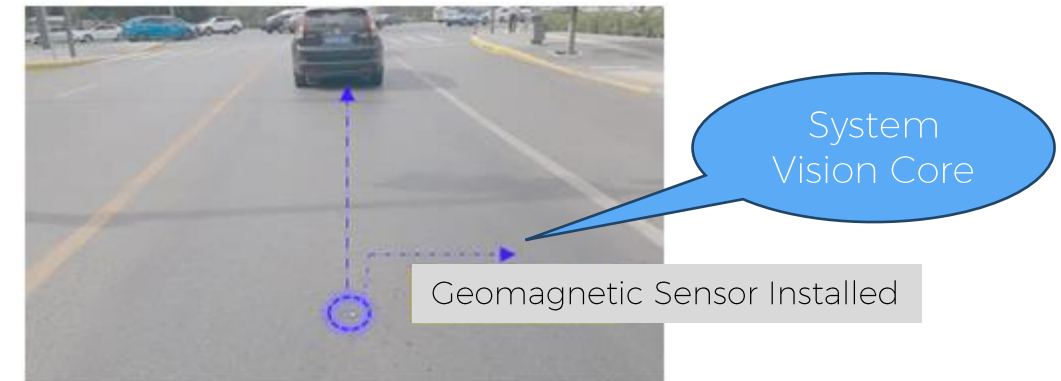
- Technical Innovations

- Data cleansing/imputation
- Demand-point identification
- Optimal control-point algorithms
- Macro-microscopic scheme auto-calculation

- Outcome: First city-wide implementation of adaptive regional signal control.



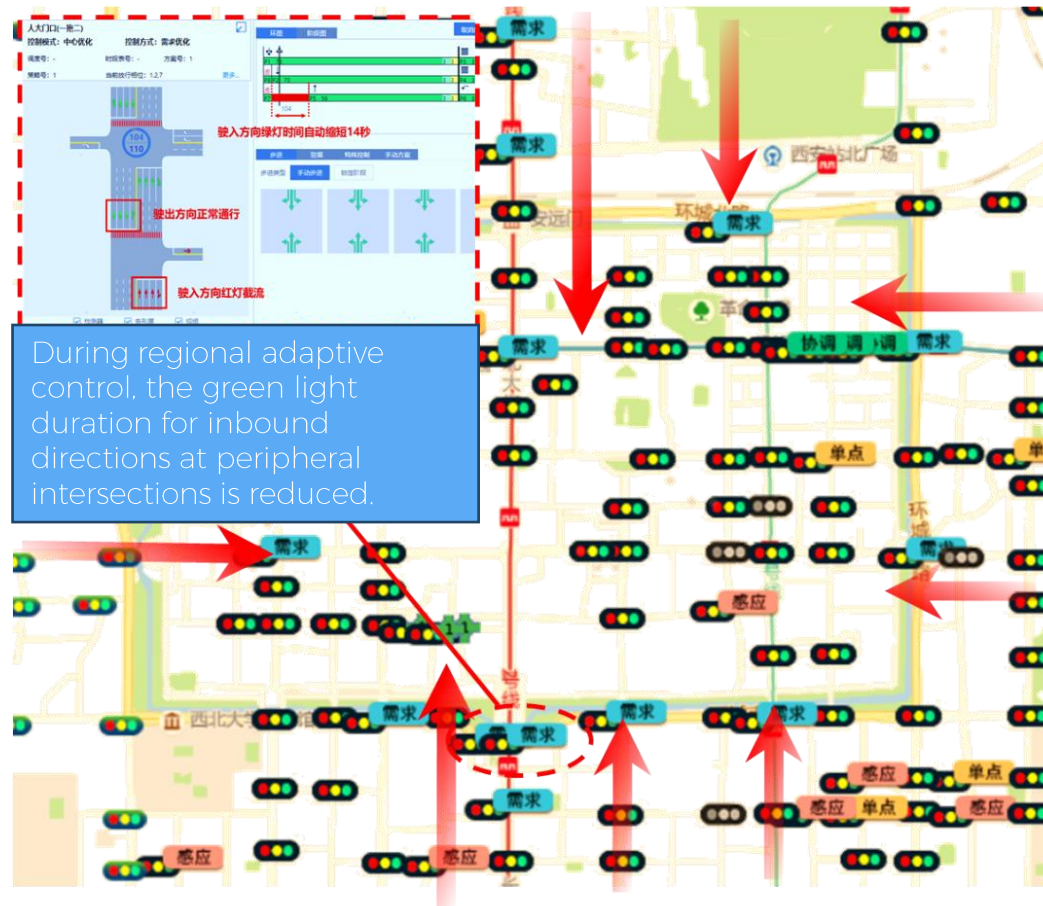
Geomagnetic Sensing System: System Vision Core



Total Installation in Xi'an City: **537** intersections, **5490** geomagnetic sensors.

Solution

Automated Perception, Automated Identification, and Auto-triggered Adaptive Regional Control



1.Dynamic Optimization

- Automatically adjusts strategies based on real-time traffic flow conditions.

2.Low-Volume Traffic Mode

- Activates routine demand control when traffic is light, optimizing:
 - Signal phasing & sequencing at congested intersections.
 - Time-period segmentation and pedestrian signals.
 - Coordinated "green wave" (progression) and "red wave" (hold-back) schemes for North Street corridor.

3.Key Bottleneck Targets

- Focuses on critical intersections:
 - North Gate Roundabout Cross
 - North Street-Lianhu Road Cross
 - Xihua Gate Cross
- Optimizes arterial roads: Lianhu Road, East 5th Road, North Street.

4.Efficiency Gains

- 15% improvement in regional traffic flow post-optimization.**

Solution

Automated Perception, Automated Identification, and Auto-triggered Adaptive Regional Control



Strategy: "Restrict outside, accelerate inside" to relieve congestion.

1. High-Traffic Adaptive Control

- Automatically activates regional adaptive optimization when traffic volume is high.

2. Traffic Monitoring & Control Points

- 5 key intersections + 2 critical road sections act as "watermark monitoring points" to track real-time upstream/downstream flow.
- 18 perimeter intersections designated as "flow control points" (restrict inbound traffic).
- 11 diversion intersections act as "flow discharge points" (accelerate outbound traffic).

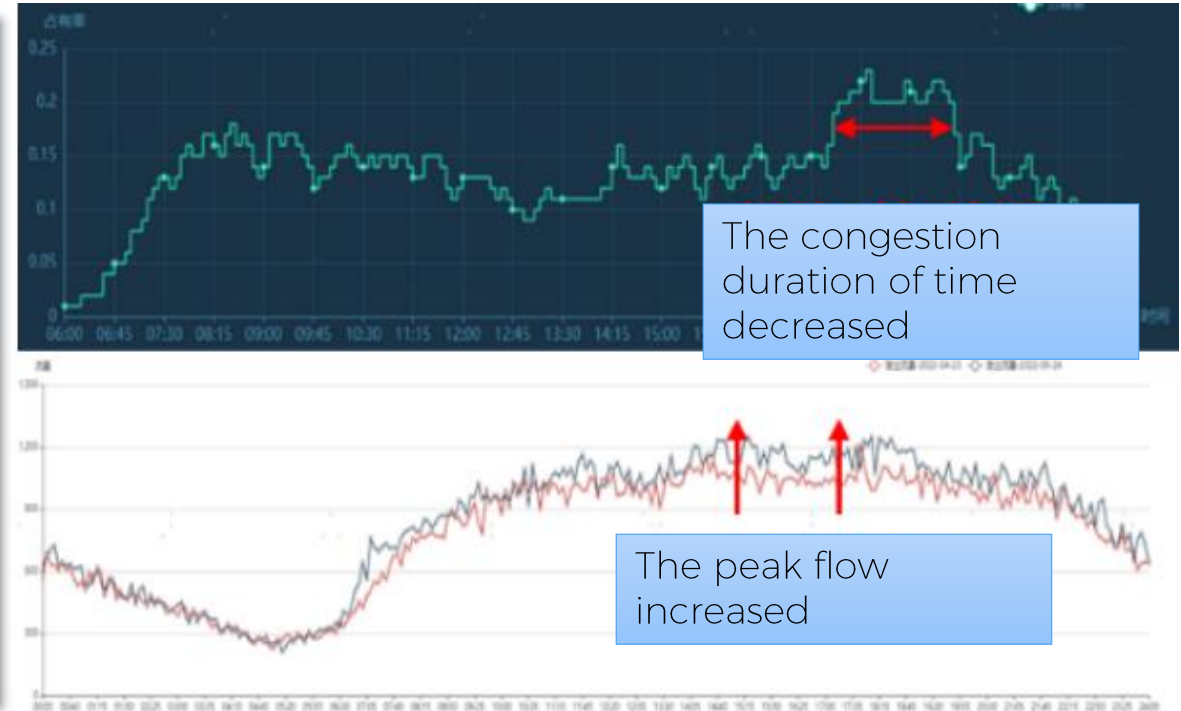
3. Dynamic Balancing Mechanism

- Adjusts traffic flow based on gate entry/exit volumes and remaining capacity calculations inside the Ming City Wall area.

4. Real-Time Signal Adjustments

- When traffic increases:
 - Shortens green time at control points (reducing inbound flow).
 - Extends green time at discharge points (speeding up outbound flow).

Result: The Whole Region



- **12.8% increase** in peak-hour throughput at regional boundaries (vs. pre-optimization)
- **7.2% reduction** in peak congestion index
- **35-minute shorter** weekday rush hours
- **100-minute shorter** holiday peak periods

Result: Each Intersection



After using data collected by geomagnetic sensing system, the real-time adaptive signal control system achieved:

- 77.8% reduction in green light idle time (18s→4s/cycle)
- 23.1% decrease in intersection delay index (28.08→21.60)
- Significant mitigation of both vehicle queuing waste and green phase underutilization

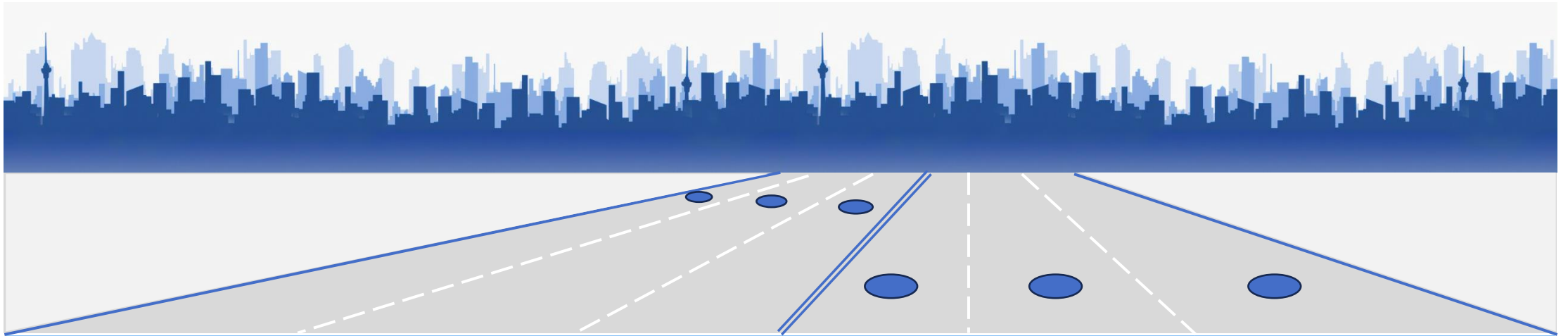
Result: Corridor GreenWave



Fengcheng 6 avenue
Intersections: 11
Stops: 1

The Mingguang Road two-way green wave scheme designates the south-to-north direction as the primary direction, allowing continuous passage from Fengcheng 1st Road to Fengcheng 8th Road with at most one stop. Due to the higher requirements of two-way green wave coordination on roadway segments, this design requires north-to-south traffic starting from Fengcheng 8th Road to stop once at Fengcheng 3rd Road and once again at Fengcheng 2nd Road.

Benefits of Geomagnetic Sensor

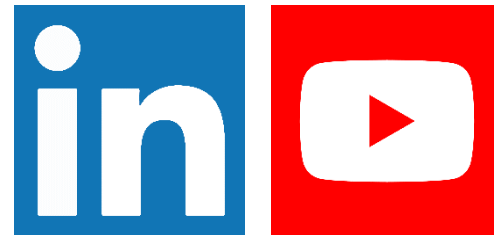


Benefits

- No need for wiring, easy construction
- Minimal damage to the road surface
- Short construction time, minimal road occupancy
- Not susceptible to crushing damage
- Can be removed for reuse due to road maintenance or other reasons
- Low susceptibility to weather conditions, not affected by sandstorm, rain, snow, or fog

Join the journey towards the future of mobility.

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[202501, 202502, 202503, all previous issues...](#)



Thanks

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