HU ENTROPY TECH
深圳胡熵科技有限公司

Shenzhen Hu Entropy Tech Co., Ltd.



ONLINE VISUAL TRACKING SYSTEM

24/7 CONTINUOUS STRUCTURAL HEALTH MONITORING

Real-Time Synchronization · Dynamic Monitoring · Intelligent Recognition · Data Reliability

PRODUCT INTRODUCTION



Powered by advanced oblique-axis Digital Image Correlation (DIC) technology, the Online Visual Tracking System combines high-resolution imaging, intelligent target recognition, and sub-pixel measurement algorithms to deliver continuous, non-contact structural displacement and deformation monitoring.

By automatically capturing and tracking passive targets installed on monitored structures, the system accurately measures horizontal and vertical displacement without requiring physical contact or manual intervention. Measurement data is processed in real time and transmitted to a cloud-based platform, enabling live visualization, quantitative analysis, historical data review, and intelligent alarm notifications.

Designed for 24/7 continuous monitoring, the system provides reliable and actionable insights into structural behavior, supporting safety assessment and early warning across a wide range of infrastructure applications, including bridges, tunnels, dams, slopes, and other critical engineering structures.

Product Advantages

Easy Operation

-Intelligent target recognition and automatic measurement eliminate the need for manual intervention.

-Automatic cloud data transmission enables real-time access through web and WeChat Mini Program clients.

- Configurable alarm thresholds provide timely notifications of potential structural anomalies.

Flexible Installation

-Quick screw-based installation with multiple mounting options, including wall, pole, and tripod mounting.

- Passive targets require no external power supply, simplifying deployment and reducing installation complexity.

Comprehensive Data Analysis

-Synchronized multi-point displacement measurement with simultaneous 2D horizontal and vertical displacement visualization.

-Provides multiple analytical outputs, including structural deflection, impact factor, power spectrum, and interval frequency.

- Supports comprehensive structural behavior assessment through real-time measurement and data analysis.

Reliable Performance

-Advanced algorithms and integrated hardware design help mitigate interference from rain, snow, fog, temperature fluctuations, changing lighting conditions, target occlusion, and mechanical vibration.

- Intelligent compensation and target reacquisition help maintain measurement stability and continuity under complex environmental conditions.

TECHNICAL PRINCIPLE

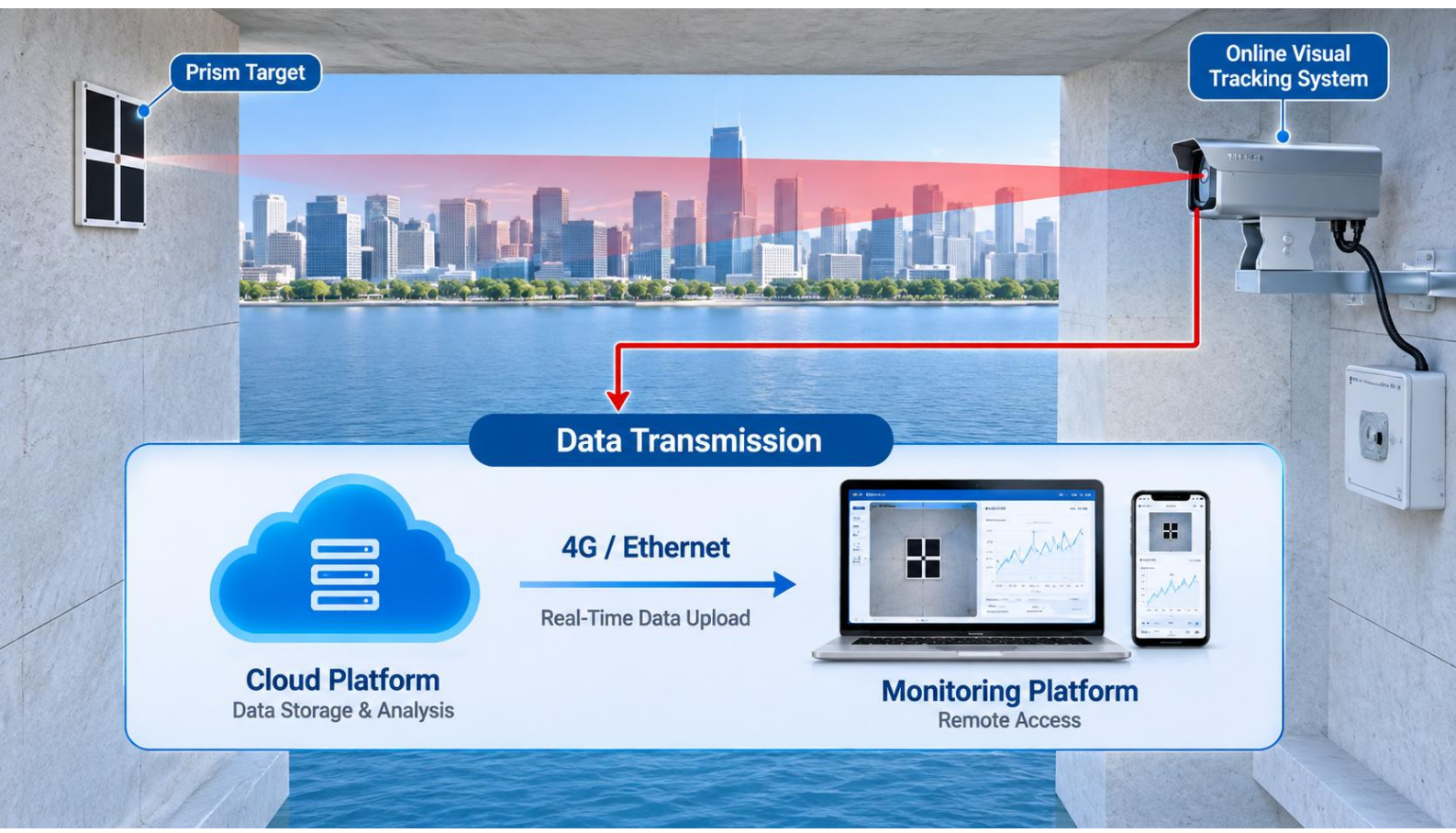
The Online Visual Tracking System is deployed at a stable reference location, while passive targets are installed on the monitored structure to serve as measurement points.

Using high-resolution image acquisition, Digital Image Correlation (DIC), and sub-pixel target recognition algorithms, the system continuously tracks changes in target positions and calculates horizontal and vertical displacement with high precision, without physical contact with the monitored structure.

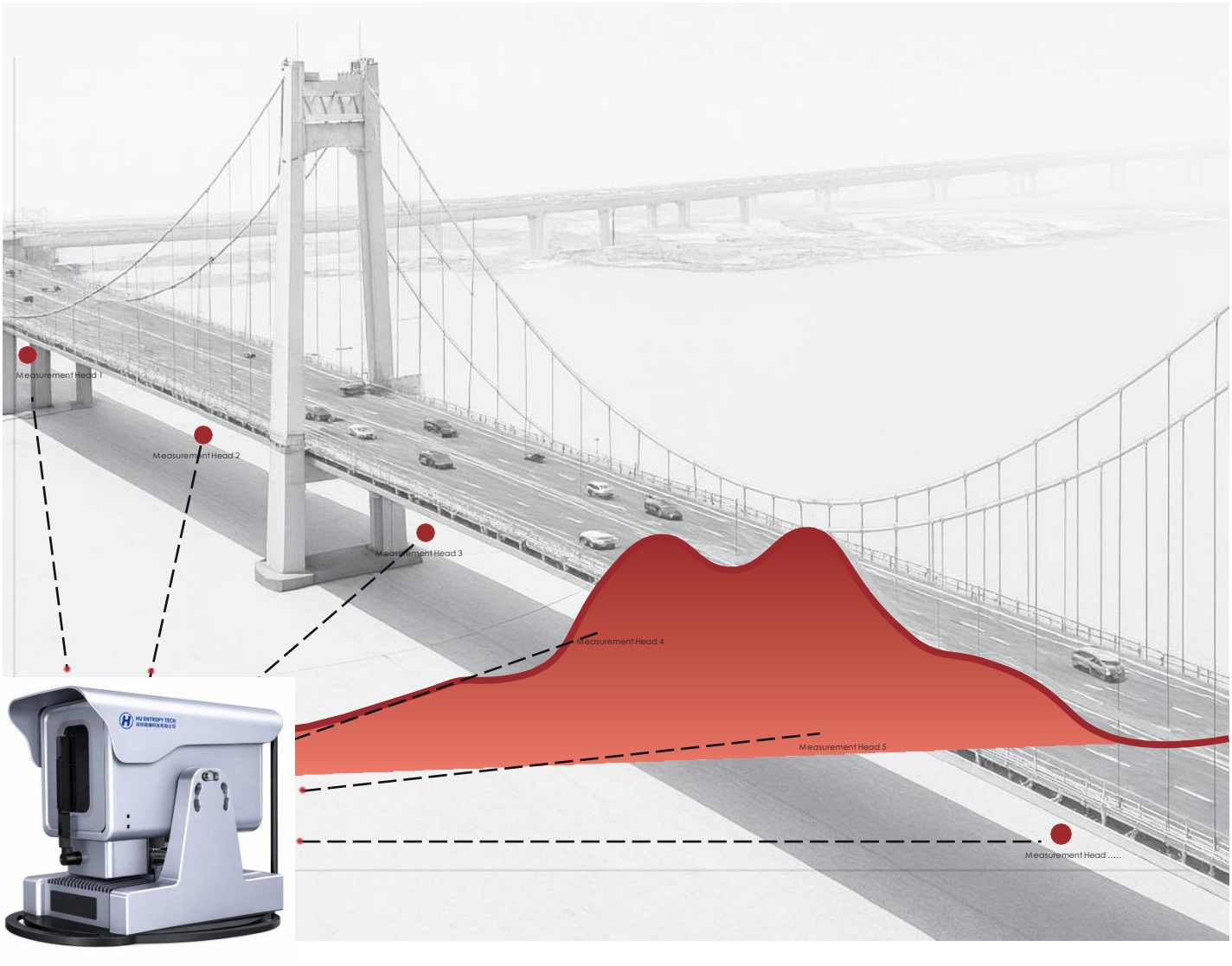
Measurement data is automatically processed and transmitted to the cloud platform via the network. Users can remotely access real-time measurements, monitor displacement trends, and review historical data through the web platform or WeChat Mini Program, enabling continuous, 24/7 structural displacement monitoring.



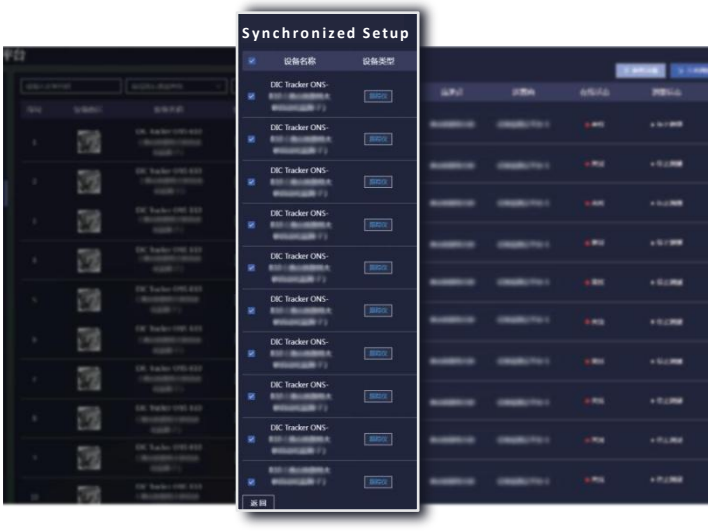
Passive Target | Online Visual Tracking System | SHM Cloud Platform | Multi-Endpoint Access



PRODUCT ADVANTAGES



MULTI-DEVICE COORDINATION

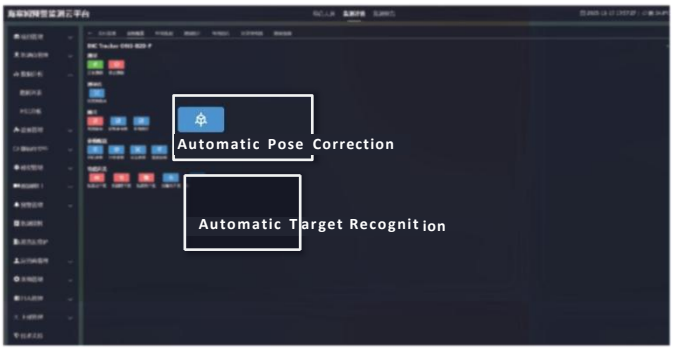


- Supports synchronized triggering and reset across multiple measurement heads, enabling coordinated multi-point, multi-directional dynamic monitoring.
- Automatic initial calibration based on pose-fusion algorithms ensures measurement consistency across multiple systems.
- Suitable for large-scale structures such as long-span bridges, tunnel groups, and dams.



MULTI-TARGET MEASUREMENT

- Using high-precision pose positioning algorithms and Intelligent target recognition, the system automatically identifies multiple targets and their spatial positions, enabling unattended initial calibration and periodic self-calibration.
- During monitoring, the system can automatically recover measurement-baseline drift caused by vibration or offset, maintaining high consistency during long-term operation.





Automatic Multi-Target Recognition & Numbering

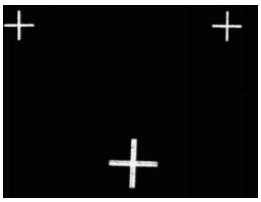


Multi-Point Data

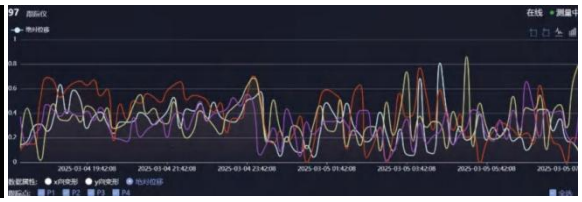
ROBUST INTERFERENCE RESISTANCE

Weather Interference Resistance

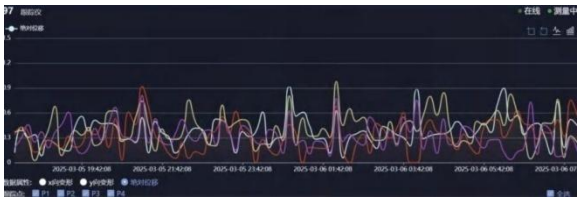
- Deep-learning models identify and mitigate interference caused by rain, snow, fog, and other weather conditions.
- Rain Interference Resistance: Hardware and algorithms work together to keep measurement fluctuation to ≤1 mm on rainy days.



Target in Rain



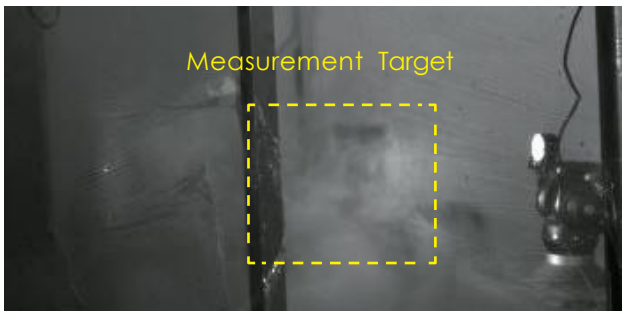
Monitoring Data in Dry Conditions



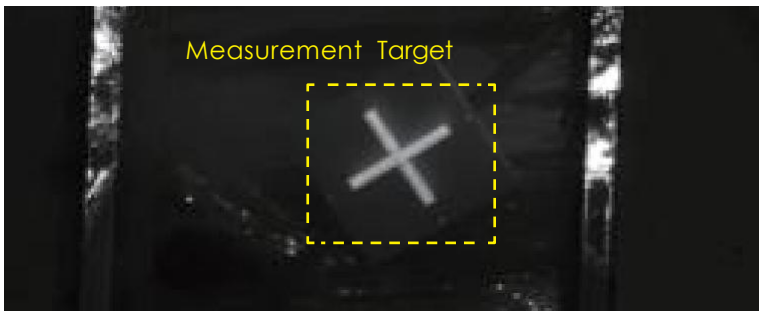
Monitoring Data on Rainy Days

Fog Interference Resistance

- Electronic de-fogging combined with algorithmic reconstruction enables target tracking even in low-visibility environments.



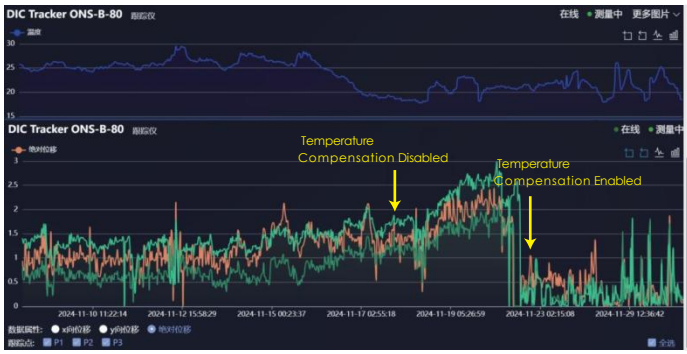
De-Fogging Disabled



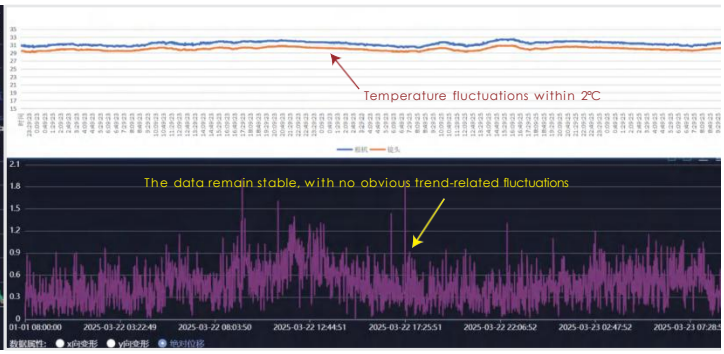
De-Fogging Enabled

Temperature Interference Resistance

- Temperature compensation works together with intelligent thermal control to reduce temperature-gradient drift, improving measurement accuracy by approximately 50%.



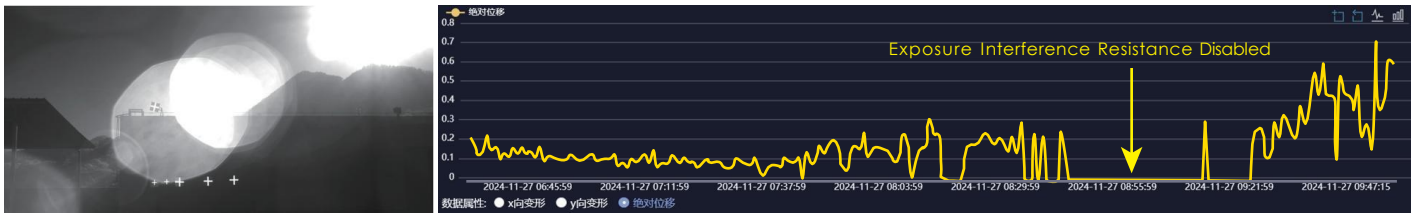
Temperature Compensation Disabled



Temperature Compensation Enabled

Exposure Interference Resistance

- Automatic lighting recognition and dynamic exposure adjustment.



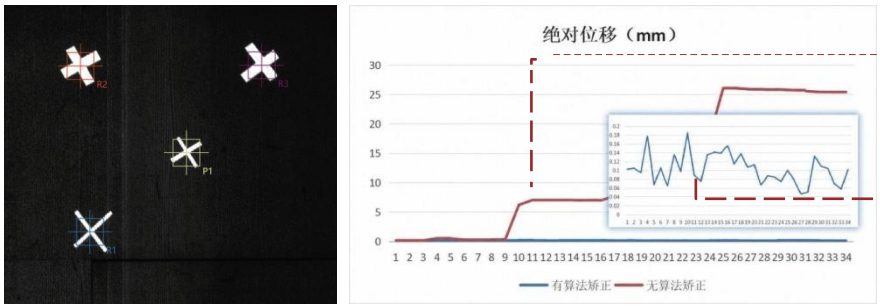
Exposure Interference Resistance Disabled



Exposure Interference Resistance Enabled

Vibration Interference Resistance

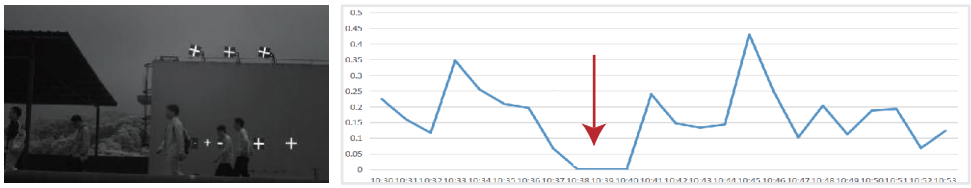
- Deep learning combined with pose positioning algorithms provides real-time pose compensation, effectively reducing the impact of mechanical vibration.



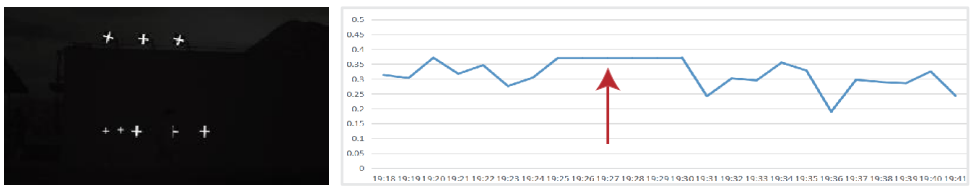
Anti-Vibration Enabled

Occlusion Interference Resistance

- After a target is temporarily occluded, the system automatically reacquires it to avoid false alarms.



Occlusion Interference Resistance Disabled



Occlusion Interference Resistance Enabled

SMART SENSING & LINKAGE

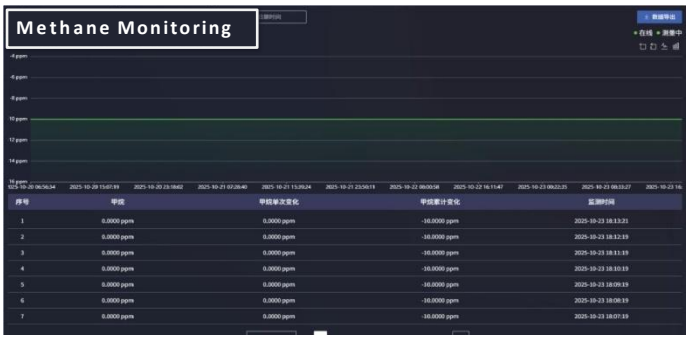
Battery Monitoring & Auto Restart

Real-time battery monitoring and automatic restart after power loss.



Gas Leak Detection

Intelligent methane detection using catalytic-combustion sensing.



Temperature & Humidity Monitoring

Integrated sensing with expandable monitoring capability.



Temperature Data



Humidity Data

Video Linkage & Visual Surveillance

Integrated sensing with expandable monitoring capability.



Deformation Monitoring



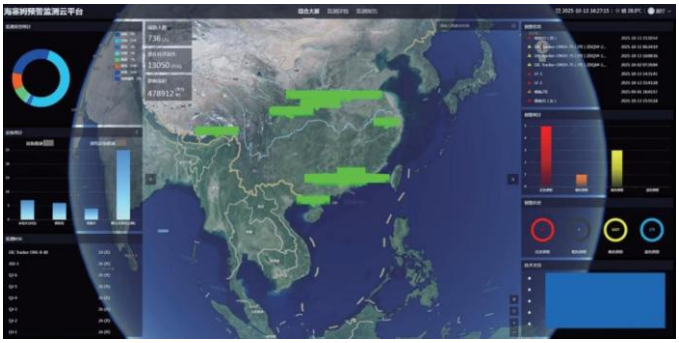
Surveillance Image

SHM CLOUD PLATFORM

All monitoring data is uploaded to HuEntropy's SHM Cloud Platform through secure protocols. Users can remotely view monitoring data, displacement trends, alert records, and linked video information through the web client or WeChat Mini Program.

The platform supports API integration, map-based visualization, alert push notifications, and report export, creating a digital closed loop from monitoring to decision-making.





Monitoring Dashboard



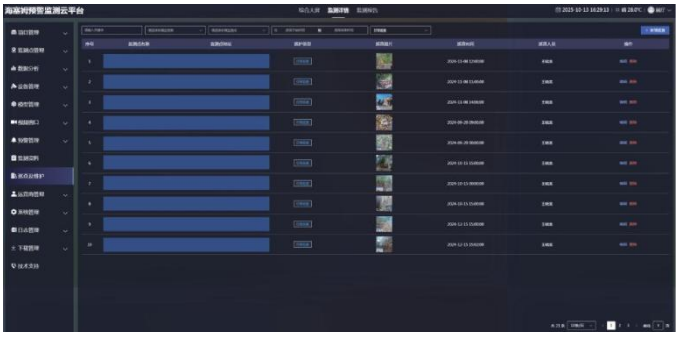
Data Analytics



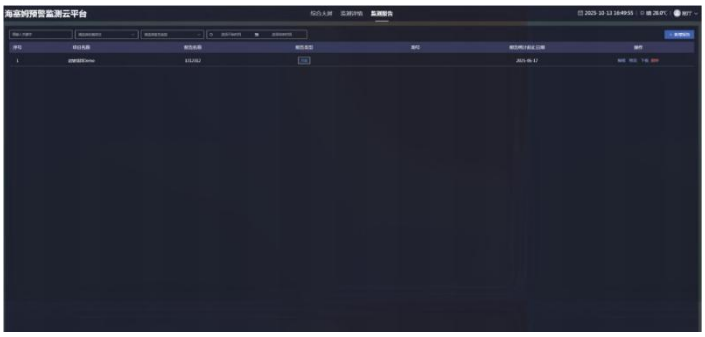
Alert Management



Live Video



Routine Inspection



Report Export

FLEXIBLE ONLINE VISUAL TRACKING SYSTEM

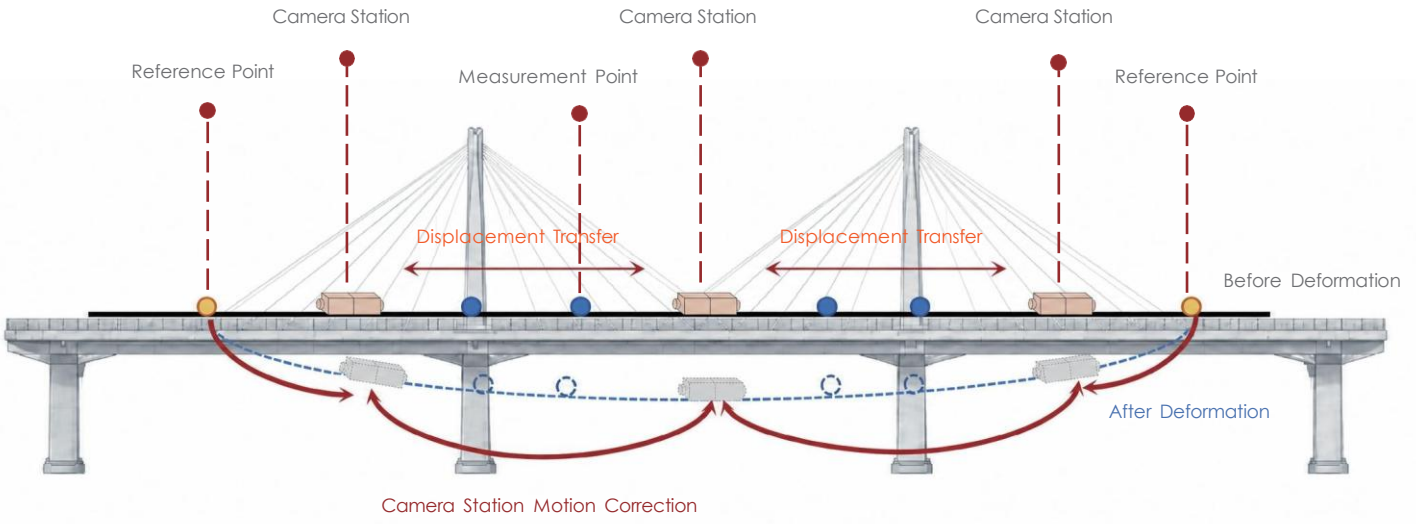
The Flexible Visual Tracking System adopts a flexible integrated dual-camera configuration based on oblique-axis DIC technology. It converts real-time image data into real-time displacement and deformation data, enabling ultra-high-precision, non-contact, real-time dynamic measurement of large structures such as bridges, tunnels, slopes, and metro systems, as well as all-weather monitoring of structural health conditions.



- No fixed limit on measurement points, supporting synchronized multi-point displacement monitoring.
- Sampling frequency up to 33 Hz for real-time dynamic deflection monitoring.
- Adjustable measurement-head spacing and angle to meet different accuracy requirements.
- Powerful edge computing enables real-time measurement, transmission, and alarming.
- Reference points can be extended to suitable stable locations when none are available within the monitored area.
- The cloud platform supports real-time data and site image viewing, as well as historical data export.

Technical Principle

Two cameras form a dual-camera station and move synchronously as a rigidly linked unit. In long-range applications, the architecture can be extended to multiple camera stations. Adjacent stations establish common-point constraints through shared cooperative targets, while reference points in stable areas provide real-time calibration. By combining rigid-link, common-point, and reference constraints, the system can maintain high-precision, real-time multi-point deformation measurement across the entire structure even when individual stations undergo slight movement.



MOBILE MONITORING

The Mobile Visual Tracking System combines IoT technology with intelligent algorithms to deliver high-precision, non-contact displacement and deformation monitoring. Designed for slopes, foundation pits, buildings, bridges, tunnels, and other structures, it supports trolley- or robot-mounted deployment for flexible manual or automated measurement.



- Enables rapid, non-contact on-site deployment.
- Supports synchronized multi-point static and dynamic displacement measurement.
- Edge computing reduces data transmission requirements.
- The cloud platform supports real-time data and live site viewing, with historical data export.
- Supports trolley, wheeled-robot, and tracked-robot mounting for flexible manual or automated deployment.

MOBILE MONITORING

Highly Integrated | Rapid Deployment | Real-Time Feedback | Temporary & Permanent Integration

01

Displacement & Tilt

Displacement, settlement, convergence, cracks, and tilt.

02

Stress, Strain & Vibration

Strain gauges and accelerometers

03

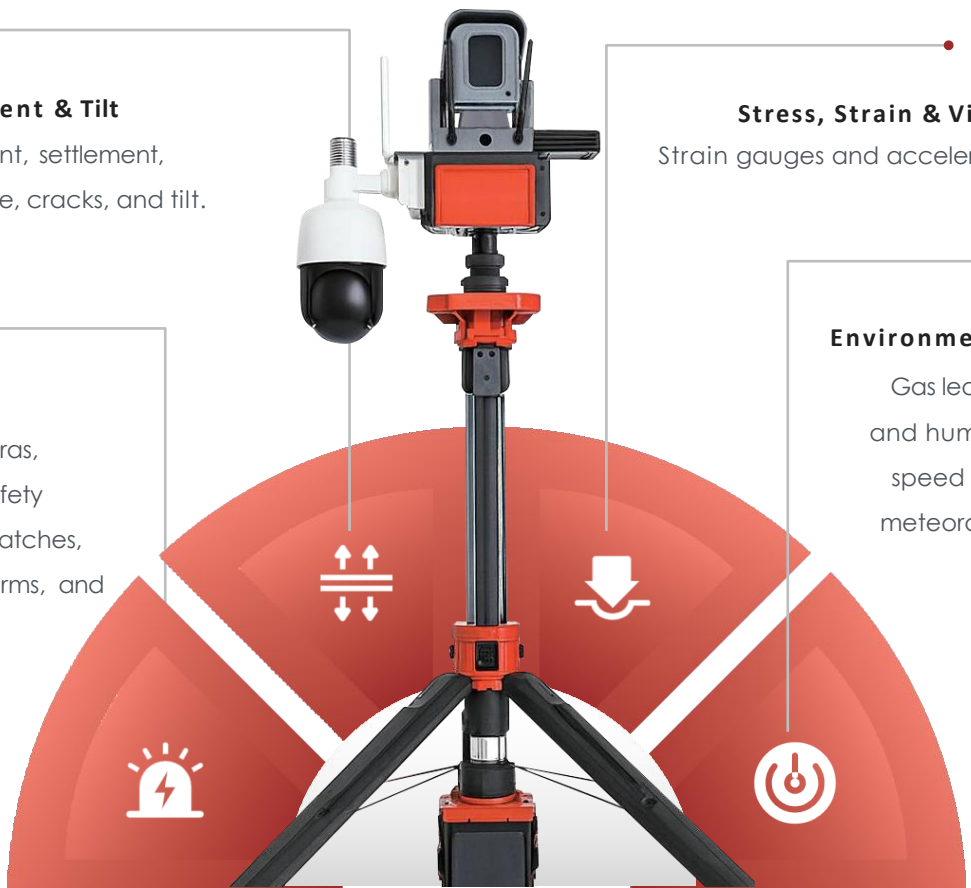
Alarm System

Monitoring cameras, alarm-enabled safety helmets, alarm watches, audible/visual alarms, and SMS alerts.

04

Environmental Monitoring

Gas leakage, temperature and humidity, rainfall, wind speed and direction, and meteorological conditions.



APPLICATIONS



Bridge

Deflection, vibration frequency, and amplitude



Tunnel

Settlement, clearance changes, cracks, etc.



Slope

Settlement, cracks, collapse, etc.



Railway & Road

Displacement and vibration



Reservoir

Settlement, cracks, collapse



Large Structure

Settlement, tilt, etc.



Mine

Settlement, cracks, collapse



Trusses & Derrick

Settlement, cracks, collapse



Large-Span Structure

Settlement, tilt, cracks, etc.



Geological

Settlement, tilt, cracks, etc.

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From installation and commissioning to long-term operation, HuEntropy supports structural safety throughout every stage.

Covering the full engineering lifecycle, HuEntropy provides integrated services from site survey and system deployment to data monitoring, intelligent analysis, and ongoing maintenance. By connecting engineering sites with safety decision-making through vision sensing technology, HuEntropy makes structural conditions visible, risks detectable, and operation and maintenance smarter.

APPLICATION CASES

- High-Frequency Dynamic Deflection Monitoring for Metro Viaduct | Wuhan,Hubei





- Bridge Structural Health Monitoring System |Guangzhou,Guangdong





- Emergency Visual Displacement Monitoring |Guangzhou,Guangdong





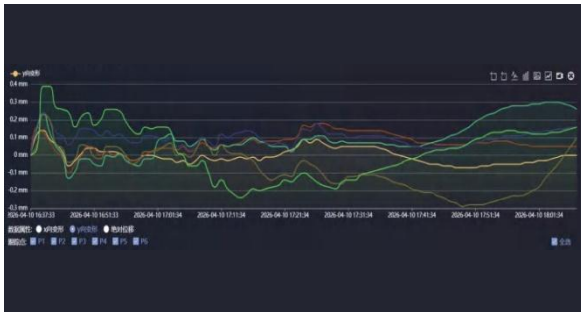
- Bridge Deflection Monitoring, Zijiang Bridge, Pingyi Expressway |Yiyang,Hunan





- Tunnel Settlement Monitoring, Shenzhen–Shantou Railway |Shenzhen,Guangdong





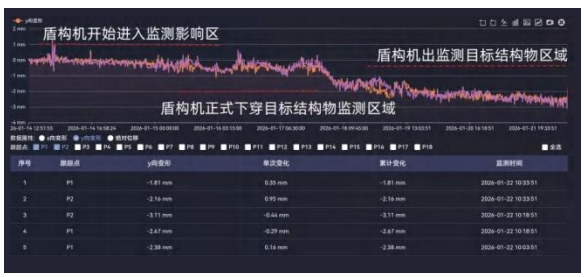
- Parallel Tunnel Convergence Monitoring, Shicun Tunnel, Changsha–Ganzhou Railway |Ganzhou,Jiangxi





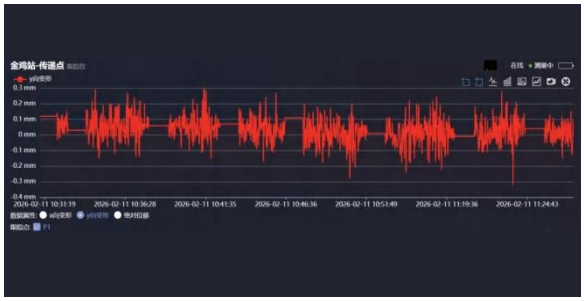
- Automated Main-Structure Monitoring, Metro Line 15 Covered Section |Qingdao,Shandong





- Station Structure Monitoring, Jinjilu Station, Metro Line 5 |Hangzhou,Zhejiang





- Automated Expressway Slope Displacement Monitoring | Jincheng,Shanxi





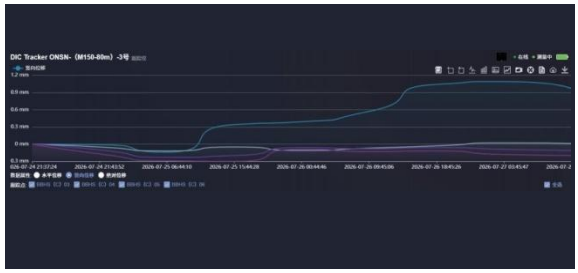
- Slope Displacement Monitoring | Zhangzhou,Fujian





- Foundation Pit Monitoring | Jiangmen,Guangdong





- Long-Distance Heating Pipeline Crossing Monitoring | Yantai,Shandong





TYPICAL CLIENTS

Guangdong Communications Group

Zhejiang Communications Investment Group

Hunan Communications & Water Conservancy Group

Beijing Capital Highway Group

Henan Communications Investment Group

Shanxi Communications Investment Group

Shandong Hi-Speed Group

Fujian Expressway Group

Beijing Construction Engineering Group

Chinese Academy of Cultural Heritage

Shenzhen Special Zone Construction Group

Shudao Group

Shenzhen Transport Bureau

Shenzhen Geotechnical Engineering Group

CCCC Tunnel Engineering Bureau

China Railway Engineering Group (CREC)

Hunan Rail Transit Group

Beijing Enterprises Group

Hubei Architectural Design Institute

Guangdong Water Resources & Hydropower Institute

China Academy of Railway Sciences Group

PowerChina East China Engineering Corporation

Chongqing Construction Industry Group

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HU ENTROPY TECH
IoT Monitoring, Smarter Future.
深圳胡熵科技有限公司

GIVING MACHINES THE POWER OF VISION

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