



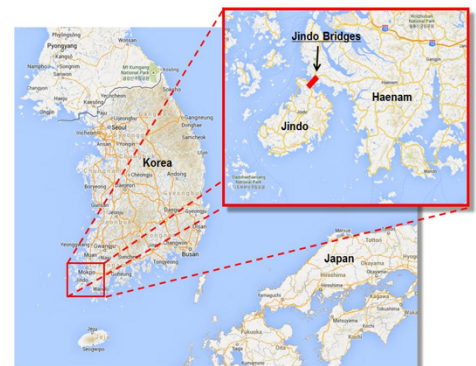
STRUCTURAL HEALTH MONITORING

Case Study: World's Largest Wireless Smart Sensor Network

Cutting Costs and Harnessing Power with Wireless Infrastructure Monitoring

The structural monitoring of the Jindo Bridge in South Korea was a collaboration between the University of Illinois and a university in Korea to demonstrate the viability of wireless sensing. When installed, it was the world's most extensive wireless structural health monitoring (SHM) deployment, featuring over 100 sensors that provided more than 600 sensor channels of near real-time data. The outcome was the development of the foundational sensor network and IoT software, which forms the core of the IoT part of StructureIQ's solution.

Location	Jindo Bridges, South Korea
Collaborating Institutions	University of Illinois Urbana-Champaign (USA), KAIST (Korea), University of Tokyo (Japan)
Lead Researcher (U.S.)	Dr. Hongki Jo, University of Illinois Urbana-Champaign, Advisors: Prof. B.F. Spencer Jr. and Prof. G. Agha
Deployment Period	2009 – 2012
Technology Platform	Smart Sensor Network (Wireless Structural Health Monitoring System)



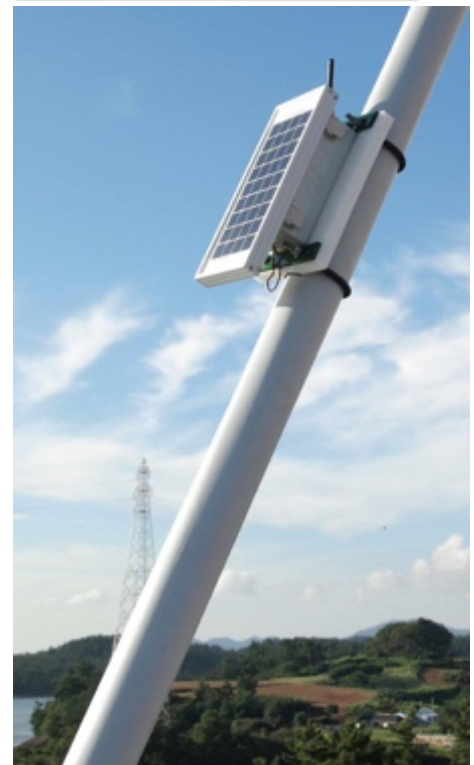
Traditional wired structural monitoring systems for bridges and other large infrastructure are expensive and complex to install.

They require kilometers of wiring for power and data, making routine maintenance and inspection costly and often reactive. Bridge owners and engineers need a cost-effective, scalable, and reliable method for continuous, proactive monitoring of structural health.

The Solution: The Jindo Bridge Wireless Monitoring Network

(Prototype for StructureIQ)

The solution is a wireless sensor network designed for continuous monitoring of structural health. This system uses small, low-power electronic sensors and microprocessors to track key structural factors such as vibration, wind conditions, humidity, and stress or strain (implied by monitoring for cracks and bridge health). Powered by solar energy, the monitoring network also reduces wiring and complexity.





How It Works:

1. **Deployment:** A network of wireless sensors is strategically placed on the structure.
2. **Data Collection:** The sensors continuously monitor the structure and gather real-time data.
3. **Analysis & Reporting:** The network evaluates the data and promptly reports anomalies or potential issues to engineers.
4. **Power Efficiency:** The system features advanced power-management software. Sensors can extend battery life by harvesting energy from the sun, supporting long-term, low-maintenance operation.

Benefits and Key Advantages:

Feature	✓ Wireless	✗ Traditional (Wired)
Installation Cost	Significantly lower (approx. \$100 per channel/sensor)	Thousands of dollars per channel
Maintenance	Low; batteries expected to last three years	High; requires routing and maintenance of extensive wiring
Scalability/Deployment	Simple and fast; no extensive wiring infrastructure required	Complex and time-consuming
Power Source	Flexible, with power harvesting (sun, wind, vibration)	Requires running power wires
Value Proposition	Enables proactive, data-driven decisions for bridge owners; potential alternative to manual inspection.	Typically used for reactive/event-driven monitoring (e.g., following an earthquake).

Technology:

The project requires seven core developments focused on hardware (for multi-metric sensing and power harvesting) and software (for autonomous, power-efficient, fault-tolerant operation, cable tension monitoring, and user management of the Imote2 WSSN).

Market Opportunity:

StructureIQ is a data-driven solution that improves global infrastructure safety, resilience, and financial stability. The company's wireless monitoring systems provide an affordable and practical alternative to traditional wired systems for long-span bridges, buildings, and other structures. The technology is especially useful after major events, like earthquakes, to quickly verify if there is any damage to a structure. This efficiency leads to cost savings and enhances safety for infrastructure owners.

StructureIQ builds on the success of pioneering wireless sensor networks, such as the Jindo Bridge system, to fundamentally transform the Structural Health Monitoring (SHM) industry. By utilizing a patented, low-cost smart sensor technology combined with advanced Internet of Things (IoT) and AI-powered analytics offered through a scalable SaaS subscription, StructureIQ delivers continuous, real-time intelligence that benefits key industry stakeholders.

- **Owners:** Reduces costs and extends asset lifespan through continuous monitoring.
- **Engineers:** Provides immediate, actionable data and automated alerts for quick post-event safety decisions.
- **Insurers:** Delivers precise, objective data for more accurate risk assessment and pricing.

Contact StructureIQ to learn more:
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