Infrastructure Inspection:

Advanced, Continuous Assessment of Structural Integrity

Background

Infrastructure owners seek to reduce risk of failure, minimize inspection costs, and extend operational lifetime. Their engineering custodians desire real-time status information that enables them to plan for, repair, and replace critical components at the most convenient time. As such, more and more frequently, engineering custodians install structural health monitoring systems. Such systems can detect changes in the infrastructure and provide real-time warning of functional and structural degradation.

Structural Integrity Assessment for:

- Bridges
- Dams
- Nuclear Power Plant Mechanical Systems
- Chemical Plant & Refinery Mechanical Systems
- Aerospace
- Automotive
- Ship & Marine Operations

Challenges

However, there are many challenges associated with today's monitoring and assessment methods.

Most real-time structural assessment instrumentation requires a probe or sensing device to be in contact with the structural element under investigation. Installation can be manually intensive. Because there are no technologies for directly sensing damage, tools commonly measure alternate, but measurable, physical quantities that can sometimes be associated with damage. Certain tools do not alert operators until the damage is quite severe. Tools that accurately monitor strain and displacement (movement), key indicators of structural health, can be cumbersome to use.

For these reasons optical methods that involve remote non-contact monitoring have gained ground. Some have proven useful in a controlled laboratory setting for experimental structural mechanics applications. However in the field they present challenges: Setup can be time consuming. They struggle to accurately assess the structural integrity of common industrial structures, which have curves, openings, holes, notches, and welds. Their accuracy can also be severely impacted by real world conditions such as wind and movement.

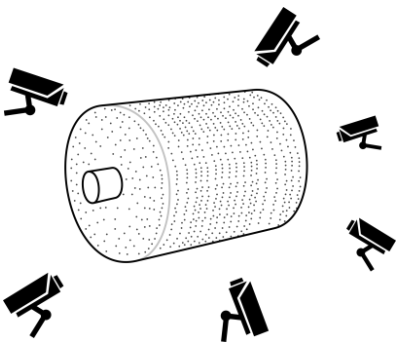


Figure 1: Schematic representation of the Point Semantics pressure vessel monitoring solution

The Point Semantics Solution

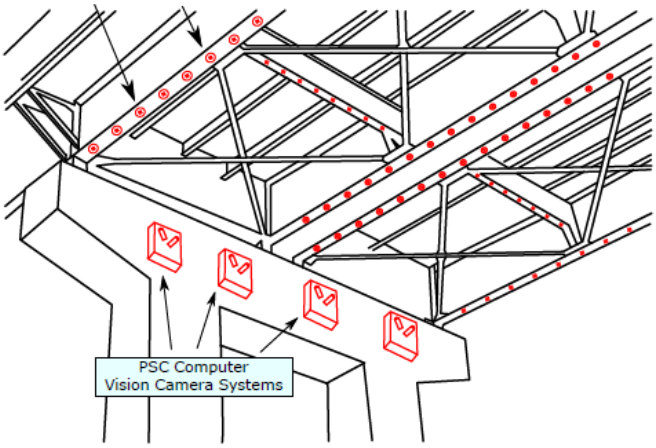
Point Semantics' solution is to provide computationally-efficient computer vision structural health assessment sensors for continuous, automated monitoring of industrial systems (See Figures 1 and 2).

Point Semantics will use its device to continuously measure structural health, sounding the alarm before strain and displacement exceed predefined operational tolerances.

Rather than waiting for terminal structural events, Point Semantics will identify problems as they progress, thus increasing safety.

Point Semantics will lower infrastructure owners' O&M costs by automating and replacing labor-intensive and sometimes subjective inspection with quantitative, remote damage monitoring sensors.

Figure 2: Schematic representation of the Point Semantics bridge monitoring solution



Other advantages include:

- **Simpler to use**: Using just digital cameras and the patented direct strain imaging technology Point Semantics' product will measure the strain at every location in the observed object within the field of view in real time.

- **More accurate:** Point Semantics' product will measure the strain and displacement component fields with higher precision, sensitivity, and accuracy at any place in the structure. It will enable customers to quantify damage, pinpoint the location of flaws, and measure crack propagation with precision. Point Semantics' products will measure near the edges and at welds and junctions – the locations that Point Semantics' prospective customers are typically most concerned about, but cannot always accurately assess.

More adaptable: Point Semantics' systems can be easily moved around or pointed in different directions to assess different geometries at varying distances. No contact is required so the structure may stay in operation during evaluation. The technology can operate in harsh environments, anywhere that hardened industrial cameras may be used

Small form factor: Point Semantics' cameras and hardware do not take up much space.

Easily integrated with unmanned systems and into wired or wireless integrated protection systems that alert a control center. Point Semantics' sensors can be powered with standard solar cells because of their low power requirements.

About Us

Point Semantics is building a next-generation 3D optical strain measurement system which will change the way industry designs, tests, and maintains structural systems. Its core technology originated in the U.S. Navy, having been developed to test composites for use in fighter jets. Point Semantics seeks developmental partners, collaborators, grants, and beta test sites. Demonstrations are available upon request.