

About

PhotoMonitoring is an AI-driven system that analyzes sequential images of slopes or structures to detect surface changes and provide metrics for displacements, strain, and cracks.

Applications

Monitoring tunnels to reveal ovaling or convergence in cross sections or vertical settlement in profile.

Monitoring slopes to reveal movement vectors and activity rates for slides, rockfalls, and other geohazards.

Monitoring slopes such as dams, bridges, and buildings to reveal deformation and evolution of cracks.

Advantages

Cost: Implemented at a lower cost than LiDAR and Radar systems.

Coverage: Provides full surface coverage with point level detail.

No Targets: Eliminates the need for installing or replacing targets or sensors.

Alerts: Can provide near-continuous monitoring and alerts.

Visual Record: Provides a visual record that supplements quantitative data.

System Components

Cameras: Cameras, drones, and satellites, chosen to provide adequate resolution. A GSD tool can guide selection.

Internet Connectivity: Required for transmitting images to a server for processing.

IRIS Analysis Software: Processes the images, generates reports and data visualizations using algorithms developed by NHAZCA.

IRIS Analysis Software

- Ingests images from terrestrial, aerial, and satellite cameras.
- Aligns images to accommodate changes in camera position.
- Corrects or filters images for changes in illumination that could interfere with analysis.
- Filters images with excessive noise from rain, fog, and snow.
- Eliminates objects such as construction machinery or animals.
- Identifies areas of change, calculates displacements, and outputs easily understood visualizations.
- Provides alerts with images, change maps, and data that can feed dashboards and downstream notification systems for early warnings.

Resolution

Resolution in photomonitoring is characterized along four related axes:

Spatial Resolution: The area on the monitored surface that the camera records as a single pixel. For example, the pixel in the recorded image may represent an area of 3 cm x 3 cm on the monitored surface.

Temporal Resolution: The sampling interval, affects rates of change calculations.

Radiometric Resolution: The contrast and detectability of subtle changes influenced by bit depth and dynamic range. Important for digital image correlation or crack detection.

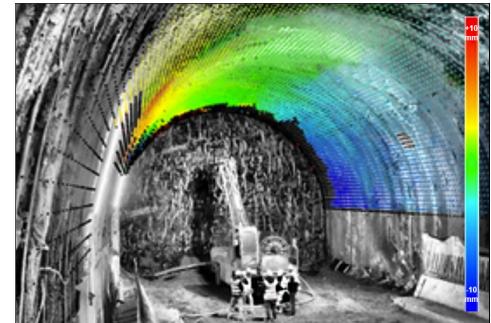
Measurement Resolution: The smallest change in position reliably reported by image correlation, possibly a fraction of a pixel, and converted to mm or cm. Important for displacement calculations.



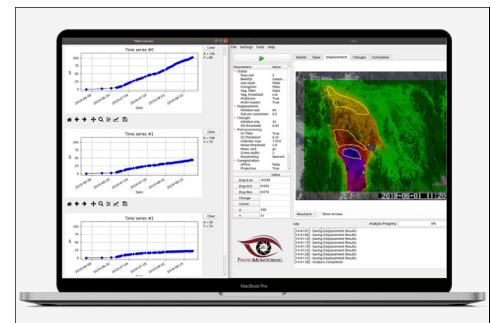
Monitoring Slope Stability



Monitoring Rockfall Activity



Monitoring Tunnel Deformation



IRIS Analysis Software

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