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Remote Image Analysis for Crack Detection

A robust automatic crack detection method utilizing local binary patterns and Bayesian decision theory provides fast, accurate inspection of critical systems by identifying and removing false-cracks in video data.

Inspection of critical systems such as piping within nuclear power plants is an important task that is complicated and time-consuming. Part of the inspection process includes checking for cracks on the metallic surfaces of components using video. Current automatic crack detection methods often fail to detect cracks that are tiny with low contrast. The components' surfaces might have textures, such as scratches, welds, and grind marks, with a similar appearance to cracks, which an automatic crack detection system could easily misidentify as a crack. Given these limitations, videos must be manually checked, which is time-consuming and subjective.

Researchers at Purdue University have developed a method of automatically detecting cracks in videos based on local binary pattern (LBP) and Bayesian decision theory. LBP can distinguish between the textures of cracks from background scratches, welds, and grind marks in video frames. This is followed with using the Bayes decision theory to remove falsely-detected cracks by tracking the cracks in different video frames. This method was tested on 20 nuclear power plant inspection videos, with results showing that this method is more robust than any other approach.

To view a video related to this technology, click on this link: https://youtu.be/8O8FFey4GJo

Advantages:

-Fast and accurate tiny crack detection

-Identifies and removes false-cracks

-More robust than alternatives

-Not subjective

Potential Applications:

Technology ID

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Category

Buildings, Infrastructure, & Construction/Structural Health Monitoring
Robotics & Automation/Perception & Sensing
Artificial Intelligence & Machine Learning/AI-Integrated Imaging Systems & Industrial Vision and Inspection

Authors

Fu-Chen Chen
Mohammad Reza Jahanshahi

Further information

Will Buchanan
wdbuchanan@prf.org

View online

-Critical infrastructure inspections

-Nuclear power plant inspections

-Coal or steel plant inspections

Related Publications:

Fu-Chen Chen, Mohammad Reza Jahanshahi. NB-CNN: Deep Learning-Based Crack Detection Using Convolutional Neural Network and Naive Bayes Data Fusion. IEEE Transactions on Industrial Electronics, Volume PP, Issue 99, 2017. DOI 10.1109/TIE.2017.2764844.

TRL: 5

Intellectual Property:

Provisional-Patent, 2016-05-27, United States | Utility Patent, 2017-05-26, United States | CON-Patent, 2020-08-24, United States

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