Presentation title: Algorithm for lighting balance in images applied to the detection of discontinuities in concrete structures - tests and validation.

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Abstract

Concrete is the most widely used construction material to date and contributes to infrastructure development in the world. Anomalies known as "cracks" and "fissures" are type discontinuities that occur when the structures are exposed to stresses higher than their resistance capacity, affecting their appearance, life, and intrinsic properties of concrete. Crack detection uses non-destructive tests as the visual tools and topographical examinations. Digital image processing for discontinuity detection is a tool to quantify visual inspection. However, it has been little extended due to various difficulties mainly associated with the random shape and irregular size of the cracks, irregular lighting conditions, shadows, imperfections, and chipping in the concrete of the acquired images. Therefore, our work shows the development and testing of an algorithm to standardize lighting conditions applied to 1100 images of concrete where cracks and fissures are present. We use histogram normalization of the digitized images and Fourier transformation to obtain condition descriptors of alterations (cracks or fissures) and a case-based reasoning (CBR) mechanism for differentiation. The information from the sample images is stored and compared with an original basis to determine differences and observe the effect it can have on other variables. Results are grouped and represented to show the quantitative approach. The purpose of the algorithm is to determine characteristics in the frequency domain after imaging balanced. These features can be associated with discontinuities. We seek to obtain information that describes the phenomenon but not why it happens. The results show a significant increase in the detection capacity when balancing the illumination of the images concerning those that do not have this preprocessing.

Biography (150-200 words):

Nilson Yulian Castillo Leon is an electromechanical Engineer, Magister in Energy Resources from the University of Santander UDES-Colombia, Internship at the Federal University of Itajuba UNIFEI-Brasil. Research areas: Energy valorization of Biomass, Biofuels, structural health, among other areas of engineering. Associate Researcher of the Energy Systems, Automation and Control Research Group GISEAC, category A1 - MINCIENCIAS COLOMBIA. Her expertise is on images digital processing to pattern recognition, analysis and structural health using non- destructive techniques. Also, on a

exegetic analysis of reheating and regeneration alternatives in steam cycles for the generation of electricity from municipal solid waste, and analysis of a piezoelectric energy harvester system from footsteps of passersby. Likewise, experience in managing automation projects for the oil and gas industry.