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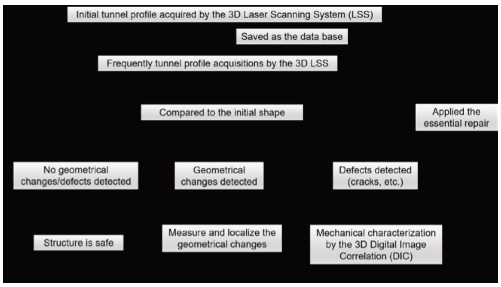
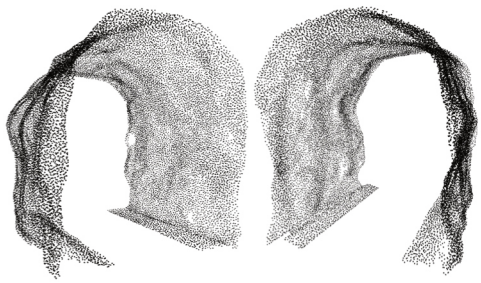
Category: **Rail** Country: **Portugal**

Research Area 3: **Automation and Robotisation** Idea Number: **17**

Innovative methodology for railway tunnel inspection

Railway tunnels deteriorate due to ageing, environmental factors, damage, inadequate maintenance and deferred repairs. The increased perception of those problems, led by advances in analysis techniques, further stresses the necessity to deploy fully automated systems for inspection and condition assessment. The latest developments in automation and laser technology support the development of innovative tunnel inspection systems and increasingly point towards automation of these systems in comparison with formerly human operated systems. The significance of commensurate inspection methodologies to address potential problems is at the forefront of monitoring systems for problems that may affect tunnels' integrity. Detecting and characterizing geometrical changes and defects is decisive for effective inspection, investigating tunnel state, and scheduling maintenance operations. This work introduces a methodology design following an image-based technique and a demonstrator relying on 3D Laser Scanning System, which was built and tested. The system consists of a laser and a camera mounted on train's front and back to perform image acquisition of projected laser lines as train passes through tunnels. Acquired data is processed and compared to the original shape to identify geometrical changes. At a second stage, once a substantial geometrical change is located, a non-destructive inspection tool based on Digital Image Correlation (DIC) was developed to characterize existing defects that led to diverge from the original geometry. The main advantage and novelty of the deployed system is a novel technological design, contributing to examine structural integrity of railway tunnel components by acquiring tunnel geometry over time combined with DIC.





Key Characteristics

Railway tunnels • Digital Image Correlation