

Automated crack detection in RIs

(Athens, May 2021) The term “crack” can be defined as a line on the surface of something along which it has split without breaking apart. When discussing about road infrastructures (RIs) two common terms involve the “cracked asphalt” and “crack-in-a-wall”. For the latter case, if the crack appears to a tunnel’s wall, it may trigger various alerts. At any case, the appearance of a crack should be spotted as soon as possible, and appropriate corrective actions should follow.

Nowadays, the detection of a crack is considered easy, by employing automated, sensor-based systems. At least, this is valid for the asphalt case. Tunnel’s structural evaluation and maintenance is, still, a tedious and resource consuming operation, mainly performed through tunnel-wide visual observations by inspectors.

Computer vision and deep learning have been used extensively for the identification of cracks on the road surface¹. Despite the type, e.g. Alligator, linear or block cracking, such systems have a high detection rate, even when mobile cameras are used. In a similar approach, automated inspection can be performed in tunnels², but with multiple constraints on the image acquisition part. To make matters worse, after the first 50 years, tunnels start to show signs of deterioration or other structural defects³. Therefore, tunnel inspection and structural monitoring is a critical aspect, for keeping safe civil infrastructures. The adoption of an automatic procedure which will incorporate vehicle robots and computer vision tools can speed up the assessment process⁴.

The EU funded PANOPTIS project, employs different kinds of machine learning approaches, to support the monitoring of large-scale RIs. This system will be based multiple channels of information, which can be used to estimate the current crack condition status and provide feedback to drivers and operators.

Additional information can be found in PANOPTIS site, just follow the link: <http://www.panoptis.eu/>.

¹ Mandal, Vishal, Lan Uong, and Yaw Adu-Gyamfi. "Automated road crack detection using deep convolutional neural networks." *2018 IEEE International Conference on Big Data (Big Data)*. IEEE, 2018.

² Protopapadakis, Eftychios, Athanasios Voulodimos, Anastasios Doulamis, Nikolaos Doulamis, and Tania Stathaki. "Automatic crack detection for tunnel inspection using deep learning and heuristic image post-processing." *Applied intelligence* 49, no. 7 (2019): 2793-2806.

³ Petroutsatou, Kleopatra, Alexander Maravas, and Athanasios Saramourtsis. "A life cycle model for estimating road tunnel cost." *Tunnelling and Underground Space Technology* 111 (2021): 103858.

⁴ A. Doulamis, N. Doulamis, E. Protopapadakis and A. Voulodimos, "Combined Convolutional Neural Networks and Fuzzy Spectral Clustering for Real Time Crack Detection in Tunnels," 2018 25th IEEE International Conference on Image Processing (ICIP), 2018, pp. 4153-4157, doi: 10.1109/ICIP.2018.8451758.



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