FEELING THE CITY – Automatic Classification of Facades' Degradation Considering the Citizens' Feelings

Summary

Maintenance decisions often extend beyond physical deterioration, with stakeholders' experiences playing crucial roles. Traditionally, building assessments rely on visual inspections, but manual methods have limitations (e.g., time and cost expensive, relying on subjective assessment by the inspection).

The Feeling the City project proposes a new methodology that intends to automate the inspection, monitoring and classification of the degradation condition of buildings' façades, considering the citizens' perceptions and emotions. In this project, real case studies are analysed, in the same neighbourhood, with a similar typology but in different degradation states.

This project intends to achieve the following goals: i) automate the identification of anomalies in façades (e.g. through image segmentation and classification), using robotic platforms (by land and/or by air) to collect the images; ii) automate the estimation of the façades' global degradation condition; iii) understand the citizens' perception regarding the buildings' degradation state, based on surveys and testimonies, and consequent linguistic modelling and sentiment analysis; iv) define a perceived limit that establishes the end of the façades' service life, considering the "feelings" of the citizens.

The automation of the inspection, using camera-based vision technology, allows a fast data mapping and revels to be able to successfully detect the most common damages in facades, and also identify distractions for image processing, such as equipment, trees, lighting and urban furniture. This automation leads to a more efficient and consistent analysis of the facades' degradation condition, significantly reducing subjectivity in inspection results. In addition to the technical benefits, this approach streamlines operational procedures, making them both cost-effective and time efficient.

Incorporating residents' feelings acknowledges the prevalence of subjective criteria in maintenance decisions, with a particular focus on facade stains that influence interventions and building aesthetics. Three buildings with the same archetype and in the same street, in different degradation conditions, are analysed as case study. A sentiment analysis is performed, to evaluate the ability of residents to clearly distinguish between facades in the best condition and those identified by automated inspection as having a higher presence of stains.

As a result of the Feeling the City project, a "Feeling-BIM" tool is created (Figure 1), which empowers decision-makers with a more comprehensive perspective on facades' condition, ensuring that decisions are well-informed and balanced, considering both objective and subjective factors.

The 'Feeling-BIM' approach provides a comprehensive perspective on the building's condition, considering assessments from technical experts, residents, and owners, thereby acknowledging the importance of integrating both objective and subjective factors in decision-making processes. This project supports decision-making regarding maintenance actions by combining objective indicators of building degradation and the subjective user perceptions to prioritize areas of focus, determine appropriate maintenance strategies, and allocate resources effectively.

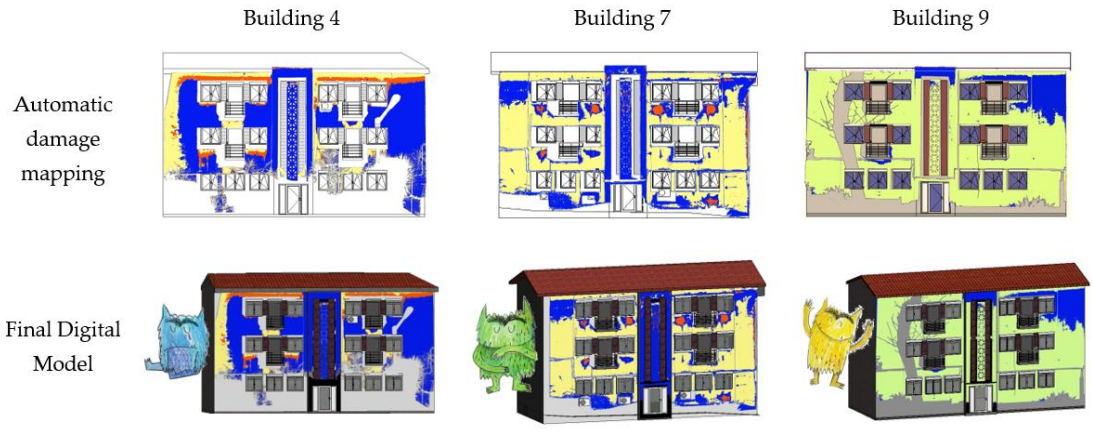

Figure 1. Digital models of three buildings in Alvalade, combining the quantitative and qualitative data collected, reflecting the physical degradation condition and the dwellers' perception.

Project Reference

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Leading Institution

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