Detecting air pockets for architectural concrete quality assessment using visual sensing

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Air pockets, one kind of concrete surface defects, are often created on formed concrete surfaces during concrete construction. Their existence undermines the desired appearance and visual uniformity of architectural concrete. Therefore, measuring the impact of air pockets on the concrete surface in the form of air pockets is vital in assessing the quality of architectural concrete. Traditionally, such measurements are mainly based on in-situ manual inspections, the results of which are subjective and heavily dependent on the inspectors' own criteria and experience. Often, inspectors may make different assessments even when inspecting the same concrete surface. In addition, the need for experienced inspectors costs owners or general contractors more in inspection fees. To alleviate these problems, this paper presents a methodology that can measure air pockets quantitatively and automatically. In order to achieve this goal, a high contrast, scaled image of a concrete surface is acquired from a fixed distance range and then a spot filter is used to accurately detect air pockets with the help of an image pyramid. The properties of air pockets (the number, the size, and the occupation area of air pockets) are subsequently calculated. These properties are used to quantify the impact of air pockets on the architectural concrete surface. The methodology is implemented in a C++ based prototype and tested on a database of concrete surface images.

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