

Quick aerial building inspection

Buildings, industrial facilities, and bridges need to withstand heavy loads and are subjected to wind and weather. Numerous post-war buildings are now showing signs of age-related damage. Expensive building inspections using helicopters, cranes, and cherry pickers are to be carried out by a small drone in the future.

Until now, inspection engineers have checked concrete structures during mandatory inspections with the naked eye and have entered any cracks found manually in 2D maps – a procedure that is fraught with potential errors. “To check their status and to be able to exclude any risks to life and limb, a lot of effort still has to be put into the inspection of buildings that are difficult to access,” says Christian Eschmann, researcher at the Fraunhofer Institute for Nondestructive Testing IZFP in Saarbrücken, who is developing and adapting microdrones for building inspections. An additional difficulty is that areas that are difficult to access or view can often only be reached by means of helicopters, cranes, cherry pickers, industrial climbers, and scaffolding. The Fraunhofer IZFP drone, which could do this work, will guarantee improved safety for humans and for buildings.

A robot to conquer skyscrapers

The mini-flyer is equipped with eight rotors and can reach heights of more than eleven floors. Slowly and quietly it investigates the façade for damage such as cracks, defective joints, or concrete that has broken off or is crumbling. The multicopter scans the brickwork at a distance of about 2 m from the building. On board is a high-resolution digital camera that takes detailed pictures – every single part of the building is recorded. This allows quick conclusions to be drawn about the condition of the building fabric. If necessary, the multicopter can also be equipped with a thermography camera to check the insulation on buildings. The photo yield is high: one 15-minute flight can produce up to 1,200 photos. The individual shots are put together on a computer; the resultant 2D and 3D data models show the visually representable condition of the building fabric. Unnecessary and superfluous shots can, in the future, be deleted automatically by a software program. The material tester is also equipped with sensors that compensate for gusts of wind, ensure a stable flight attitude, and avoid collisions with the building.

Support for experts

Compared with many conventional procedures, inspection with a drone is cost-effective and can take place at shorter intervals. The duration of the inspection can also be shortened considerably, usually without any restrictions on use of the building. A test engineer needs approximately two to three days for a 20 x 80 m² façade; the multicopter needs three to four hours. In the future, a complete software suite is planned that will automate all processes – from damage detection to documentation. The drone must currently be controlled manually.



Eschmann and his colleagues are working on navigation sensors that will control the drone automatically. These sensors will follow a specified pattern that will guide the flight robot up the façade – floor by floor and from one side to the other.

The micro-aircraft will not replace the work of experts and their close-up inspections, but it will speed up the inspection process and allow permanent monitoring and documentation from the very beginning. Poor workmanship and warranty claims can be discovered at an early stage and the measures necessary to remedy them can be commenced.



*The high-tech mini-flyer scans entire buildings in just a few hours.
Photo: Uwe Bellhäuser*

*The eight rotors on the little building inspector allow it to climb more than eleven stories.
Photo: Oliver Dietze*

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