Drones used to assess damage after disasters

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Researchers of the University of Twente use a new method to map structural damage after disasters. A remote-controlled drone with a regular high-quality camera takes a large amount of pictures of a building. From this, a 3D model is created, a point cloud from which the researchers can read geometric information. The drone can be employed after natural disasters or terrorist attacks in order to map damage to important infrastructural places, such as government buildings, hospitals, airports or bridges.

Dr Norman Kerle is a researcher at the ITC Faculty of the University of Twente: "We use the drone - a remote-controlled multicopter with six

rotors - to examine the exterior of the damaged building. This multicopter takes a large amount of overlapping pictures that we combine to form a 3D point cloud. From this, we can read geometric information. The images are so detailed that you can recognize small tears, holes, crooked walls and debris. With sensors in buildings or on satellites this cannot be achieved. We analyze the information in order to come to an objective assessment of the damage. With the drone, even 'invisible' damage can be determined, like shifted or inclined walls or a distortion of the roof. After an earthquake, this type of damage can cause the building to collapse during aftershocks."

Current situation

Currently after a disaster, buildings are inspected through satellite data and with the help of investigators, but there is a shortage of experienced investigators and this type of inspection is very time-consuming. Moreover, the building cannot be used in the meantime. This is very inconvenient if it concerns important buildings such as ministries, hospitals, police stations or bridges and tunnels that have to be accessible to emergency services.

Benefits

Inspection by drone is faster, more efficient, cheaper and more objective than current methods. Kerle: "With satellites, all you typically see is the roof of the building, while an investigator sees the building from the ground only; the drone shows the entire exterior of the building, including the roof." Because the correct information is availably quickly, lives can be saved. Aid, emergency measures and measures for rebuilding can be provided and taken more quickly and more precisely. Whether a building is safe is determined more quickly, ensuring that the building can be used for important work sooner. In the long-term, too, the method is more cost-efficient because it makes it clear where exactly the building requires repairs.

Kerle: "In Italy we tested the method on buildings that were damaged during an earthquake. We came to a detailed three-dimensional geometric information model from which we could read the damage in great detail." Kerle and his colleague, Dr Markus Gerke, are performing follow-up research to develop an algorithm that calculcates exactly which parts of a building are safe and which are not.

Reconass

The method is part of a large European project called RECONASS, partly financed by the European Commission. The Faculty of Geo-Information Science and Earth Observation (ITC) of the University of Twente focuses on the damage to the exterior of buildings by using a drone. The ITC Faculty collaborates with nine partners, all of them engineers, and who focus on structural integrity assessment of the buildings with the aid of wireless sensor networks. The combination of these techniques ensures as complete a damage assessment as possible.

Provided by University of Twente