Drones can now scan terrain and excavations without human intervention

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Drone pilots may become superfluous in the future. New research from Aarhus University has allowed artificial intelligence to take over control of drones scanning and measuring terrain.

A research project at Aarhus University (AU) in collaboration with the

Technical University of Denmark (DTU) aims to make measuring and documenting gravel and limestone quarries much faster, cheaper and easier in the future.

The project has allowed artificial intelligence to take over the human-controlled drones currently being used for the task.

"We've made the entire process completely automatic. We tell the drone where to start, and the width of the wall or rock face we want to photograph, and then it flies zig-zag all the way along and lands automatically," says Associate Professor Erdal Kayacan, an expert in artificial intelligence and drones at the Department of Engineering at Aarhus University.

Measuring and documenting gravel and limestone quarries, cliff faces and similar natural and man-made formations is often done using drones that photograph the area. The recordings are then uploaded to a computer that automatically converts everything into a 3-D terrain model.

However, drone pilots are costly, and the measurements are time-consuming because the drone has to be controlled manually to hold the same constant distance to the wall of an excavation, while simultaneously keeping the drone camera perpendicular to the wall.

Furthermore, there must be a specific overlap in the images taken, so that the computer can then "sew together" the images into a large 3-D figure.

Researchers from the Department of Engineering at Aarhus University have now automated this process using artificial intelligence.

"Our algorithm ensures that the drone always keeps the same distance to

the wall and that the camera constantly repositions itself perpendicular to the wall. At the same time, our algorithm predicts the wind forces acting on the drone body," says Erdal Kayacan.

This means that the researchers have been able to compensate for one of the major challenges associated with autonomous drone flight: the wind.

"The designed Gaussian process model also predicts the wind to be encountered in the near future. This implies that the drone can get ready and take the corrective actions beforehand," says Mohit Mehndiratta, a visiting Ph.D. student in the Department of Engineering at Aarhus University.

Today, it takes little more than a light breeze to blow a drone off course, but with the help of Gaussian processes, the team has taken into account gusts and the overall wind speed.

"The drone doesn't actually measure the wind, it estimates the wind on the basis of input it receives as it moves. This means that the drone responds to the force of the wind, just like when we human beings correct our movements when we are exposed to a strong wind," says Erdal Kayacan.

Provided by Aarhus University

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