Self-assembling vehicles take flight (w/ Video)

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Modules assembled into a hexagonal array

(PhysOrg.com) -- Researchers in Switzerland are developing miniature vehicles that can self-assemble and then take off vertically and fly as a stable array.

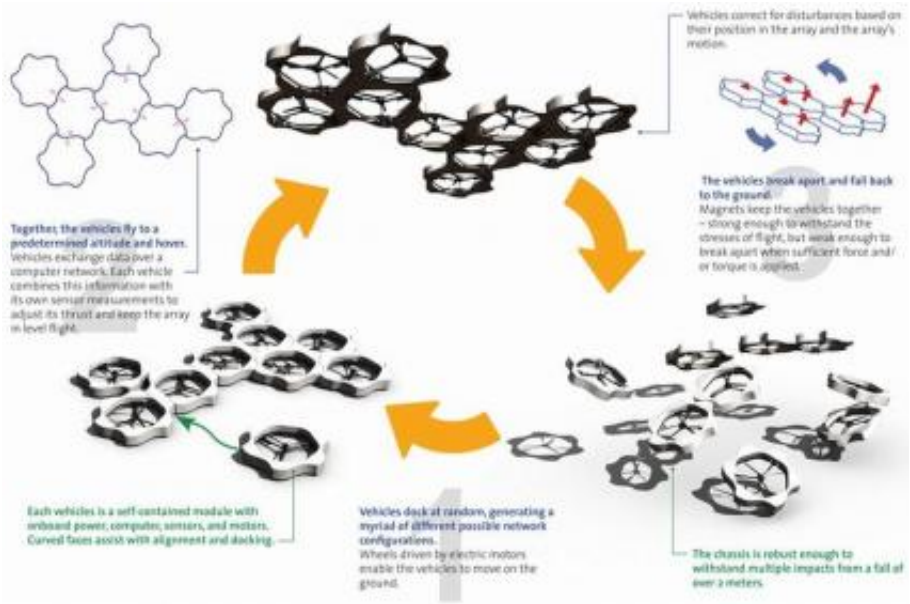
The system, developed at the Institute of Dynamic Systems and Control at the Swiss Federal Institute of Technology (ETH) in Zürich, is known as a Distributed Flight Array. The system is basically a flying platform consisting of a number of autonomous wheeled vehicles, each driven by a fixed ducted propeller. Each vehicle has its own motor and flight control system and is equipped with a computer, sensors and wireless communication systems.

The individual vehicles can drive on the ground, dock with other

vehicles, and can fly but only in an uncontrolled and erratic way. When the vehicles are joined together, however, the combination becomes a sophisticated flight platform capable of coordinated flight, with data shared rapidly between the individual vehicles and flight control distributed across the array.

Each vehicle has sensors, and the information from all the vehicles is combined to calculate the thrust required for take off and to maintain level flight. If the flight level is disturbed each vehicle in the array determines the thrust required to correct the flight of the array, taking into account the position of the vehicle in the array and its motion. Instead of landing, the array breaks up, with the individual modules dropping to the ground on their own and then driving off.

The distributed flight array is at the proof of concept stage, but in the future could be useful for applications such as lifting heavy objects, with the number of vehicles or modules in the array selected according to the lift required. The modular nature of the array also means some failure can be tolerated since if one or two vehicles fail the others can compensate.



Among ETH Zürich's many other research projects is a Flying Machine Arena (FMA), which is a 10 m cube of indoor space designed specifically for testing and validating autonomous vehicles. The space has glass on one side and nets on the other three sides so flying vehicles can be tested safely. An optional safety net can also be installed on the bottom of the space to prevent crashes onto the hard ground.

ETH Zürich, founded in 1855, is one of the leading universities in the world for technology and the natural sciences, and aims to facilitate research and results beneficial for society as a whole.

More information: DFA project page:
www.idsc.ethz.ch/Research_DAndrea/DFA
More videos on YouTube:
www.youtube.com/watch?v=Bh-7G9fYbY8
www.youtube.com/watch?v=XJFGuyBNClo
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