

## **Researchers show off omnicopter with ballcatching skills**

May 23 2017, by Nancy Owano



(Tech Xplore)—A little flying device is drawing attention in the media this month on two counts, the way it moves and what it can do, which is fetching a ball in a pouch.

The work comes from two researchers, Dario Brescianini and Raffaello D'Andrea, Institute for Dynamic Systems and Control (IDSC), ETH



Zurich.

This is their omnicopter. It can accomplish the task of going after a ball and fetching it with precision. As seen in their video, playing fetch for the device is no big deal. "In this video, we show an example application that requires the evaluation of a large number of trajectories in real time."

They were referring to a video posted earlier this month. To show off the algorithm's capabilities, they sent off a vehicle to catch a ball in a small pouch. The focus of their work has been "computationally efficient trajectory generation for six degrees of freedom multirotor vehicles."

The trajectory generator can generate 500,000 trajectories per second. These guide this flying vehicle from any initial state to any desired final state. A highlight of their work is target efficiency. *Daily Mail*: "The algorithm <u>chooses</u> the trajectory that will allow it to get to the ball fastest and then carries it out, according to the researchers."

Dario Brescianini in *Digital Trends* discussed calculating paths. "We use an external <u>camera</u> system to detect both the position of the <u>ball</u> and the omnicopter." He said "the key element behind making a successful catch is the computationally efficient generation of trajectories."

The way they move drew interest. The little machine can zip off in any direction "with laser-like accuracy," said the *Daily Mail*.

Evan Ackermann in *IEEE Spectrum* highlighted how their omnicopter goes about flying: "With eight motors oriented in all directions, the Omnicopter doesn't have an up or down or front or back: It can translate and rotate in any direction, letting it play a very skilled game of <u>fetch</u>."



*Manufacturing.net* talked about the machine's skills in orientation. "Aircraft usually have considerable skill zipping around in different directions. An omnicopter straight out of the Institute for Dynamic Systems and Control at ETH Zurich, steps away from convention by using <u>eight</u> motors to orient itself in all directions." The article said that the machine, with this design, is able to translate and rotate in any desired route.

Ackerman observed that even if the rest of its body is still in motion, their device could keep the net stationary while making the catch. "This is only possible with the Omnicopter, because of how translation and rotation are decoupled from each other: A quadrotor configuration can't do it, because it has to rotate itself in order to control translation (it tilts to move sideways, in other words)."

Researchers with such interests in flying machines are stepping into a level of investigation which explores not only how these machines can accomplish surveillance and inspection tasks but something more. The omnicopter researchers said in a previous paper that "several groups have more recently started to investigate the use of flying machines for physical interaction with the environment."

Applications? Luke Dormehl in *Digital Trends* said "the vehicle and trajectory generation algorithm presented could be used in any scenario that requires flying to any desired attitude and position with a high degree of exactness and timing."

**More information:** Design, Modeling and Control of an Omni-Directional Aerial Vehicle (PDF) <u>flyingmachinearena.org/wp-cont ...</u> <u>s/2016/breIEEE16.pdf</u>

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