

Improving algorithms in drones to increase their usability

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You have probably seen one flying above you at some point: a quadcopter, also known as a drone. These flying robots are becoming increasingly important in today's society, leading to stricter demands on

their performance in terms of speed, accuracy, reliability and robustness. In order for these demands to be met, improvement of existing estimation and control algorithms is of crucial importance. In his research, Ph.D. candidate Alex Andriën has improved upon several existing methods for estimation and control of quadcopters by employing optimization-based techniques. He will defend his thesis on Monday 24th of February, 2022.

Quadcopters are commonly used to provide high quality aerial footage of concerts, festivals, news items and vacations. Other application fields include agriculture, (industrial) inspection, [law enforcement](#), delivery (in [remote locations](#)), construction, security, environmental studies and human transport. It is clear that their use in both industry and consumer markets is expected to increase in the future, making it increasingly vital that they function well.

The state of the drone

One necessary improvement is that of estimation of the state of the quadcopter. Accurate angle and position estimation is important for the control of quadcopters, in order to know their configuration with respect to the environment they are operating in. In his research, Andriën, who is part of the Control Systems Technology group at the department of Mechanical Engineering, has developed new estimation algorithms for both angle and position estimation.

Another important area of improvement in quadcopters are planning and control. Good planning algorithms are essential in order to ensure that the trajectories generated for the [quadcopter](#) are fast, efficient and safe. The control part of the [research](#) investigates trajectory tracking for quadcopters. Accurate and robust trajectory tracking is important to ensure that planned trajectories are followed even when disturbances are present.

Future

In his thesis, Andriën has developed new methods that improve the capabilities of quadcopters. These methods cover many of the most important aspects of quadcopters, including estimation, identification, planning and control. By using these results as starting points for future work, quadcopters can become an important part of our everyday lives.

More information: Optimization-based Estimation and Control Algorithms for Quadcopter Applications:
[pure.tue.nl/ws/files/193354777 ... 20122 Andrien hf.pdf](https://pure.tue.nl/ws/files/193354777/20122_Andrien_hf.pdf)

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