

Smooth videos from airborne TV-cameras

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New camera stabilization offers top-quality HD-video footage for TV and film even when flying dynamically. Credit: Dynamic Perspective

TU Wien and the company Dynamic Perspective develop an advanced camera suspension system, actively controlled to deliver pin sharp videos from dynamic aerial viewpoints.

A shake-free video stream from inside a roller coaster - sounds unbelievable. That's an easy one for the new TV [camera](#) suspension system jointly developed by TU Wien and Dynamic Perspective. A camera gimbal featuring five rotational axes and high-performance control technology stabilizes the camera's line-of-sight accurately and dynamically, enabling best pictures even from light-weight remote-controlled aircraft. For live TV sports broadcasting and film production tasks, this technology opens up entirely new possibilities.

Clever not clunky

"The easiest way to overcome shaking problems is to make the camera system as heavy as possible," explains Alexander Schirrer from the Institute of Mechanics and Mechatronics at TU Wien. A heavy camera has so much inertia that minor vibrations have no impact. However, if the camera has to be mounted on an aircraft, the weight has to be kept to an absolute minimum. Including the camera, the newly developed system weighs just under twenty kilos in total - the kind of load that is perfectly manageable for a small aircraft to carry. Other camera systems can be up to one hundred kilos in weight.



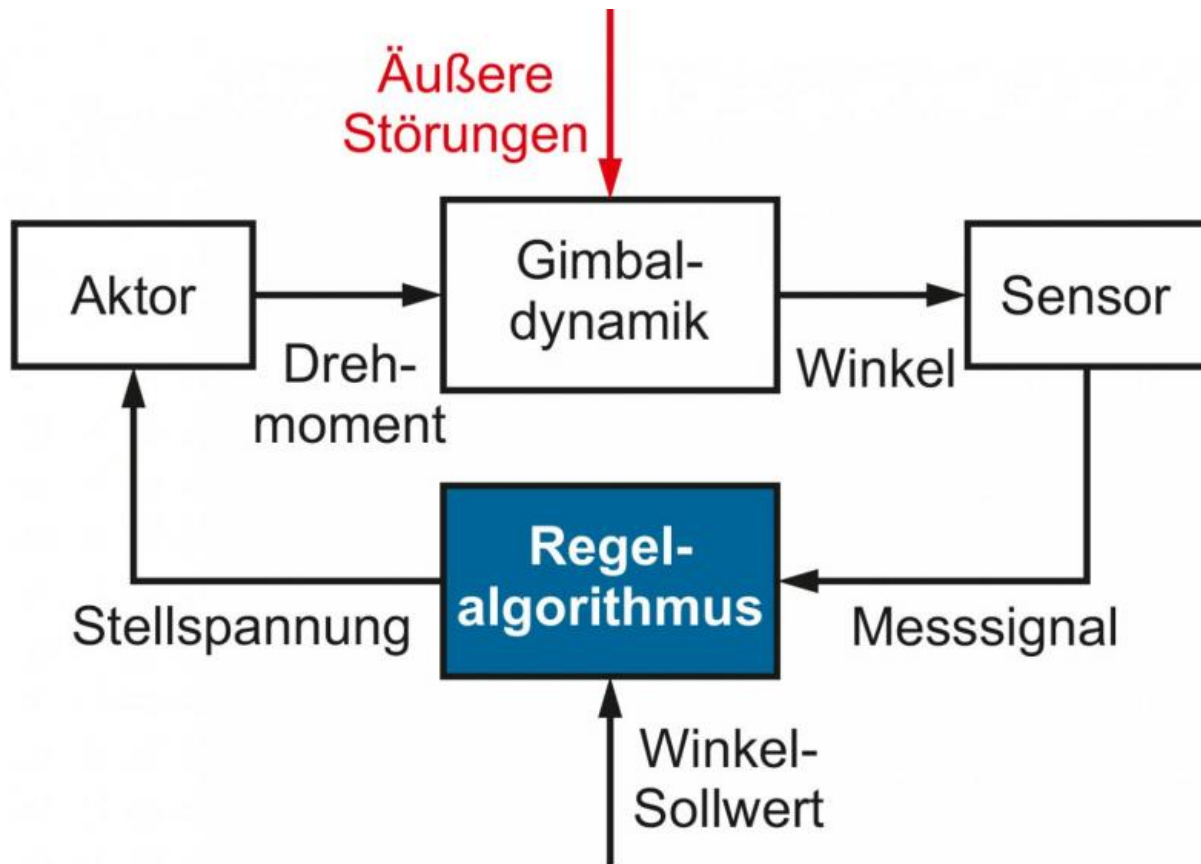
The innovative mechatronic design and high-performance control system of the camera gimbal enable high precision in image stability even on small and light aircrafts. Credit: Dynamic Perspective

TU Wien and Dynamic Perspective spent two years working on an innovative high-performance control system to enable active camera stabilisation. The result was a special type of cardan suspension called a 'gimbal'. You actually only need three rotational axes to rotate a camera in space in any direction you like. However, two extra axes were added so that particularly fine corrections could be made very quickly.

Thousands of measurements per second

It is not just the mechanical suspension that is crucial; in fact, it is the control system that plays a leading role: sensors measure the position of the camera several thousand times a second and the programmed control algorithms must then calculate exactly the right corrective movements in a matter of several hundred microseconds so that they can be performed subsequently by the electromechanical actuators.

"First of all, we had to carry out extensive computer simulations. Then, we were able to use gyrocopters to test our control technology in practice," says Alexander Schirrer. Their patient research work certainly paid off: "Our set-up still delivers razor-sharp images even when flying dynamically, with full zoom and at full HD resolution. As a result, we are opening up a whole new level of quality, the like of which has never been seen before within this application area."



The optimized control algorithm calculates thousands of measurements per seconds, including vibrations of the aircraft, and stabilizes the image. Credit: TU Wien

"Weighing up to 70% less than existing systems, our gimbal is the first that is suitable for use on ultralight aircrafts and drones - alongside conventional applications such as helicopters, cranes, cars and boats," asserts Peter Morawitz from Dynamic Perspective. "Within this context, maximum image stability is assured thanks to our control systems."

A new level of quality for sports footage

When you first hear about the flying camera system, action films might immediately spring to mind, but it is primarily intended for capturing sports footage. In contrast to motion pictures, sports footage does not allow for 3D animation techniques and there is no scope for time-consuming post-editing on a computer. "The footage delivered by the camera must be of top quality from the start and suitable for immediate live broadcast - and that is precisely what our system has made possible," says Schirrer. Another potential application for the new [camera system](#) is the recording of precise scientific measurements, e.g. geoinformation.

Provided by Vienna University of Technology

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