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Hybrid Velocity Control Approach for Tethered Aerial Vehicle

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Abstract : With the rising need for human-robot interaction, researchers have proposed and tested multiple models with varying degrees of success. A few of these models performed on aerial platforms are commonly known as Tethered Aerial Systems. These aerial vehicles may be powered continuously by a tether cable, which addresses the predicament of the short battery life of quadcopters. This system finds applications to minimize humanitarian efforts for industrial, medical, agricultural, and service uses. However, a significant challenge in employing such systems is that it necessities attaining smooth and secure robot-human interaction while ensuring that the forces from the tether remain within the standard comfortable range for the humans. To tackle this problem, a hybrid control method that could switch between two control techniques: constant control input and the steady-state solution, is implemented. The constant control approach is implemented when a person is far from the target location, and error is thought to be eventually constant. The controller switches to the steady-state approach when the person reaches within a specific range of the goal position. Both strategies take into account human velocity feedback. This hybrid technique enhances the outcomes by assisting the person to reach the desired location while decreasing the human's unwanted disturbance throughout the process, thereby keeping the interaction between the robot and the subject smooth.

Keywords : unmanned aerial vehicle, tethered system, physical human-robot interaction, hybrid control
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