

Interaction control of under-actuated UAV capable of exerting downward force

*Jinyeong Jeong¹⁾ and Min Jun Kim²⁾

^{1), 2)} School of Electrical Engineering, KAIST, Daejeon, 34141, Korea

¹⁾ jsmi868@kaist.ac.kr

²⁾ minjun.kim@kaist.ac.kr

ABSTRACT

The interaction control scheme is a key ingredient in realizing complex manipulation tasks of quadrotors. In particular, Interconnection and Damping Assignment Passivity Based Control (IDA-PBC) is noteworthy because it provides a means to modulate the system's energy which plays an important role in physical interaction problems. However, since conventional quadrotors cannot exert downward forces, there is a limitation that the maximum downward acceleration is limited by the gravitational constant. In this paper, we propose to use two additional downward-facing motors enabling quadrotors to exert downward forces greater than gravity. Consequently, it will be shown that the interaction control can be realized more realistically compared to the existing method. Simulation results confirm the validity of our approach.



Fig. 1 Quadrotor with two downward-facing motors

REFERENCES

- Kim, M. J., Balachandran, R., De Stefano, M., Kondak, K. and Ott, C. (2018), "Passive compliance control of aerial manipulators", *IROS*, pp. 4177-4184.
- Ortega, R., Van Der Schaft, A., Maschke, B. and Escobar, G. (2002), "Interconnection and damping assignment passivity-based control of port-controlled Hamiltonian systems", *Automatica*, **38**(4), 585-596.
- Yüksel, B., Secchi, C., Bühlhoff, H. H. and Franchi, A. (2019), "Aerial physical interaction via IDA-PBC", *Int. J. Robot. Res.*, **38**(4), 403-421.

¹⁾ Graduate Student

²⁾ Professor