Landing a Quadrotor on a Ground Vehicle without Exteroceptive Airborne Sensors: A Non-Robocentric Framework and Implementation*

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***Abstract*— This research addresses the problem of a quadrotor UAV landing on a ground vehicle. Yet, unlike most existing literature, we transfer most sensing and computing tasks to the ground vehicle, designing the landing system in a non-robocentric fashion. Such a framework greatly alleviates the payload burden, allowing more resource allocation for the quadrotor UAV. To validate the proposed framework, the implementation starts with relative pose estimation through detection and tracking of LED markers on an aerial vehicle. The 6 DoF orientation and position information is then returned through a PnP-based algorithm. Successively, by considering the visibility and dynamic constraints in the target local frame, the motion planning module computes an optimized landing trajectory, such that the aerial vehicle stays within a safety corridor and performs the landing mission. Through experiments, we demonstrate the applicability of this research work, in which a quadrotor could be guided remotely and landed on a moving ground vehicle smoothly without the support from any airborne exteroceptive sensors and computers.**

SUPPLEMENTARY MATERIAL

Supporting video of this paper is available at: `https://youtu.be/7wiCh46MQmc`

I. INTRODUCTION

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