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Computer Vision Onboard UAVs for Civilian Tasks

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Abstract Computer vision is much more than a technique to sense and recover environmental information from an UAV. It should play a main role regarding UAVs' functionality because of the big amount of information that can be extracted, its possible uses and applications, and its natural connection to human driven tasks, taking into account that vision is our main interface to world understanding. Our current research's focus lays on the development of techniques that allow UAVs to maneuver in spaces using visual information as their main input source. This task involves the creation of techniques that allow an UAV to maneuver towards features of interest whenever a GPS signal is not reliable or sufficient, e.g. when signal dropouts occur (which usually happens in urban areas, when flying through terrestrial urban canyons or when operating on remote planetary bodies), or when tracking or inspecting visual targets—including moving ones—without knowing their exact UTM coordinates. This paper also investigates visual servoing control techniques that use velocity and position of suitable image features to compute the references for flight control. This paper aims to give a global view of the main aspects related to the research field of computer vision for UAVs, clustered in four main active research lines: visual servoing and control, stereo-based visual navigation, image processing algorithms for detection and tracking, and visual SLAM. Finally, the results of applying these techniques in several applications are presented and discussed: this

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