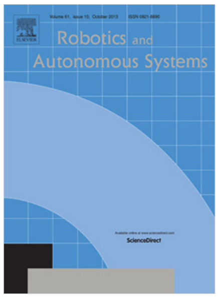
Accepted Manuscript

Path following and obstacle avoidance for an autonomous UAV using a depth camera

Massimiliano Iacono, Antonio Sgorbissa



PII: S0921-8890(18)30102-7
DOI: https://doi.org/10.1016/j.robot.2018.04.005
Reference: ROBOT 3017

To appear in: *Robotics and Autonomous Systems*

Received date : 7 February 2018
Accepted date : 12 April 2018

Please cite this article as: M. Iacono, A. Sgorbissa, Path following and obstacle avoidance for an autonomous UAV using a depth camera, *Robotics and Autonomous Systems* (2018), https://doi.org/10.1016/j.robot.2018.04.005

Path following and obstacle avoidance for an autonomous UAV using a depth camera

Massimiliano Iacono, Antonio Sgorbissa

Abstract

The main focus of this work is the development of a software architecture to autonomously navigate a flying vehicle in an indoor environment in presence of obstacles. The hardware platform used to test the developed algorithms is the AscTec Firefly equipped with a RGB-D camera (Microsoft Kinect): the sensor output is used to incrementally build a map of the environment and generate a collision-free path. Specifically, we introduce a novel approach to analytically compute the path in an efficient and effective manner. An initial path, given by the intersection of two 3D surfaces, is shaped around the obstacles by adding to either of the two surfaces a radial function at every obstacle location. The intersection between the deformed surfaces is guaranteed not to intersect obstacles, hence it is a safe path for the robot to follow. The entire computation runs on-board and the path is computed in real-time. In this article we present the developed algorithms, the software architecture as well as the results of our experiments, showing that the method can adapt in real time the robot's path in order to avoid several types of obstacles, while producing a map of the surroundings.

Keywords: UAV, MAV, Flying Vehicle, Obstacle avoidance, Path planning

1. Introduction

Multi-rotor copters have been widely adopted by the research community in the last few years because, in relation to other classes of aerial vehicles, they can be more easily controlled and have a high maneuverability. This allows them to navigate in small, human-unaccessible and inhospitable en-

☆