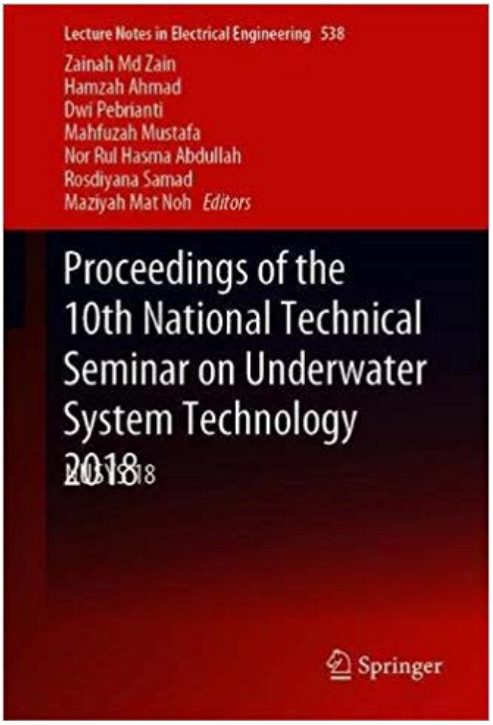

Proceedings of the 10th National Technical Seminar on Underwater System Technology 2018

NUSYS'18

Editors: **Md Zain**, Z., **Ahmad**, H., **Pebrianti**, d., **Mustafa**, M., **Abdullah**, N.R.H., **Samad**, R., **Mat Noh**, M. (Eds.)

ISSN 2194-5357 ISSN 2194-5365 (electronic)
Advances in Intelligent Systems and Computing
ISBN 978-3-030-00978-6 ISBN 978-3-030-00979-3 (eBook)
https://doi.org/10.1007/978-3-030-00979-3

Library of Congress Control Number: 2018955576

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Contents

Adaptive Fuzzy-PID Controller for Quad-rotor MAV with Mass Changes

Goh Ming Qian[1], Dwi Pebrianti[1,3], Luhur Bayuaji[2,3], Rosdiyana Samad[1], Mahfuzah Mustafa[1] and Mohammad Syafrullah[3]

[1] Faculty of Electrical &Electronics Engineering, University Malaysia Pahang, Campus Pekan, 26600 Pekan,Pahang.

[2] Faculty of Computer Science and Software Engineering, University Malaysia Pahang, Malaysia.

[3] Magister of Computer Science, University Budi Luhur, Indonesia.

gohmingqian@gmail.com /dwipebrianti@ump.edu.my

Abstract. Micro Aerial Vehicle (MAV) has become famous to be used in agricultural application such as for spraying operation, for watering plantation or spraying the pesticide, 2-D flow visualization image to measure the droplet distribution and so on. Due to the need to sustain food for all human population, there is need for development of effective spraying to increase the productivity. In crop spraying, the payload changes against time is the big challenge on the development of MAV. This is because the payload change problem could affect the altitude which is the position along z-axis of the MAV. In this research, a quad-rotor MAV is used as the platform. Then, an adaptive Fuzzy-PID controller for the altitude control by considering payload change is presented. The performance of altitude control by using adaptive Fuzzy-PID controller and PID controller are validated in this research study through simulation. The adaptive Fuzzy-PID controller is successfully designed for the changing of payload. The result shows the performance of adaptive Fuzzy-PID controller is better than PID controller on quad-rotor MAV control considering payload changes.

Keywords: Adaptive Fuzzy-PID controller, Quad-rotor MAV, Payload Change

1 Introduction

Recently, the viability of UAVs as a multipurpose research vehicle have been widely used in many practical applications such as military, rescue operation, photographing, payload carrier, agricultural and transportation [1]. The common types of UAVs are fixed-wing, rotary-wing UAVs that includes helicopters and quad-rotor MAV [2]. Fixed-wing UAVs can fly at high speed and efficient in long distance travelling compared to rotary-wing UAVs. However, it requires a long runway take-off and landing [3]. The rotary-wing UAVs has advantages which are high maneuverability, vertical take-off and landing (VTOL) and hovering [4]. By comparing the maintenance cost and system design of rotary wing UAV, quad-rotor MAV has a simple design and low maintenance cost. Therefore, quad-rotor MAV as shown in Fig. 1 is chosen in this research because the size and safety is most practical for experimental testing.