Chapter 8
Altitude Lock Capability Benchmarking: Type 2 Fuzzy, Type 1 Fuzzy, and Fuzzy-PID with Extreme Altitude Change as a Disturbance

Hendi Wicaksono, Yohanes Gunawan, Cornelius Kristanto and Leonardie Haryanto

Abstract In the past three years, our research developed a low cost QuadRotor. QuadRotor are built from four brushless motors with four Electronic Speed Controllers (ESC) and four propellers in one carbon frame of QuadRotor. KK2 board is added as a flight controller of QuadRotor. This KK2 board has been completed only to deal with altitude stabilization. Our research focused on altitude locking development using several control methods implemented on YoHe board. This paper presents altitude lock capability, to be benchmark between Type2 Fuzzy controller and Type1 Fuzzy controller, also with Fuzzy-PID. The benchmark focuses on their flight analysis performance with extreme altitude change (50 cm) as a disturbance. From that three control methods that have applied, and overall tested, Type2 Fuzzy shows better result than others.

Keywords Type2 fuzzy · Type1 fuzzy · Fuzzy-PID · Altitude lock

8.1 Introduction

QuadRotor is one of a popular Unmanned Aerial Vehicle (UAV). QuadRotor have four rotors to spin symmetrically. This fast growing QuadRotor had been become a popular research's object more than any other UAVs. Many controllers was develop to complete a Quadrotor maneuver. Type2 Fuzzy with Fast Geometric Defuzzification was introduced by Simon [2]. This method shows very important concept to make us able to apply it in the Type2 Fuzzy in a real time. Type1 Fuzzy

H. Wicaksono (✉) · Y. Gunawan · C. Kristanto · L. Haryanto
Electrical Engineering Department, University of Surabaya,
Raya Kalirungkut, Surabaya, Indonesia
e-mail: hendi@staff.ubaya.ac.id