Design of a Time-Delayed Controller for Attitude Control of a Quadrotor System

Jeong Geun Lim and Seul Jung

Intelligent Systems and Emotional Engineering Laboratory
Department of Mechatronics Engineering, Chungnam National University
99 Daehak-Ro, Yuseong-Gu,
Dajeon, 305-764 Korea
jungs@cnu.ac.kr

Abstract. This paper presents the design of the time-delayed controller for the attitude control of a quadrotor system. Based on the measurement of acceleration data, the time-delayed control algorithm is implemented. Performances of the time-delayed control method are compared with the PD control method through empirical studies. Experimental results of the attitude control of a quadrotor system on the test platform verify that the performance of the time-delayed control method is better than that of the PD control method.

Keywords: quadrotor system, time-delayed control**,** attitude control.

1 Introduction

Recently research on unmanned aerial vehicles (UAVs) is enormously increasing due to interests of researchers in control and robotics communities. UAVs play an important role in dangerous areas like war zone for monitoring and surveillance. Long range UAVs have a conventional take-off and landing (CTOL) structure that requires large areas to take off while the vertical take-off and landing (VTOL) structure does not require long areas. Therefore, UAVs with VTOL structure have advantages over CTOL UAVs in terms of areas required for taking –off.

One of VTOL UAVs is a quadrotor system which has 4 rotors. Since quadrotor systems have 4 rotors, omni-directional movement is possible. Due to 4 rotors, a more stable hovering posture can be achieved. Therefore quadrotor systems can be used for surveillance or monitoring tasks in urban areas. Traffic accidents on the highway can be monitored and dangerous threat to special persons can be protected by monitoring vicinities.

These advantages lead to active research on quadrotor systems. Different designs of tilting mechanism of a quadrotor system for both driving and flying capabilities have been proposed [1,2]. Aggressive maneuvering control performances of quadrotor systems have been presented in the outdoor environment [3]. The precise position control performance of a quadrotor has been presented by University of Pennsylvania based on the accurate sensing of quadrotor position. The challenging passing control performance of an inverted pendulum between two quadrotor systems has been demonstrated by ETH Zurich.

J. Lee et al. (Eds.): ICIRA 2013, Part II, LNAI 8103, pp. 274–280, 2013.