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Developing an Autopilot System for Autonomous Aerial Vehicle

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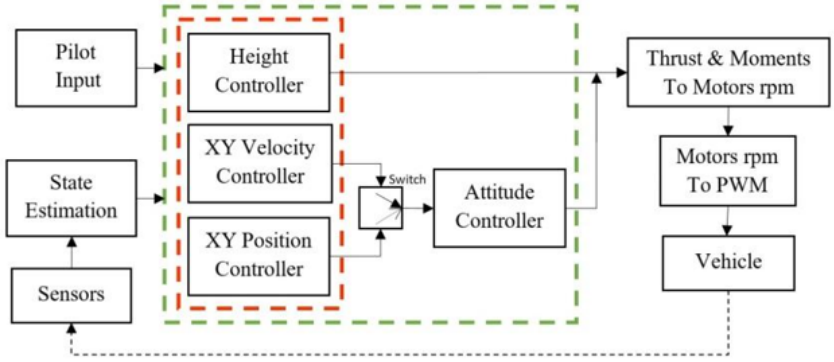
Research Snippet

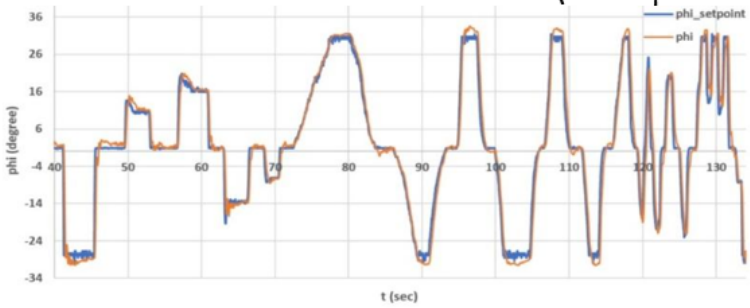
The development of unmanned aerial vehicles has been a highly active area of research in the recent decade. These aerial vehicles require proper control strategies for a stable flight to make the vehicle perform the required task in the real outdoor environment. All over the world, several organizations, educational institutions, and individuals are working on various aspects of development and application of this technology to real life scenarios. Development of an autopilot system is one of the main challenges in the realization of a reliable vehicle. In India, there are many companies/startups that use the procured foreign technology, particularly with regards to the autopilot system, to make their vehicle fly in autonomous mode. As the design of the autopilot system is critical and challenging (which depends on the dynamic behavior of the vehicle), it is important for us to develop a system indigenously so that we have maximum control and information regarding the reliability and working mechanism of the autopilot system. This will allow us to modify various modules and algorithms of the system to achieve the specified task.

To achieve the goal, the focus of our study is on the design and development of a complete autopilot system including selection of sensors, their integration, data processing, control algorithm for attitude and navigation, and communication to ground station. The developed autopilot system has been tested on-board a quadcopter flying in an outdoor environment. The results of the flight test clearly show that the indigenous autopilot system satisfies the autonomous control and way-point navigation for short range flights due to limitation in the range of wireless communication. The design procedure and the control algorithm developed in this study can now be implemented and tested in various flying vehicles with VTOL capabilities, including mini helicopters. The control architecture, quality of attitude control achieved, and the quadcopter with autopilot are shown in the figures below.



Control architecture

Quadcopter with autopilot board



Attitude control: set point vs vehicle angle

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