ABSTRACT

Before a control system is implemented, it is necessary to design and simulate to find out whether the design is feasible to implement. Even though the design and simulation have been carried out, the implementation of the control system still has the risk of experiencing failure which can result in damage to a system. Therefore, we need a technique that can reduce or eliminate these risks, and the technique used here is hardware in-the-loop (HIL) simulation.

In this study, a HIL simulation will be carried out with an actual controller containing the control Lyapunov-barrier function (CLBF) control method and a virtual plant modeled using software. Data Acquisition (DAQ) is also used to collect and transmit information between controller and virtual plant.

Based on the results of the research conducted, the application of CLBF control for the 3D trajectory and guided missile models has been successfully carried out using HIL simulator. Experiments with 3D trajectory models and guided missiles resulted in an average error of 0.05% and 2.58% for the simulation, 1.36% and 3.24% for the HIL simulation. The 3D trajectory model and guided missiles also managed to avoid the barrier with an average value of closest to the barrier of 0.124 m and 0.585 m/s for simulation testing, 0.125 m and 0.458 m/s for HIL simulation testing.

Keywords: Control Lyapunov-barrier function, hardware in-the-loop, 3D trajectory, guided missile, quadcopter