

Neural Network-Based Adaptive Control Design of Dual-Spin Projectile with Rotating Canards

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Guided munition is composed of a highly rotating main body and a guidance/control fuze with two pairs of control canards. The guidance/control fuze rotates in an opposite direction at a slower rate than the main body. The first pair of canards, called pitch canards, is used as the pitch and yaw attitude control effector, and the second pair, called spin canards, is used to generate the rotation of the fuze. Due to the highly rotating motion of the munition, the cross coupling effect between the pitch and yaw axes is significant. To decouple the pitch and yaw axes, the neural network-based L1 adaptive control with dynamic model inversion is proposed in this paper. We also present a coordinate transformation for the controller of the rotating guided munition. The 7 DOF nonlinear simulation model was conducted to validate the results of the controller