

# Integral Super Twisting Sliding Mode Control (ISTSMC) Application in 1DOF Internal Mass Autonomous Underwater Glider (AUG)



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**Abstract** This paper presents the design and implementation of the integral super twisting sliding mode control for the tracking control of a linearized model of longitudinal plane autonomous underwater glider. The performance of the proposed controller is evaluated in terms of chattering reduction in control input for the nominal system as well as the system in the presence of external disturbance. The controller is designed for the gliding path from  $45^\circ$  to  $30^\circ$  downward and upward. The performance of the proposed controller is compared with the quasi sliding mode control (boundary layer), integral sliding control, and super twisting sliding mode control. The simulation results have shown that the proposed controller is able to eliminate the undesired chattering in control inputs.

**Keywords** Autonomous underwater glider (AUG) · Super twisting sliding mode control (STSMC) · Integral sliding mode control (ISMC)

## 1 Introduction

Underwater offers a wide range of research opportunities. Autonomous underwater vehicles (AUVs) are amongst the popular of underwater vehicles used in underwater for data gathering. While autonomous underwater gliders (AUGs) are considered as a new class of AUVs where the idea was initiated by Henry Stommel in 1989 [1]. However the real operational AUGs are realized more than a decade later

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