

ABSTRACT:

The paper presents an improved recursive instrumental variable (RIV) estimation method known as the 'RIV with centre of triangle' (RIV+COT) estimator to be used in the self-tuning pole-placement (STPP) control of a coupled tank liquid level system,. Estimating and tracking the parameters of a system operating in closed-loop, such as in the self-tuning control system is a challenging system identification problem due to the correlation between the disturbances and the control signal. The proposed RIV+COT estimation method aims to estimate and track the time-varying parameters of the couple tank system so that the controller is designed based on the current parameter values, providing better control of the plant. The main attractive features of the proposed estimator are its ability to produce smaller estimation overshoot and bias, and smoother steady-state estimates compared with the recursive least squares (RLS) and the basic RIV estimators. Furthermore, the algorithm is quite simple and therefore suitable for real time applications such as in a self-tuning control system. Experimental results show that the RIV+COT estimator performs better than the RLS and the basic RIV estimators as well as more robust against variations in the controller specifications.