

Work 4

1) Consider the system

$$\begin{aligned}\dot{x}_1 &= x_2 + \sin x_1 \\ \dot{x}_2 &= \theta_1 x_1^2 + (2 + \theta_2)u'\end{aligned}$$

where $|\theta_1| \leq 1, |\theta_2| \leq 1$. The state vector is measurable. Tasks:

1. Synthesize a stabilizing discontinuous controller based on sliding modes;
2. Synthesize a stabilizing continuous controller based on sliding modes;
3. Carry out mathematical modeling.

2) Consider the system

$$\begin{aligned}\dot{x}_1 &= x_2 + a_1 x_1 \sin x_1 \\ \dot{x}_2 &= a_2 x_1 x_2 + 3u\end{aligned}$$

where a_1, a_2 are unknown parameters, $|a_1 - 1| \leq 1, |a_2 - 1| \leq 1$. The state vector is measurable. It is necessary to synthesize a stabilizing controller based on sliding modes, conduct an appropriate stability analysis and conduct mathematical modeling.