

Conclusion

As a mathematical model of chattering in the small neighbourhood of the switching surface in sliding mode systems the singularly perturbed relay control systems was examined.

The following mathematical apparatus for the investigation of the SPRCS has been designed

- the sufficient conditions for existence of fast periodic solutions;
- the averaging theorem;
- the algorithm for asymptotic representation of fast periodic solutions;
- the sufficient conditions and reduction principle theorem for the investigation of the stability of fast periodic solutions.

It was shown that the slow motions in such SPRCS are approximately described by equations obtained from the equations for the slow variables of SPRCS by averaging along fast periodic motions.

The analysis of oscillations of sliding mode systems in the small neighbourhood of the sliding mode control systems has shown that

- in the general case when the original SPCSC contains the relay control nonlinearly, the averaging equations do not coincide with the equivalent control equations or the Filippov extension definition which describe the motions in the sliding mode in the reduced system;
- in the case when the original SPCSC contain the relay control linearly, the averaging equations and equations which describe the motions in the sliding mode in the reduced system coincide.

The results obtained were used for eigenvalue assignment for slow motions using the dynamics of the actuators in the case when the actuator is a MIMO system.

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