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Classification and decomposition of mechanical control systems

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Summary

Motivated by the control of biped walking robots, this talk focuses
1. on characteristic properties of elementary mechanical systems such as the Acrobot or the Pendubot and
2. on the decomposition of more complex higher order mechanical systems.

Whenever a higher order mechanical system can be decomposed into the cascade of lower order systems, then its control is also decomposed into simplified control problems. The model of a biped robot may be decomposed – up to some approximation – into a cascade which includes the Acrobot model. The latter stands for the hips and legs.

The classification of elementary mechanical systems is based on the involutivity of some distributions. The decomposition of a nonlinear system into the cascade of a given system with an other system is characterized as well thanks to geometric tools. It can be viewed as an extension of results on partial linearization.

References

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