

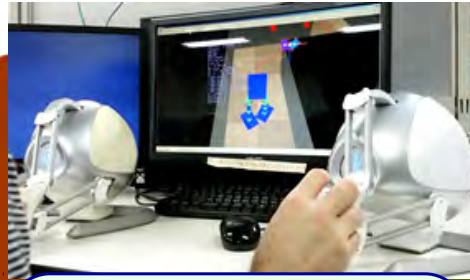
Control Engineering Lab

Control & Computation Group

The main interest of our research group is on the control, simulation, and analysis of various mechanical systems, especially of robotic systems. The research themes range from the fundamentals of computational and control theory to the development of various control and computing techniques intended for industrial applications.



New control scheme for stable & safe master-slave control



Controller development platform for master-slave biped robots



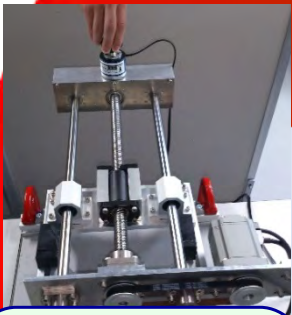
Stable numerical integration of hyper-DOF systems

Theory

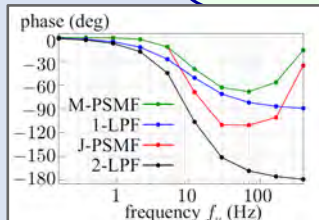
$$f = Ke + B\dot{e}$$

$$f \in -F \operatorname{sgn}(p + e + H(\dot{p} + \dot{e}))$$

Differential-algebraic relaxation of sliding mode systems



Friction compensation control



Noise-filtering and differentiators with small phase lag

$$M(q)\ddot{q} + \Phi(q, \dot{q}) = J(q)^T \lambda$$

$$\begin{bmatrix} J_v(q)\dot{q} \\ \Psi_p(q) \end{bmatrix} \in - \lim_{\epsilon \rightarrow +0} \mathcal{N}_C^{U_\epsilon}(\lambda)$$

Bounded Lagrange multipliers for mechanical systems



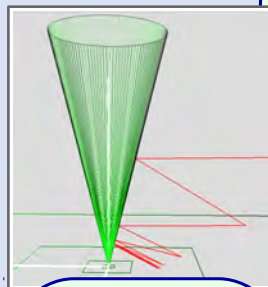
Fast computation of finite element method



Force-magnifying master-slave system



Contact-force computation in large-scale physics simulator



Fast solver for frictional contact problems



Vehicle simulation using fully-physics-based tire model



Force control techniques for human-robot interaction



Simulator-based controller development of multicopters