Abstract

Stability aspects of redundancy resolution both in velocity and acceleration level have been investigated for a method which augments the weighted least norm solution by weighted residual of the current joint rate and preferred pose rate in null space. While doing this the first and second order inverse kinematics solutions with redundancy have been re-casted as a feedback control problem, with the classical Close Loop Inverse Kinematics (CLIK) both for range space and null space and its stability conditions are derived for continuous and discrete time domains using Lyapunov and non Lyapunov based stability criteria. The non Lyapunov based analysis is based on the exponential convergence of the task space error system in discrete time domain. For generality the stability conditions of regularized version of CWLS has been analyzed considering the null space contribution which will provide the information of feasible and unfeasible directions that is especially important in near singularity configuration.

Index Terms

Computer Science

Algorithms
Keywords
Null space  range space  stability  redundancy  inverse kinematics  CLIK