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Humanoid robotics session

An application of receding-horizon neural control in humanoid robotics

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Optimal trajectory planning of a humanoid arm is addressed. The goal is to make the end effector reach a desired target or track it when it moves in the arm's workspace unpredictably. As a reference setup, we considered a seven degrees of freedom humanoid robot arm, more specifically the humanoid robot James, which is being developed by the University of Genoa and the Italian Institute of Technology. Physical constraints require the online computations to be very quick. Following previous studies, a receding horizon method is proposed that consists in assigning the control function a fixed structure where a fixed number of parameters have to be tuned. The expected value of a suitable cost is minimized. Therefore, a nonlinear programming problem is addressed that can be solved by means of a stochastic gradient technique. In a offline phase a finite horizon optimization problem is solved, then only the first control function is retained in the online phase: at any sample time *t*, given the system's state and the target's position and velocity, the control action is generated with a very small computational effort.