

Smooth motion controller for the CyberCarpet considering a dead-zone around the center

This project aims at the evaluation of an alternative feedback law for (approximately) re-centering the position of the walking user on the CyberCarpet platform, including now a small area around the center where the controller is no longer acting (dead-zone). As long as the walker remains inside this area, assumed to be circular and with radius equal to a fraction (a free parameter) of that of the circular platform, the CyberCarpet remains still.

Modifications of the controller presented in [1] should be made, so that:

- the walker safely remains inside the platform;
- smoothness of the control action is guaranteed while crossing the border of the dead-zone area;
- the linear and angular velocity applied to the walker by the platform should be kept reasonably limited (perceptual constraint)

All other operative conditions remain those in the paper [1]. In particular, a first-order kinematic model of the walker/platform should be used, and the circular platform is assumed to have 3 m of diameter. Test the control performance with Matlab/Simulink simulations for different walker motion patterns (with some 2D visualization of the walker motion on the platform, and plots of the relevant variables and commands).

Supporting material:

[1] A. De Luca, R. Mattone, P. Robuffo Giordano, H. Ulbrich, M. Schwaiger, M. Van den Bergh, E. Koller-Meier, and L. Van Gool, “Motion Control of the CyberCarpet Platform,” *IEEE Trans. on Control Systems Technology*, on-line in IEEE Xplore from 6 Feb 2012.