

1. Record Nr.	UNINA9910506390803321
Autore	Insperger T (Tamas)
Titolo	Delay and uncertainty in human balancing tasks / / Tamas Insperger, John Milton
Pubbl/distr/stampa	Cham, Switzerland : , : Springer, , [2021] ©2021
ISBN	3-030-84582-6
Descrizione fisica	1 online resource (162 pages)
Collana	Lecture notes on mathematical modelling in the life sciences
Disciplina	612.76
Soggetti	Human mechanics - Mathematical models Equilibri (Fisiologia) Models matemàtics Equacions diferencials retardades Llibres electrònics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Intro -- Preface -- Acknowledgements -- Contents -- Chapter 1 Introduction -- 1.1 Organization -- 1.2 Resources -- Chapter 2 Background -- 2.1 The Inverted Pendulum -- 2.2 Time-delayed Feedback Control -- 2.3 Stability Analysis -- 2.3.1 PD Feedback -- 2.3.2 PDA Feedback -- 2.3.3 Predictor Feedback -- 2.4 Critical Parameters -- 2.4.1 PD Feedback -- 2.4.2 PDA Feedback -- 2.4.3 Predictor Feedback -- 2.5 Summary -- Chapter 3 Pole Balancing at the Fingertip -- 3.1 Pendulum-cart Model -- 3.1.1 The Control Problem: Stabilization Angular Displacement -- 3.1.2 Equations of Motion -- 3.1.3 Estimation of $m_0$ -- 3.1.4 Physical Constraints -- 3.1.5 Measurement of -- 3.2 Feedback Identification -- 3.3 Skill Acquisition -- 3.4 Over-control -- 3.5 Summary -- Chapter 4 Sensory Dead Zones: Switching Feedback -- 4.1 Time Scales for Balance Control -- 4.1.1 Vertical Displacement Angle -- 4.1.2 Fingertip Speed -- 4.2 Sensory Dead Zones -- 4.2.1 Dead Zones in Pole Balancing -- 4.2.2 Estimating the Sensory Dead Zone -- 4.2.3 Dead Zone Benefits -- 4.3 Model: Pole Balancing on the Fingertip -- 4.3.1 Feedback Identification -- 4.3.2 Edge of Stability -- 4.3.3 Why the Pole Falls? -- 4.4

Intermittent Control -- 4.5 Summary -- Chapter 5 Microchaos in Balance Control -- 5.1 Semi-discretization -- 5.2 First-order Models -- 5.3 Quail Map -- 5.4 Microchaotic Map -- 5.4.1 Permanent Microchaos -- 5.4.2 Transient Microchaos -- 5.5 Hayes Equation -- 5.6 Postural Sway: Eurich-Milton Model -- 5.6.1 Case 1: Continuous Control ( $R$ ) -- 5.6.2 Case 2: Digital Control ( $R = 0$ ) -- 5.6.3 Case 3: Semi-discretized Control ( $0 < R < \dots$ ) -- 5.7 Bifurcations -- 5.8 Summary -- Chapter 6 Postural Sway during Quiet Standing -- 6.1 Postural Sway -- 6.2 Inverted Pendulum Models for Postural Sway -- 6.3 Sensory Dead Zone -- 6.4 Time Delay -- 6.5 "Pinned" Inverted Pendulum Model. 6.6 Sensory Dead Zones and Torque Saturation -- 6.7 Chaotic Sway -- 6.8 Frontal Plane Balance Control: Stance Width -- 6.9 Summary -- Chapter 7 Stability Radii and Uncertainty in Balance Control -- 7.1 Rectangular Tiling -- 7.2 D-curve Slicing -- 7.3 -Pseudospectrum -- 7.4 Comparison of the Three Approaches -- 7.5 Measuring Uncertainty Radii -- 7.6 Stability Radii for Frontal Plane Balance as Stance Width Changes -- 7.7 Summary -- Chapter 8 Challenges for the Future -- 8.1 Derivative Control -- 8.2 Different Feedback Delays in the Feedback Loop -- 8.3 Act-and-Wait Control -- 8.4 Ball and Beam Balancing -- 8.5 Balancing on Balance Boards -- 8.6 Skill Acquisition -- 8.7 Stochastic Perturbations -- 8.8 Falls -- Appendix A Semi-discretization Method -- Appendix B Stability Radii: Some Mathematical Aspects -- References -- Index.

---