

HW1

什么是被动行走

Def:

1. Passive Dynamic Walking robots are robots that show a perfectly stable gait when walking down a gentle slope without any control or actuation. (Hobbelen_2008)
2. A completely unactuated and therefore uncontrolled robot can perform a stable walk. (Schwab_2001)
3. Gravity and inertia alone generate the locomotion pattern. (McGeer_1990)

描述研究被动行走主要包括哪些内容

Basic

1. Equations/Dynamics of Motion (Schwab_2001)
 - Stride function: $v_{n+1} = S(v_n)$.
2. Step-to-Step behavior (Schwab_2001)
 - Failure modes: Falls forwards or Falls backwards.
 - Cyclic motion: $v_{n+k} = v_n$
 - Cell mapping method: The continuous state space of the dynamic system is discretized into a finite number of cells. The system's behavior is then analyzed by studying the transitions between these cells.
3. Basin of Attraction (Schwab_2001)
 - Def: The set of initial conditions in the robot's state space that lead to a stable walking gait.
 - Analysis: Use cell mapping method to analyze its size. Most importantly for analyzing the development of its size for an increasing ramp slope γ

Evaluation

1. Energy efficiency (Hobbelen_2008)
2. Disturbance rejection (Hobbelen_2008)
3. Versatility (Hobbelen_2008)

什么是准被动行走

Def:

- Quasi-PDW means that a robot usually does PDW without any input torques, and the actuators of the robot are used just only when the walking begins or disturbances come in. (2004)
- Positively utilizing the passive dynamics of the system to enable underactuated legged robots to walk efficiently and stably on **level ground** (2020)