Planning and Executing Humanoid Gaits in a World of Stairs

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Introduction

Abstract. Humanoid Robot Locomotion Problem. Approach + Block Scheme.

Variable Height CoM IS-MPC

3D Motion Plan. Variable Height CoM Motion Model. MPC Formulation (ZMP constraints, stability constraints, algorithm+BHuman).

Experiments: Normal Staircase. Simple Staircase. Multiple Staircases (Up/Down).

RRT-based Footstep Planning

Problem Formulation: R1, R2, R3. How the planner works (briefly). NAO's catalogue of primitives.

Experiment: Obstacle Avoidance.

Elevation Map Generation

`elevation_mapping`, features, how it works (briefly). Settings: NAO + Xtion + *World of Stairs*.

Experiments: Generated Map + Stair Climbing in Unknown Environment.

Video

Conclusion

Results. Future Works.

Q&A

References

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- P. Fankhauser, M. Bloesch, and M. Hutter, "Probabilistic terrain mapping for mobile robots with uncertain localization," *IEEE Robotics and Automation Letters (RA-L)*, vol. 3, no. 4, pp. 3019–3026, 2018.