Contents

1 Research Statement

1.1 Background & Motivation

Research in Wearable Robotics Systems, such as prosthesis and exoskeleton, has advanced to the point where benefiting people with disabilities. However, most of these systems fail to offer a [smooth] experience for addressing the locomotor deficits of disabled people, due to a lack of bidirectional feedback between human locomotion and Mechatronics system.

1.2 Research Questions

Based on the background stated above, my research questions, which also serve for the focus of my research, are as follows:

- How the fundamental actuator modes are combined, in order to mimic human gaits?
- How mechanical design is developed to aid the interactions between Mechatronics systems and environments?

1.3 Related Projects

1.3.1 Open-Source Leg

1.3.2 Series-Elastic Actuation

1.3.3 Finite State Machine Design for Prosthesis

1.3.4 Design & Control of Bionic Robot Swimmer

1.4 Gimbal Stabilization Camera Design

1.5 Goals & Perspectives

I strive to improve experience of interactions between wearable robotics systems and disabled people.

On the one hand, I help create mechanical designs for the components of the series elastic actuator, lying a foundation for the robust gait phase control.

On the other hand, I also help create finite state machines, such as mode transitions for the control states, to make gait phase controls more robust in automation processes.

1.6 Future Agenda

My long term research goal is to to investigate more on human locomotion, and develop corresponding control strategies & mechanical design to improve experience of interactions between people + prosthesis / exoskeletons and environments [1]

1.7 Reference

2 Publications

References

[1] Z. Bons, G. C. Thomas, L. Mooney, and E. J. Rouse, "An energy-dense two-part torsion spring architecture and design tool," *IEEE/ASME Transactions on Mechatronics*, 2023.