Journal of Zhejiang University-SCIENCE A (Applied Physics & Engineering)

Wheeled jumping robot by power modulation using twisted string lever mechanism

Xian-wei LIU, Yong-bin JIN, Lei JIANG, Hong-tao WANG

Cite this as: Xian-wei Liu, Yong-bin Jin, Lei Jiang, Hong-tao Wang, 2021. Wheeled jumping robot by power modulation using twisted string lever mechanism. *Journal of Zhejiang University-SCIENCE A (Applied Physics & Engineering)*, 22(10):767-776.

https://doi.org/10.1631/jzus.A2000618

Research Background

- For electric powered jumping robots, three different schemes are usually used.
- In this study, we propose a novel scheme by simply replacing the rigid gear with a flexible twisted string in realizing a variable transmission ratio, to reach a higher jump height.

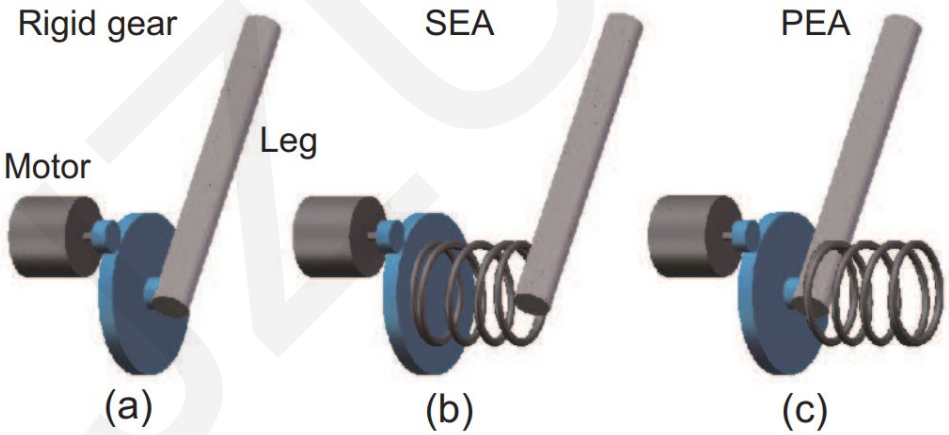


Fig. 1 Three different schemes for motor-driven jumping robots.

Twisted String Lever Mechanism

- As the string twisted, the string would shorten. We use the string to actuate a lever mechanism to realize the drive of a rotary joint.

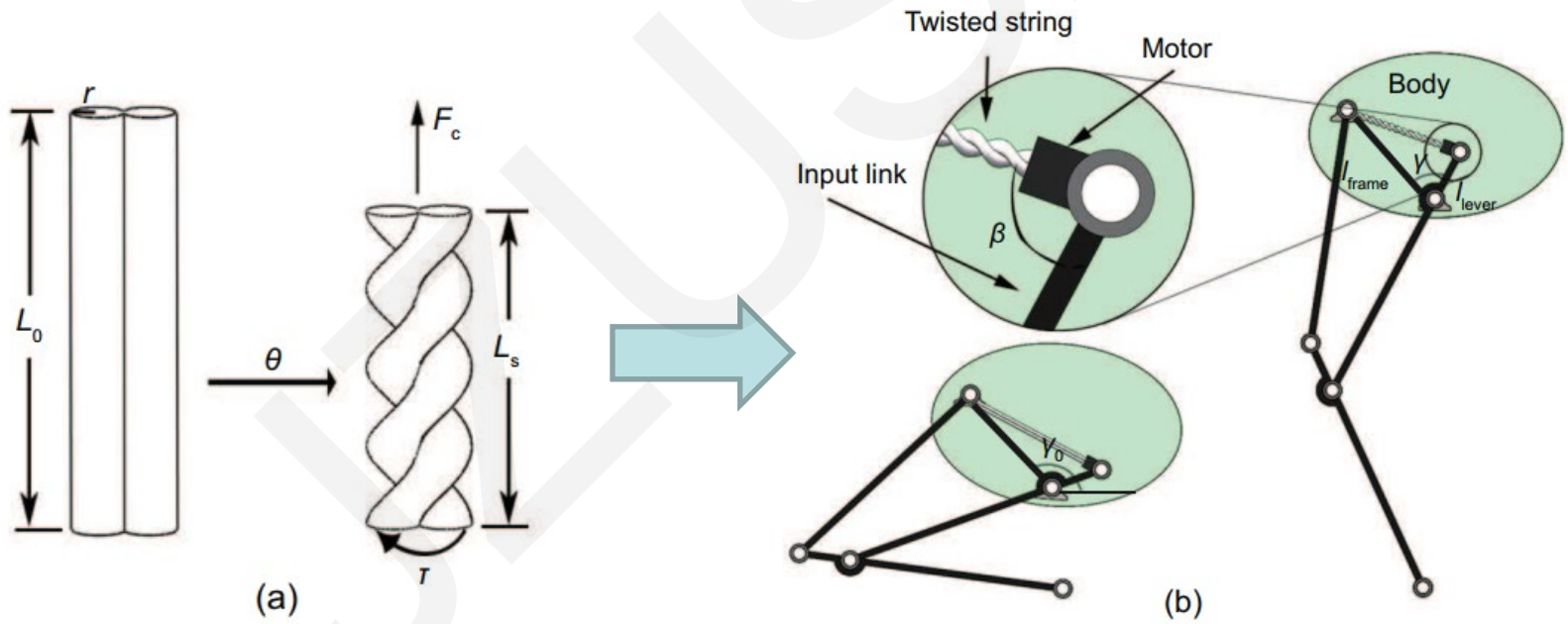


Fig. 2 A schematic of the twisted string mechanism and the setup of the Twisted String Lever Mechanism (TSLM).

Prototype of the jumping robot

- **We built the leg-wheeled robot prototype using light materials like carbon fiber, aluminum alloy.**

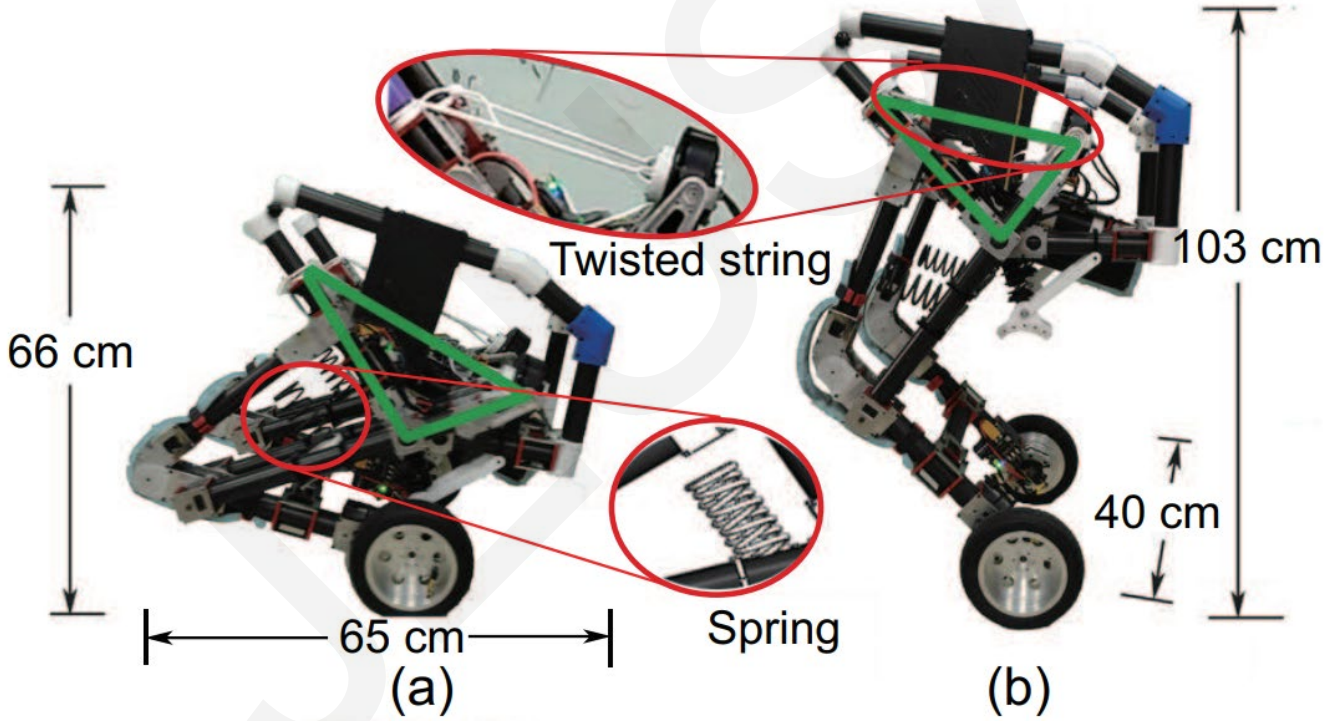


Fig. 3 The prototype of the jumping robot in different position: (a) in rest position and (b) in stance position.

The experiment on jumping ability

- **We performed a series of jumping experiments on its jumping ability.**

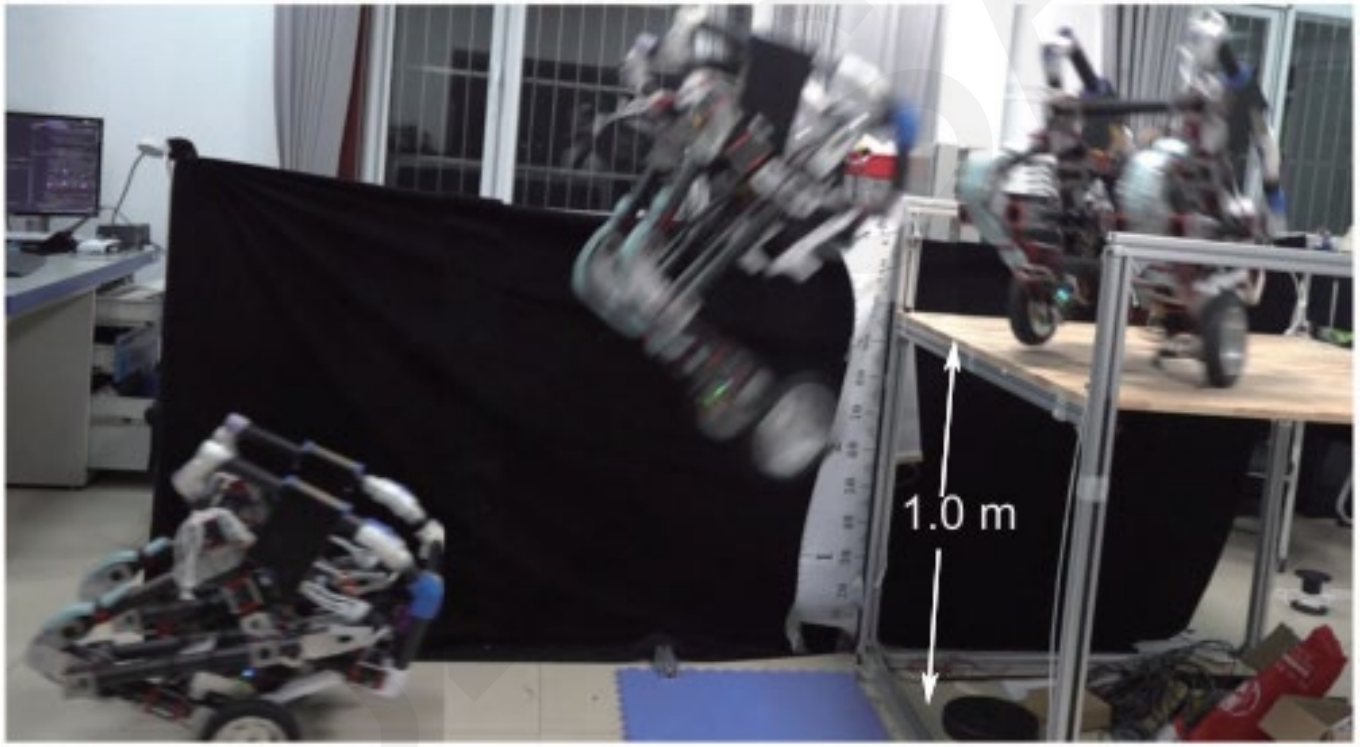


Fig. 4 The prototype is able to jump up to a stage with a height of 1.0 m.

Conclusion

- we have introduced the leg-wheeled robot based on the novel TSLM. Combining TSLM and the optimized design of leg has achieved both fast traveling speed and excellent jumping ability.
- Compared with other actuator systems, the TSLM has the advantages of high integration, lightweight, and high explosive power, making the twisted string actuator particularly suitable for use in jumping robot legs.

JZUSA