Research on Radial Symmetric Flexible Body Robot Based on Shape Memory Alloy

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Introduction

In this paper, an SMA spring-driven bionic radially symmetric soft body robot was proposed based on the morphological structure of symmetric animals such as starfish and the motion mechanism of octopus brachiopods. The structural design, kinematic modeling and control system of the radially symmetric soft body robot were mainly studied. Finally, the physical prototype of the radially symmetric soft body robot was trial-produced, and the multi-legged coordination control experiment of the robot was carried out. The experimental results show that the soft body robot prototype can well implement the designed motion strategy of unobstructed terrain crawling.

Methods

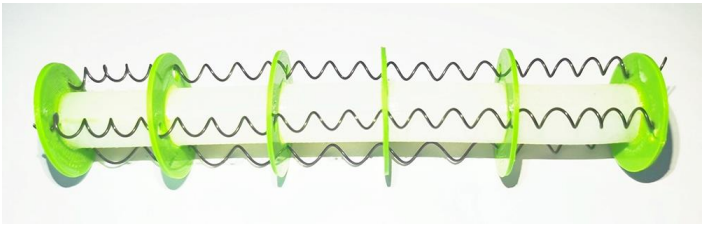
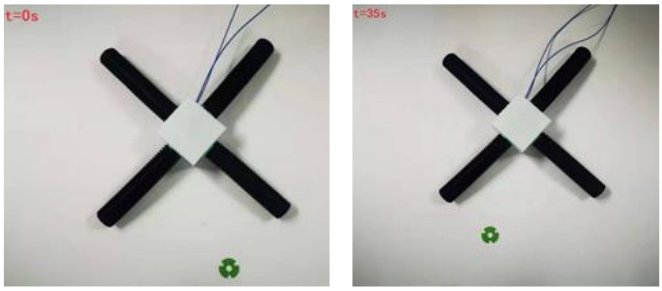


Fig.1 Flexible mechanical foot assembly product

According to the driving characteristics of the SMA spring obtained by the experimental analysis, the pulse width modulation is used as the method to control the electric heating power, the proportional integral algorithm is used, and the resistance of the SMA spring is selected as the feedback amount to carry out the closed-loop control of the flexible mechanical foot. Referring to the motion mode of starfish, the motion mechanism of the soft-body robot is designed, and the multi-legged coordination control strategy of the robot facing different environments is written. Finally, the physical prototype of the radially symmetric soft-body robot is trial-produced, and the multi-legged coordination control experiment of the robot is carried out.

Discussion/Results



(a) **(b)**

Fig.1 Robot prototype and experimental results, (a) initial state, (b) state after 35 s movement

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Conclusions

Completed the design and experimental research of the control system of the radially symmetric soft body robot. The physical prototype of the radially symmetric soft body robot was trial-produced, and the multi-legged coordination control experiment of the robot was carried out. Experiments show that the soft body robot prototype can well execute the motion strategy on unobstructed terrain.