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DESIGN AND SENSING OF A BIONIC SOFT ROBOTIC ARM FOR IMPROVED SERVICES AND MAINTENANCE IN THE SPACE STATION CABIN

Abstract

Space exploration has been a focus of scientific research and development. With the increasing number of astronauts and unmanned missions in space, the demand for improved services and maintenance in the space station cabin has become a major concern. In order to better serve the needs of astronauts and improve the efficiency of maintenance work, we have utilized bionics to design a soft robotic arm that can be applied to the service robot in the space station cabin.

The design of the soft robotic arm was inspired by the anatomical structure of the elephant's nose. We analyze the internal muscle layout of the elephant nose and use the resulting information to produce a soft robotic arm utilizing 3D printing technology and silicone pouring technology. The design of the robotic arm was aimed at achieving accurate exercise, and as such, we used the commercial finite element simulation software ANSYS to perform motion simulation. The simulation results were verified through experiments, and the experimental results showed an excellent fit with the simulation data.

One of the challenges we faced was the need for soft robotic arm sensing in a non-visual environment. To overcome this challenge, we utilized ion hydrogel to realize the exercise feedback of the soft robotic arm. This technology allows the robotic arm to detect and maintain the closed environment in the cabin, and provides improved services and maintenance for unmanned missions in the space station.

The application of bionics in the design of the soft robotic arm has enabled the expansion of the functional capabilities of the service robot in the space station cabin. The research we conducted has contributed to the advancement of technology in the field of space exploration, and has opened up new possibilities for the use of robotics in the maintenance of space infrastructure.

In conclusion, the use of bionics in the design of the soft robotic arm has provided a breakthrough in the development of space technology. The soft robotic arm has expanded the functional capabilities of the service robot in the space station cabin, providing improved services and maintenance for unmanned missions in space. The research we conducted has paved the way for the future development of space

technology and has opened up new possibilities for the use of robotics in the maintenance of space infrastructure.