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Utilization & Exploitation of Human Spaceflight Systems (3)

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

Abstract

In recent years, 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. Our design is inspired by the anatomical structure of an elephant's trunk, and we have analyzed the internal muscle layout of the trunk to produce a soft robotic arm using 3D printing technology and silicone pouring technology. We aimed to achieve accurate exercise, and we used the finite element analysis software ANSYS to perform motion simulation. The simulation results were verified through experiments, and the results showed a good fit with the simulation data. One of the key challenges we faced was the need for the soft robotic arm to be able to perceive touch in a non-visual environment. To overcome this challenge, we utilized ion hydrogel to perceive touch and enable exercise feedback control 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 space. Our use of bionics in the design of the soft robotic arm has expanded the functional capabilities of the service robot in the space station cabin. The robotic arm's ability to detect and maintain the closed environment in the cabin has improved the efficiency of maintenance work and made the space station a safer place for astronauts. Our research 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. Our research 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.