A Novel Pneumatically-Actuated Soft Robotic Hand With 3D Vision-Based Teleoperation

Matusik, Hanna (School: Lexington High School)

Having robots at home could help with accomplishing many daily tasks. As larger percentages of the world's population begin to age, as well as there being many people with disabilities, having robots at home becomes more and more important. However, the progress of robotics at home has been quite slow so far. Also, many robotic actuators are very expensive which makes them inaccessible to most of the population. I propose a way to accelerate the progress of robotics at home. I designed and fabricated an affordable robot hand and designed a teleoperation system to control it. The hand is pneumatically actuated with over 12 degrees of freedom to provide dexterity. The hand is completely 3D printed using both elastomeric and rigid materials. The elastomeric material is used for pneumatic actuators and for a soft skin which allows safe operation. The rigid materials make the hand more structurally stable. The manufacturing process using 3D printing is automated and inexpensive (less than $300). In order to allow demonstrations of using this hand for different tasks, I designed and utilized a teleoperation system. The system uses hand tracking in current consumer VR headsets. Hand poses are mapped to the appropriate degrees of freedom of the robotic hand. I demonstrate the whole system by performing different tasks.

Awards Won:
Office of Naval Research on behalf of the United States Navy and Marine Corps: The Chief of Naval Research Scholarship Award of $15,000