



CALIFORNIA STATE SCIENCE FAIR 2017 PROJECT SUMMARY

Name(s) Natalie R. Dean	Project Number J0309
Project Title What Does a Simple, Low Cost, 3D Printed Design for an Automated Robotic Hand Look Like?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals With up to one million people in just the United States reported to be missing limbs due to birth defects, injuries, or illness, the need for replacement prostheses is extremely medically important. Furthermore, an equal need exists to make artificial limbs easy to manufacture and assemble at affordable costs so that more people can benefit.</p> <p>Methods/Materials A 3D-printed design for a robotic hand was created and sized appropriately to comfortably fit a child near ten years of age. 3D CAD software (123D Design by Autodesk) and a 3D printer (Da Vinci 1.0 Pro by XYZprinting) were used. Commercially-available materials (for example, polyactic filament) and components (for example, monofilament and cotter pins) were selected. Simple geometric shapes and basic 3D CAD software functions were used while creating the design.</p> <p>Results The design resulted in a very low-cost and effective robotic hand solution. This design can be scaled larger or smaller using the 3D printer software to create hands for different sizes/ages of people. The entire hand was 3D-printed in just over 19 hours and for less than \$10. The parts were designed to be interchangeable, so only a few spares need to be kept by the recipient. Assembly is easy for the user and requires simple hand tools and a short amount of time.</p> <p>Conclusions/Discussion The 3D-printed hand functions manually with individual finger movements. Simple tasks such as grabbing and picking up can be achieved but not as easily as expected. Movement of the fingers takes more force/effort than expected, and the fingers do not bend as much as expected. However, the overall design requirements for the hand were achieved.</p>	
Summary Statement Commercially-available software and hardware (3D CAD and 3D printer), materials, and components were used to create a simple 3D-printed design for a robotic hand.	
Help Received None. I designed, built, and performed the experiments myself.	