



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

Name(s) Amulya Vadlakonda	Project Number 34741
Project Title A Smart Gripping Prosthetic to Aid Hand Amputees in Handling Delicate Objects	
Abstract Objectives/Goals My objective was to design and build an electronic prosthetic device to handle delicate objects, like eggs, and be size and shape independent. It uses sensors to provide input to a microcontroller, and a feedback-based smart system to make decisions, so it is self-sufficient. Goal 1: Design, develop, and verify the operation of the smart system, including the input sensors, motors, and microcontroller algorithm. Goal 2: Design, manufacture, and assemble the mechanical device for lifting and moving delicate objects. Goal 3: Join the subsystems together, creating an independent system. Methods/Materials Device operates on portable 9V DC power; Time constraint of 6 weeks; Budget of \$400; Custom-designed parts created at the pace of the machinist I used 4 variable resistors, 3 stepper motors, 1 microcontroller, 3 motor drivers, 6 resistors, and 1 push-button switch. I designed the parts for the device—two pincer arms, the bases for the motors, and the brackets for each of the motors. I then calibrated the force sensors by testing amount of voltage produced with different known weights. I set up the sensor and motor circuits. I designed an algorithm to carry and move an egg, and translated it into C. I connected my circuits to the microcontroller, and tested out the final code, representing the mechanical device with my hands. Results My device is programmed to initialize motors and sensors, squeeze the egg, lift it, move it, set it down, and release it without breaking it. It uses the proposed smart system. It is superior to previous designs by not being shape or size dependent. It caters to objects of different shapes and sizes within a range of 3 to 7 cm. The complete set of mechanical parts is still being manufactured, so the prototype could not be completely tested. Still, all the parts are designed, and the electronics, microcontroller, and the algorithm work. The only thing keeping the device from being usable is the integration of the circuits and mechanical parts. Conclusions/Discussion My project accomplished everything I set out to do. This device is unique because of its ability to handle more fragile objects, while functioning on its own. With this kind of device, hand amputees will not be restricted to bulky prosthetics. Their everyday lives will be improved, because they will be able to handle activities that require fine motor skills, like opening bottles, or even holding the hand of a baby.	
Summary Statement My project was to design and build a device that can handle delicate objects unaided, and is size and shape independent. It uses sensors to provide input for the feedback based smart system the device uses to make decisions.	
Help Received Dr. Youssef Ismail from Schmahl Science Workshops taught me about electrical circuits and programming	