



CALIFORNIA STATE SCIENCE FAIR 2011 PROJECT SUMMARY

Name(s) Arjun V. Balasingam	Project Number S0901
Project Title M2D2 Mechatronic Medicine Dispensing Device Engineered from Scratch and Enabled with Computer Vision for Assisted Living	
Objectives/Goals I was motivated to work on this project, because the population of older people in the United States is increasing rapidly. As people age, they tend to develop motor skill issues, which can cause them to miss, or take incorrect doses of prescription medications. In order to address this problem I built a device which extracts the required mix of tablets out of multiple containers at scheduled times during the day and places them in a cup for a patient to take.	
Abstract Methods/Materials I built my entire system from scratch. I used sheets of plastic, wood, and various fastening devices to create my mechanical system. I repurposed a "Lazy Susan" to build a smoothly operating base. I went through many design revisions. I used servos for actuation. Physically my system consists of four main components: (1) a webcam, (2) a laptop computer, (3) a microcontroller, and (4) a robot arm. My software system consists of three key modules: (1) a vision system, which is built on OpenCV a public domain computer vision library. (2) a Trig Engine which computes the joint angles of my arm, and (3) a Command and Control Interface, which helps the computer, cooperate with the microcontroller to control the servos on the arm.	
Results My system ensures that it delivers precisely the right number of tablets using a two-step approach: Dip/Grab and Pick/Vision. In Dip/Grab, the robot arm reaches into a tablet container, and grabs some tablets. These tablets are then scattered on a staging area. Then, in Pick/Vision, a webcam takes an image of the scattered tablets. The computer analyzes this image using computer vision and trigonometry. The results from this analysis are then used to drive the arm to a particular scattered tablet. The arm then picks this specific tablet and drops it in the patient's bowl. Then using Pick/Vision, the arm cleans up the remaining tablets to the bottle.	
Conclusions/Discussion I invented a device, which can help patients with motor skill issues take tablets. I integrated my system, calibrated, tested and debugged it and showed that my original goals were met.	
Summary Statement I invented a device which will benefit the growing population of older people in our nation; this has the potential to decrease the cost of healthcare	
Help Received I would like to thank my advisors Mr. Nicoletti and Dr. Kucherov for their valuable advice, and encouragement. I would like to thank my dad Dr. Pratheep Balasingam, and my mom for all of their support.	