

## **Filippos, James, Anders, Josh, Radmer**

Through this project we learned a lot about what it takes to produce a fully integrated product that combines intricate computer, electronic and mechanical subsystems. Initially, we focused on each subteam's tasks and didn't really take into account integrating the systems with each other. For the first design review, we had a working openCV program that was able to recognize different contours and colors via a web camera and had developed the basic initial frameworks in Python for checkers and chess. We had also designed and fabricated the frame of the gantry, however no integration between the two systems had taken place up to that point.

After the first design review, we recognized this flaw in our scrum design process and set as a high priority the integration of the mechanical and the software system. By the second design review we had set up the Raspberry Pi and we were able to perform contour detection with the Pi Camera. Moreover, the motors were correctly mounted on the gantry and we were able to write via pyserial to the Arduino UNO. Yet, we encountered an issue with both motors drawing too much current and had to experiment with different shields and look for new motors. We purchased a bipolar stepper Pololu shield and, finally, shifted back to Adafruit shields using some new bipolar stepper motors that had appropriate power demands of approximately 4W.

Finally, we wrote the AI code and managed to have an integrated system. The Raspberry Pi connects to our mechanical system, via our motor system, through our framework file. The universal gripper is able to pick up pieces and move them in valid places of the board.

This final project in the Principles of Engineering (POE) class was an extremely rewarding experience, where every team member understood his strengths and difficulties. Although we had initially divided up into two main teams of software and mechanical engineering, we realized that only via collaborating and helping each other we would be able to accelerate our design process and finally integrate our system.