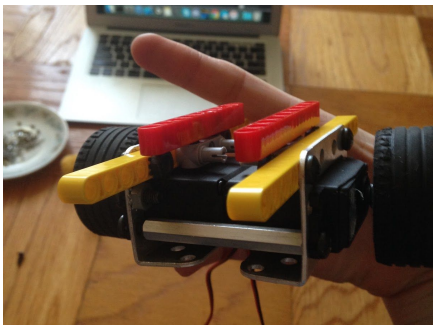
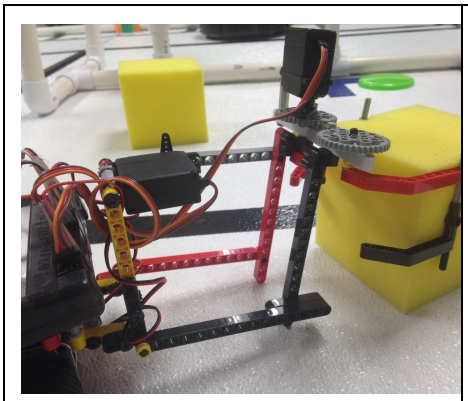
Greater DC/Virginia Region

Period 2 Mechanical Design

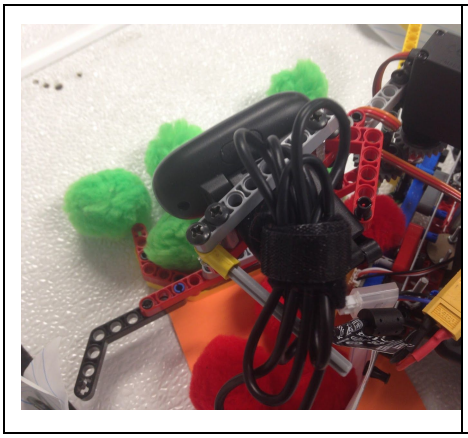
Drivetrain:

	The picture here is the drivetrain of the Scorpio robot. Scorpio utilizes a wheel-motor drivetrain, with its wheels mounted via the classic servo horn method. Instead of using the standard chassi to connect our drivetrain, our team decided to use a very tight, two-servo-horn-and-standoff method. This gave us numerous benefits such as having a smaller turn radius and freeing another robot to use the chassis provided in the parts list.

Effector:

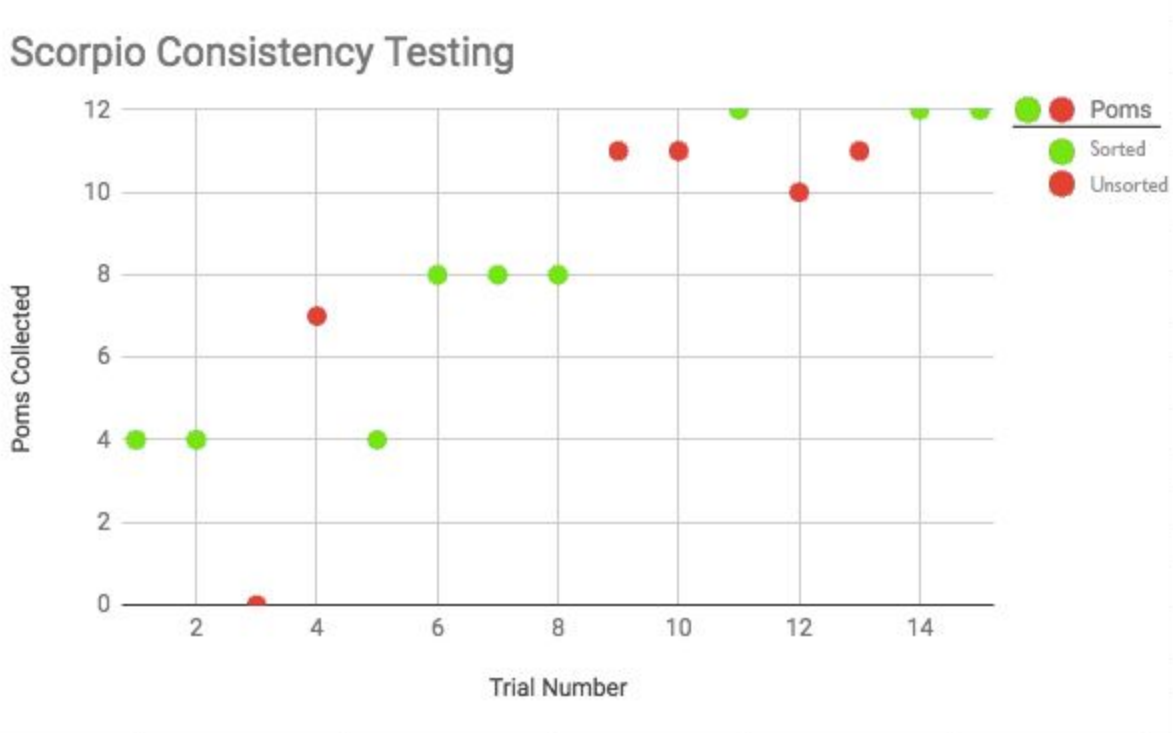
	Here you will find our effector for picking up the crates. The system is based on a four-bar parallel linkage, which is operated by one servo to lift the arm and another one for the claw on the end.. The claw uses a simple, two-gear mesh to allow the claw to open both ways. Another design that we had considered before reaching the linkage was a linear slide. The linear slide would have consisted of a claw that would slide along a metal beam with a string to move it along. While this would have allowed our claw to move straight up, we determined that it would have required a much longer time to lower and raise, which countered some of the advantages that its linear motion provided. The parallel system proved to be both fast and effective.

Sensor Mount:



We sandwiched the two flaps of the camera between two lego beams, which were connected by standoffs in order to prevent shaking. Another proposed idea was to put lego beams around the head of the camera itself. We ended up not going in this direction as it was a less secure mount that added an additional layer of inconsistency we felt was unnecessary.

Data:



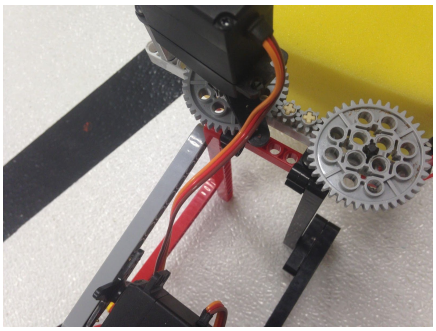
This graph shows how many poms Scorpio was able to collect for each run as well as whether or not the poms collected were color sorted. For each trial, Scorpio would run its path and attempt to obtain a maximum of 12 poms. We would record how many of the 12 poms Scorpio would collect and add a data point to our graph. If Scorpio's red

poms were separated from the green, we would mark the data point green to indicate that the poms were color-sorted. Otherwise, we would mark the point red.

Data Evaluation:

By looking at our data, we are able to evaluate how efficient our pom-collecting mechanism was and how effective our camera mounting and coding were. A high number of poms collected meant that the pom sweeper was working efficiently whereas a low number would mean vice-versa. Green data points would indicate that the camera code and mount are working well while red would mean vice-versa. In our initial trials, we collected less poms, this was due to basing our movement functions on time which, became more and more inaccurate as the battery charge dropped. As we changed our functions to being motor-tick based, the number of poms we were able to collect rose. Although our poms scored seemed to level out near the end of the trials, unsorted runs seemed to continue to plague us regardless. Out of our 15 runs, only 9 were sorted, meaning that we only had a 60% successful sort rate. This was due to some poms slipping out of their color-determined sections while Scorpio was driving, an occurrence that did not change as we continued to improve the code. It can be concluded that our Scorpio bot is highly effective at getting a high number of poms, while perhaps somewhat unreliable in making sure that those poms are sorted. Based off of these results, we will probably end up making our pom color-sections bigger to prevent poms from slipping out, increasing the chance of a sorted run.

Modified System:

	Our claw design for obtaining the crates went through two variations. In the first variation, only two adjacent gears were meshed to open the claw, but, in the rebuild, we decided to use a four-length gear train. This allowed the claw to better fit the width of the crates and open much wider . We decided to switch to the second system in order to make picking up the crates easier. Having a larger open radius gave Scorpio bot more leeway in how perfectly it had to be aligned with the crates in order to pick them up. We plan to continue running the bot and monitor how often we successfully pick up the crates. If Scorpio bot still has trouble grabbing the crates, we may decide to make the actual arms of the claw longer.