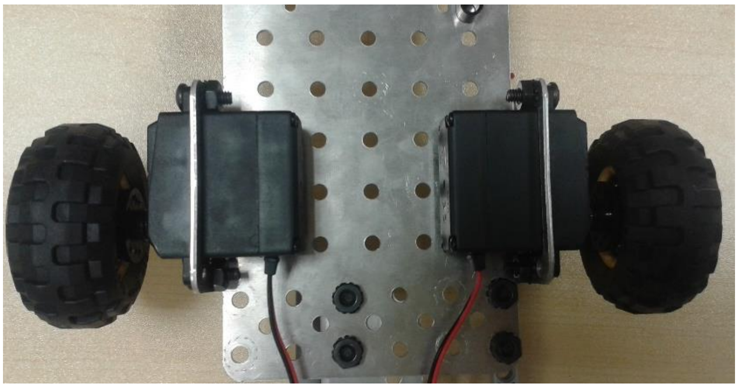
Tunisian School (0717)

Mechanical Design Period 2

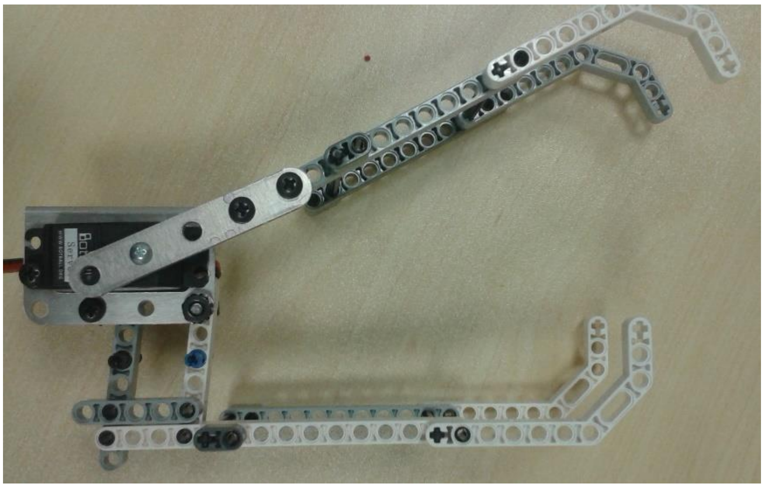


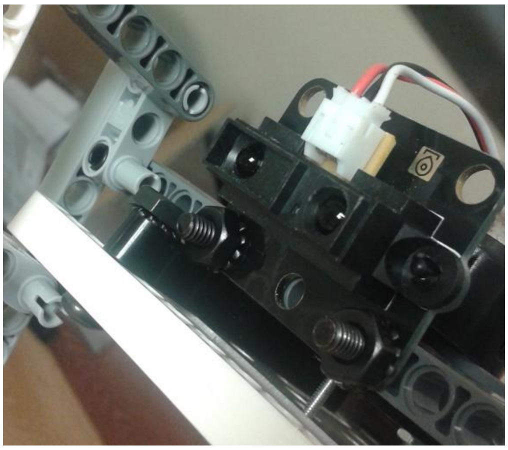
Drivetrain:

As shown in the picture on the left, we are using a simple drivetrain. On each side of the robot a *LEGO Wheel* is connected to a *black gear motor* via an *Axle* mounted on the *Knob wheel*. We chose to use this drive system because it makes the Chassis near to the ground, giving us a better control over the game pieces (food supplies, people…). Therefore, the programming will be easier which will allow us to focus more on the complex parts. We thought about using the *Solarbotics Wheels* and connect them directly to the gear motor so we can use less pieces. But by doing so, our robot won't be able to do some tasks that requires a low-height robot.

Effector section:

The effector of our robot shown in the figure is basically a grabbing claw We chose this design because it will give our robot the ability to grab and lift the game pieces to take them in the scoring areas. The gripper features two LEGO beams; one stationary and the other moved by a servo in order to grab properly the pieces so they don't fall while the robot moves. The first claw model that we have made was a combination of two LEGO beams linked to a *black gear motor* that control their movements simultaneously via two *Tooth*s connected for every LEGO beam.

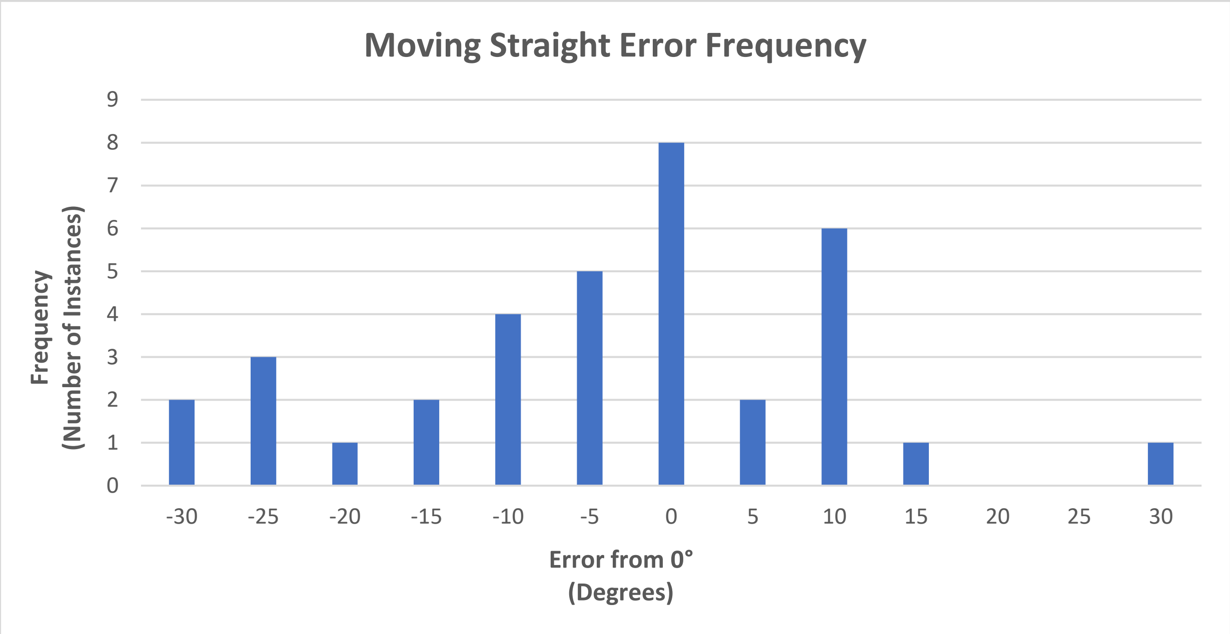




Sensor mount section:

We set up on the main body of our robot DEKU an *ET analog sensor* as shown in the picture, using two *Screws (8-32 x 1/2").* Another mounting method we considered was using two pieces of *Axle* to attach the sensor to the main body and limit them with a *Bush*. Event though using *Axle*s and *Bush*s would be easier to mount/unmount the sensor, we chose using *Screw*s because it will have a better hold.

Data:



We programmed our robot, so it can move straightforward without any deviation. We attached to it a pen touching the ground in a way that can show us the exact path of DEKU. The robot will be running on a drawn perpendicular line that represent the 0°. We would run the program and see the frequency of deviation of the robot by noting the angle of the intersection of the two lines (line from the pencil & drawn line). Positive numbers represent deviation to the right, negative numbers represent deviation to the left.

Data evaluation:

The data represents the accuracy in the drivetrain system of our robot. Factors such as motor alignment, weight distribution, and motor velocity all have influence on the data. The data shows that our robot is generally accurate within a couple of degrees when moving straightforward. However, upon seeing the data and calculating the mean of the values, we realized our robot is often over deviating in the negative direction. This caused much concern among our team as such an error would be critical when trying to score points. We realized after many tries that it is sometimes tipping causing one wheel to lift from the gameboard. This fitful tipping is the cause of the significant overturning to the left that we observed in the data. To prevent the robot from this flaw, we need to distribute the weight better on the robot. Our plan is to place the Wallaby in the opposite side of the arm and add 250g of coins so our robot will be more balanced. With a centered center of gravity our robot should keep all of its wheels on the ground. Therefore, it will turn much more accurately.

Modified system section:

A change that we made to the robot was to add a “mini-lift” composed of a combination of LEGO pieces and *Wheel*s linked via *Tooth*s with a motor black gear and a chain in which we will attach our robot’s claw, as shown in the picture. We made this change in order to give our robot the ability to raise its claw up and down to collect game pieces that can’t be reached with our old model. We tested this lifting system and its new code by telling the motor to rotate so the mechanism can work and the arm can move up and down. We will continue testing it, so we can ensure that no mistakes will occur.