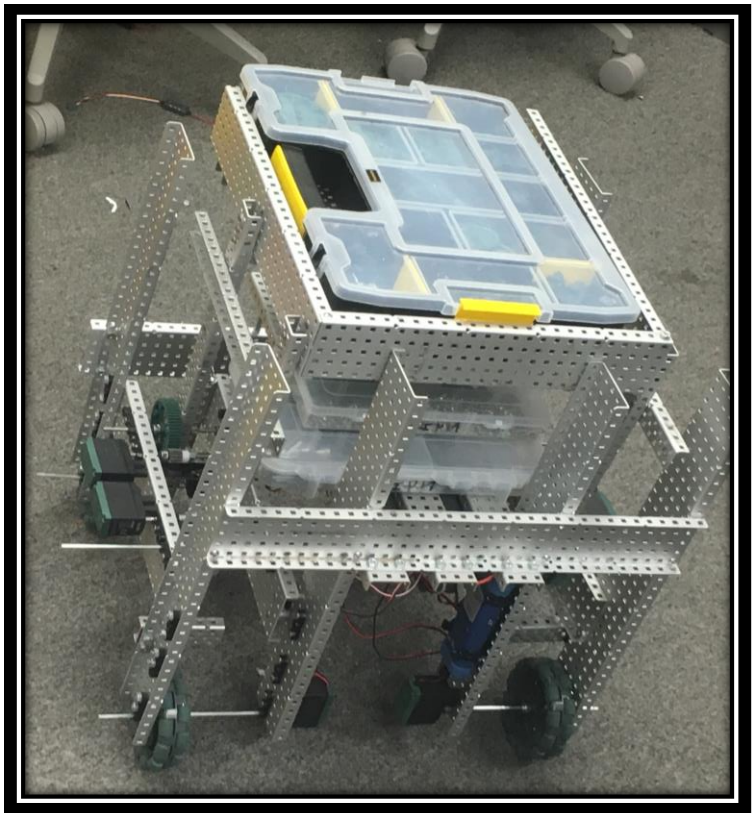
NYIT Bears in VEX U (Team NYIT5)
IEEE Student Branch at New York Institute of Technology
Old Westbury, United States
FUTURE Foundation Robot Construction Challenge

CADDY BUDDY: The "Buddy-est" Caddy Around



For everyone who has ever built, programmed, managed, and designed robots, a big challenge we face is not having the parts we need at our fingertips. Caddy Buddy is our one-stop-shop solution for everything we need.

We chose this task because we wanted something practical for helping us build our VEX robots. One of the trials and tribulations we face when building is not having every part or box we need by our side. When building, we often get into a rhythm, but at some critical point we realize we have run out of materials and desperately look for the part we need or the box that holds it. While this may only take a few seconds, or up to a minute every time, a year's worth of this time can amount to hours. This is precious time that we could spend on building our robots. To fix this problem, we created a robot that not only brings tools and parts to you at the push of a button, but also elevates them for easy accessibility, Caddy Buddy. Caddy Buddy took six days to build, spread over a three week period.

Our first task when designing this robot, was figuring out what we wanted the robot to do. We brainstormed different challenges we face when building, and interviewed other students at our school; the one answer that everyone gave was not being able to get parts boxes easily because there are four different workstations and only one set of boxes – thus we needed a robot that could transport them. This robot would also have the ability to store tools and other miscellaneous parts that we would need. It could also deliver things from station to station. And if reaching down to get the parts boxes was an issue, we could have a system lift boxes up higher or lower as needed.

For our design, we first started with the drive train and chassis. The drive train consists of four 4" omni-wheels with 1 torque motor directly attached to each. The omni-wheels allow for little friction and easy maneuverability which allows the robot to move and turn with ease. We used tank drive to control it to allow for more user control.

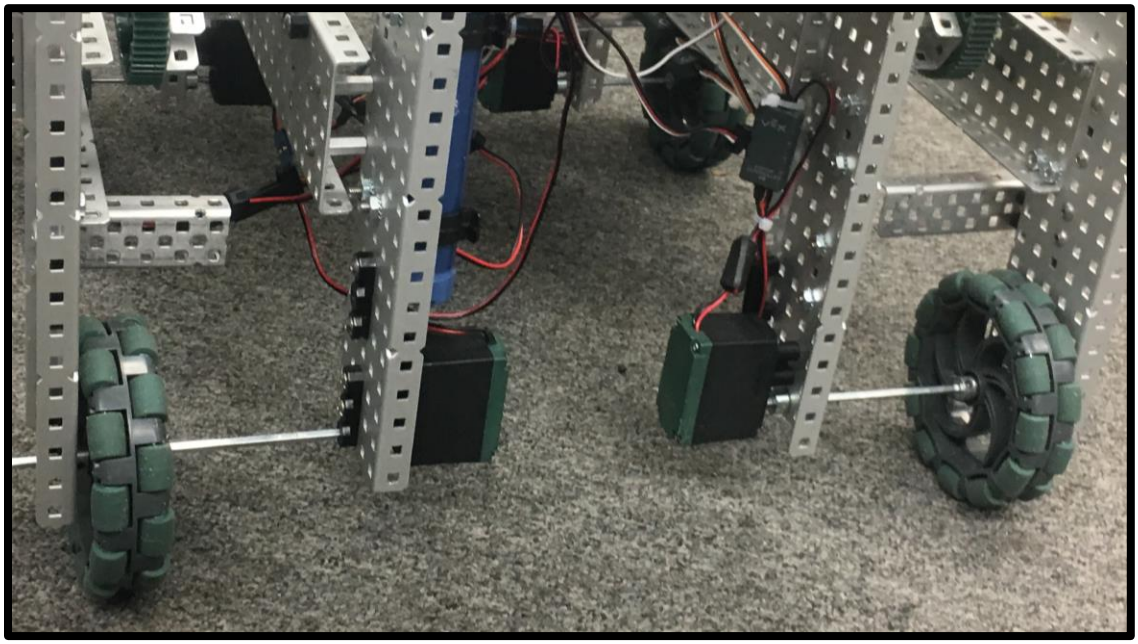


Figure 1: Chassis and Drive Train

After we finished the tank drive, we began to work on the elevation system for the parts rack. We designed a 4-bar pivot using 1 motor for each bar. The motor spins a 12-tooth metal pinion gear, which turned a 36 tooth gear, which was attached to the pivot bar directly. This provides a 3:1 gear ratio which provides an output torque of 4.5 N-m and an output speed of 33.3 rpm. The output torque is enough to lift 5 lbs of parts safely. In addition, the rack itself is dependent on gravity which eliminates power needed to return the rack to its position. There are 4 pivot points which let the rack swing freely. The rack is also able to hold tools, parts, and part boxes. Underneath the rack is a small compartment for small boxes or other tools. Along the perimeter of the robot is ample space to put tools such as a drill, screw drivers, or hex keys.

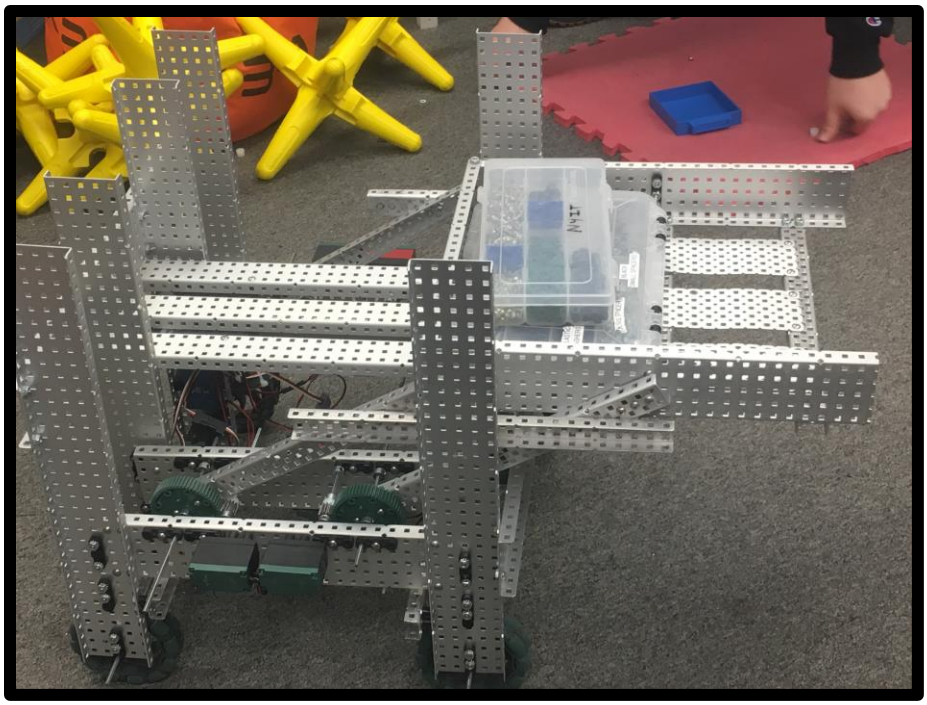


Figure 2: Rack in lower elevation

Using all VEX parts, Caddy Buddy is the best robot assistant any robotics team could ask for, both easy to use and it's even travel size with a starting position of approximately 25” x 23” x 22”.

Future Improvements

Caddy Buddy is the first iteration of our concept. For Caddy Buddy 2.0, we would make the design much sleeker, cutting the axles and metal to make the robot as symmetrical as possible with no parts sticking out (our senior members would not let us cut them for this robot because we might need them for competition robots). We could also incorporate age-group unique decoration for the end-user.

Another thing we would do is incorporate a controller-free feature. We believe than a robot that moves upon being called by the requestor is the best kind of robot because our target group often does not have enough hands to drive the controller while building. Thus, for our next iteration we would give each station its own “call button” or homing beacon. This would allow the robot to know where it is needed next and give the robot the ability to travel there. Different sensors such as ultrasonics and line trackers would be added to ensure the robot does not bump into anything on the way to its final destination, and that it does in fact reach its final destination.

Thirdly, we realize that future iterations of Caddy Buddy can be used in places and people that need them most: hospital patients, senior citizens, special needs children and adults, and even in rehabilitation facilities and schools. In the future, Caddy Buddy, or some version of it will definitely be found in homes and buildings.