Our journey in robot design has reached new heights with the creation of our innovative moving wall robot. This design has 2 motors, each motor handles one part of the movement-vertical, and horizontal. However, having the wall only be able to move each way at different times wasn’t helpful. So, we had to have the side-to-side motor connected to the vertical motor to help them move at the same time. Essentially, there are two rack and pinions connected to each motor. The vertical motor is placed firmly on the robot and has a rack connected to its gear which is inside a cage so it can’t fall out. Then there is a cage with a rack connected to it, and inside the cage is the horizontal motor which isn’t stationary and moves along the rack. By keeping it inside a cage we can ensure it doesn’t fall out. Then the cage is connected to the vertical motor’s rack to move up and down and then the motor side to side. This unique design allows us to develop smaller attachments tailored for various missions. With its two-dimensional movement capabilities—up, down, left, and right—the robot navigates efficiently without the need for constant repositioning. Utilizing two motors for rear-wheel movement and an additional two for vertical and horizontal motions, balanced with a front ball bearing, making our runs more efficient. To simplify coding, we leveraged Spike Prime, introducing deceleration for gyro turns to enhance the robot's turning precision.

This project has been a mix of learning, creativity, and teamwork. Each team member had the opportunity to code, and learn from mistakes, fostering a collaborative environment. We split up into groups, and made sure every 2 hours we would switch, allowing everyone an equal opportunity to both, code, and innovate on their attachments. At the end of each meeting, we would have a discussion on next steps, for our robot game. This allowed us to hear everyone’s opinions at once and settle disagreements between the team. An example of such a disagreement is, our decision on whether to make a wall robot or not, because we were discussing if it would be worth it or not with enough range, and if the wall would be sturdy enough. This is because some of our team felt that with two different rack and pinions the wall wouldn’t be sturdy and it won’t have enough range. However, we settled on a compromise, we made a prototype of our wall itself to check if it was sturdy or not. After this, we saw the wall was sturdy enough and started working on the final robot. However, making a robot this complicated wasn’t easy.

To decide our mission strategy, we began by identifying the missions with the most points. We evaluated which missions could be completed passively and which required active attachment. Then, we grouped the missions into zones and identified which ones could be accomplished with the same attachments. We assessed the difficulty of each mission to determine which ones we could complete more easily. One building resource we used was our wall it gave us the ability to do more missions close to each other, allowing us to develop our innovative mission strategy. This would also make coding easier, allowing us to navigate less and move the wall more. One coding resource we used were functions, this allowed us to use our gyro sensor to do accurate navigation ensuring our wall could get in the correct spot. Based on this analysis, we planned the missions into four runs. For instance, one mission we rigorously tested was Changing Shipping Lanes. We documented all our tests in a table and observed that when the preceding mission failed, this mission would fail. By re-evaluating and changing the number of missions in one run, we managed to make this into 2 different runs causing the robot to successfully complete other tasks. While not messing this one up. This in the end caused us to have 5 runs. Our mission strategy evolved to address challenges head-on. Initially, our plan for Run 1 included tasks like Water Sample, Kraken's Nest, Coral Buds, and Coral Nursery. However, during trial runs, we encountered obstacles such as a krill obstructing our path. We adapted by rearranging our mission sequence, which minimized navigation issues and capitalized on our robot’s side-to-side movement capabilities. We prioritized passive missions, like Raise the Mast, to maximize efficiency. Through continuous testing and iteration, we refined our approach, making our runs smoother and more effective.

One of our most challenging attachments was the krill collector, which required multiple iterations. It was notoriously difficult to collect and retain the krill. We worked on making it more efficient and lighter, ensuring that even if the wall moved up, we would be able to still capture the krill, and because of this we put a wall in the back with axles sticking out to keep them in the cage. This attachment was designed innovatively to accommodate the wall’s range, collecting the krill, and maintaining their hold even when the wall adjusted its position.

One significant challenge was gyro turning, with different angle scales for right (0-179 degrees) and left (0 to -179 degrees) turns, making precise turns difficult. This taught us determination and the importance of focusing on successes despite setbacks. HI THERE

Through rigorous testing and continuous improvement, we aimed to achieve 2/5 successful runs and gradually increased to 4/5. We tracked mission failures, identified problems on a table, and focused on fixes. Wait times were crucial for pinpointing issues and implementing solutions.

Reflecting on our improvements, we are proud of our journey this year, marked by significant growth and innovation. We learned valuable lessons by adding waits and segmenting the code, which sped up mission completion and clarified fixes. Efficient task division allowed us to work faster and take necessary breaks. Passive attachments simplified missions, and improving gyro turns and straight movements enhanced navigation and precision. Our robot's design enabled side-to-side movement without repositioning, saving time and improving task execution while fostering continuous learning, problem-solving, and teamwork within our team.

To decide our mission strategy, we started by looking at which missions have the most points. We grouped our missions into zones and saw which missions we could do with the same attachments. Then we decided which ones were in which run. We documented all our tests in a table and observed when the preceding mission failed, we knew it would fail later. By re-evaluating and changing the number of missions in one run, we managed to make this into 2 different runs causing the robot to successfully complete other tasks. While not messing this one up. This in the end caused us to have 5 runs. Initially, our plan for Run 1 included tasks like Water Sample, Kraken's Nest, Coral Buds, and Coral Nursery. We adapted by rearranging our mission sequence, which minimized navigation issues and capitalized on our robot’s side-to-side movement capabilities. We prioritized passive missions, like Raise the Mast, to maximize efficiency. Through continuous testing and iteration, we refined our approach, making our runs smoother and more effective.