Team info

Team name: SSTrider

Team ID: FE24_309_02

Team members:

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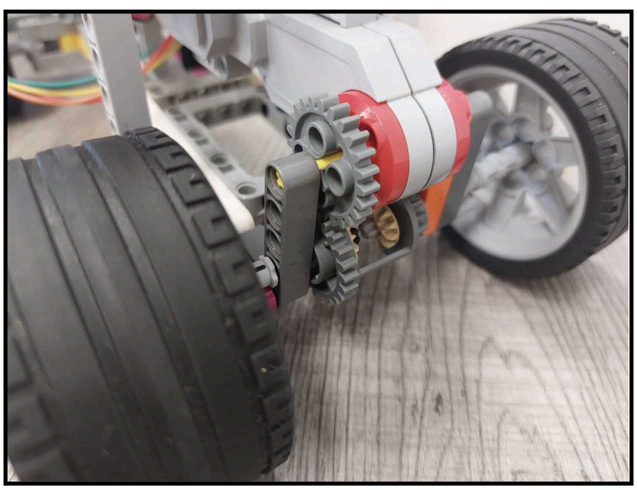
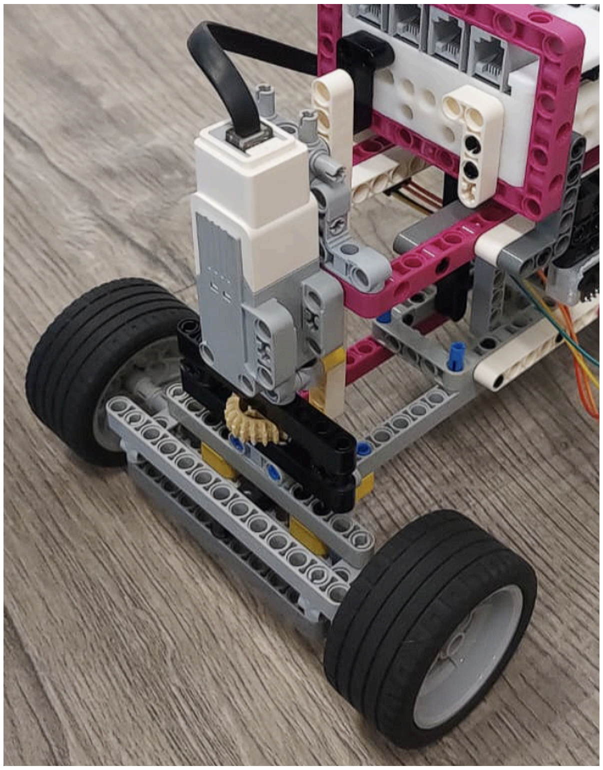
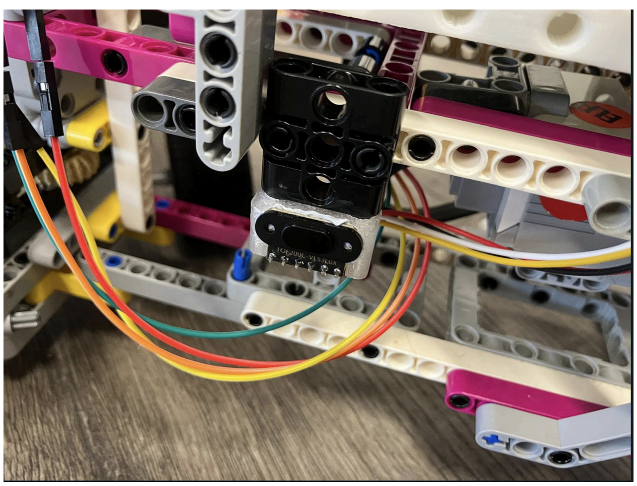
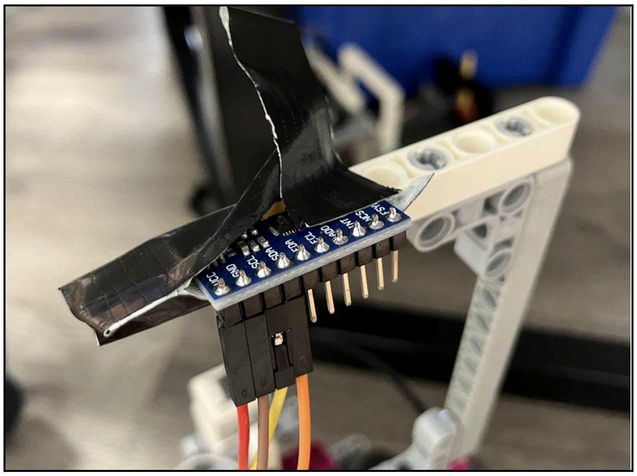
Electrical components and stuff

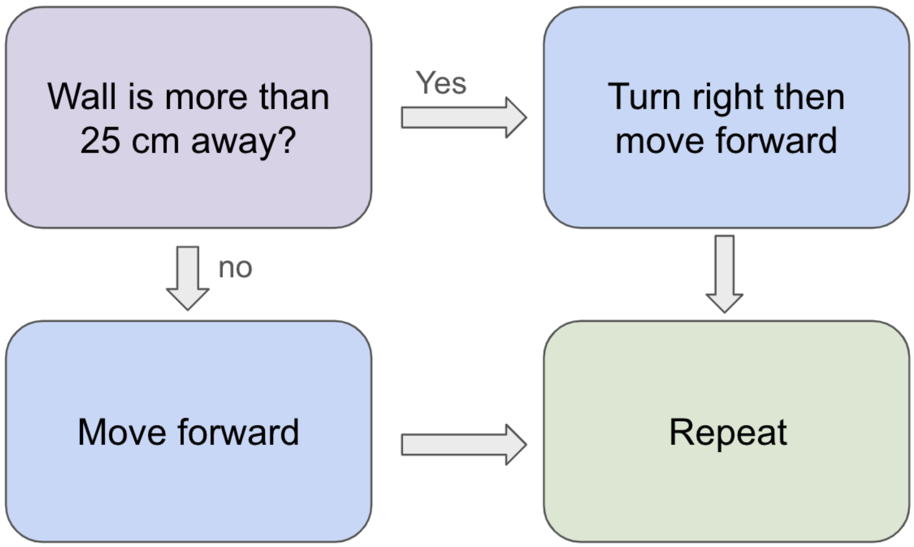
	The differential gear is to allow a wheel to turn while the other wheel stops in order to turn. Both wheels are still connected with the motor in order to move forward and backwards. We use a large motor because it has more power than a medium motor.

	The steering system allows the robot to rotate left and right with one motor in order to turn. We use a medium motor because it is easier to attach and is smaller than a large motor.
	The distance sensors help to detect the distance of objects from the sensor. This allows it to dodge obstacles and detect walls. There are 2 distance sensors on each side to make sure it can carry out the TOF.

	The MPU allows us to keep track of the robot's direction so the robot can detect roughly where it is.
*image	The HuskyLens helps to spot and follow objects and colors. This makes it easier for the robot to track the red and green pillars for the second round without using much time or complex code.

Flow chart

Flowchart (first round):



Mobility

For this project, we picked the EV3 large motor because it is more powerful, which makes it better to drive the vehicle with more force and quickness. We use a differential gearing system to help the vehicle turn. One motor controls the wheels, while another handles the steering. This setup gives us pinpoint control, which we use to navigate tight spots or make sharp turns.

We designed the vehicle's body to fit the motors and differential gearing while keeping everything balanced and inside the size limit. We put the light sensors on the body's sides, ensuring nothing can interfere with it. This lets the robot spot and track things around them without many problems.

Our design makes the most of the EV3 motor's power and the differential gearing system. This boosts how well the vehicle performs when it needs to be fast and efficient

Power and Sense

One is selected to deliver the proper voltage and current to the motors and sensors moving this vehicle. A single large EV3 motor handles propulsion; a medium-centric motor turns the wheels, which drive this battery box to supply power. The car is configured in a manner that gives power to the car for movement and maneuverability. This is why the producers of this vehicle are convinced that absolutely no obstacle will stop it.

Two distance sensors are placed on opposite sides of the bot so that it can detect the distance of the robot and the wall. Using time of flight, we can determine when to turn.

Wiring for all sensors and the motors with power supply adequately to be powered up. The driving, steering, and sensing elements are used to distribute the power to allow the vehicle to drive while performing its functions effectively. The best wiring practices are used to safely route the cables and make connections that are stable & professional.

Obstacle

In the same way, it involves a system that drives through an obstacle course with randomly placed walls. The primary way to deal with these problems is using side-mounted sensors for an ever-vigilant environmental monitoring program. These sensors are how the vehicle knows that it is passing a wall and at what distance away from any given sensor while moving through the course.

The vehicle´s control system sees the wall at a distance and starts making a 90-degree turn, either left or right, to avoid getting hit, as shown by its behavior. This way, the car can react accordingly to walls in unpredictable places but still be able to traverse through the course without a perspective racing line.
The normalization layer helps ensure that the vehicle only turns when a wall is detected at all (or not too near), preventing immediate and unnecessary turning and leading to better navigation. This should fare well in tackling the random obstacles found on an average course, although we have yet to test them.

Engineering

The robot is fine-tuned to fit within the size of 20x30x30 cm, small enough for practical use with all sensors and components while maintaining computational power. A light but strong chassis provides a solid, stable, and balanced platform from which to provide durability and speed. All components such as motors, sensors, and batteries are carefully packed to maximize space. The weight distribution and overall architecture layout were designed for a stable, balanced robot that maintained a good center of mass with performance in mind, achieving an efficient geometry without compromising mobility, thus resulting in a small form factor capable of navigating & completing tasks.

Mobility is provided by an EV3 large motor, which wheels the robot across the field at a steady pace. The robot can turn on the spot using differential gearing. This gearing is critical for striking the necessary balance of speed and torque to allow fast, precise handling over a complex course. Necessary side-mounted sensors that come to life when the vehicle is rolling are positioned not to be obstructed and offer clear-cut visualization of any approaching obstacles.

This has been design for power management. The chassis design allows for easy access to the top-mounted battery. To keep the battery stable while riding, it is switched on in a rather clumsy and tightfitting way, complicating removal. The robot is programmed to maneuver an obstacle course filled with unpredictable elements, but its programming is simple and effective. The sensors are constantly monitoring for walls; when a wall is picked up, the robot moves forward, and when no images of a wall are processed in previous frames, it will turn. This adaptive technique enables the robot to deal with obstacles randomly placed in its vicinity, completing this walled-course navigation successfully.