[Ri3D 2020] The Ohio State University

Robot Resume

Released 01/09/20

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OVERVIEW OF COMPONENTS

Intake System

- Harvester and ramp systems driven by a REV NEO brushless motor
- Harvester
    - Active roller bar intake that passively falls at the start of the match
    - Two 4” mecanum wheels to center the balls and three green compliant wheels (25A durometer) in the center to pull the ball into the roller system
- Ramp
    - Two nylon tube rollers with various indents for polyester cord
    - 5051 plasma cut sheet aluminum ramp with the walls at 135 degrees. WIP
- Gate
    - Pneumatic actuated gate designed perpendicular to ramp

Control Panel Spinner

- Mechanism
    - Three stacked green compliant wheels
    - Driven by a 775pro with a 35:1 VersaPlanetary gearbox reduction
    - Spins control panel at 55 rpm using an encoder to track position of motor and motion profiles to carefully accelerate the panel
- REV Robotics Color Sensor
    - Enclosed in a shop-vac brush to block external light for consistency
    - Deployed via pneumatic cylinder when activated by the driver
    - Piston stays extended for three seconds after the driver stops the wheel to continue tracking rotation

Climber

- Arm
    - Jointed arm actuated and retracted by a winch
    - Driven by a REV NEO brushless motor with a 35:1 VersaPlanetary gearbox reduction
- Carriage
    - One black compliant wheel (60A durometer) drives the robot along the generator switch
    - Driven by a Mini CIM Motor through a VersaPlanetary gearbox
    - Two 3D-printed rollers support the weight of the robot to prevent drive wheel overloading

Code

- One dimensional motion profiling utility for controlling the spinner
- Pure pursuit path following system for the drivetrain
- Custom subsystem code structure to support abstraction and determinism
- Custom finite state machine for running autonomous sequences
- Ten millisecond control loop update rate

GAMEPLAY AND STRATEGY

In this year's game, Infinite Recharge, teams are tasked with collecting, transporting, and scoring small balls, called power cells, into different towers, or loading zones, on either side of the field. Additionally, there is a component of this years game that is entirely new to *FIRST* robotics competition: the control panel. The control panel is a small spinner that teams must spin precisely in order to advance to the next stage in the match. Teams have never seen a mechanism like this in a game and we are very excited to be able to design for it. In almost every *FIRST* Robotics Competition game, there is some part of the game, usually the end, when you have to be elevated somehow through a climb, hang, or lift. This year, there is a large structure in the middle of the field, the generator switch, that has two free-pivoting bars that teams are tasks with climbing and hanging on. Additionally, there is a bonus you can receive if your bar is level after you or any of your alliance partners are hanging from it.

This season, we kept the principle of a simple, robust, and fast robot. These three ideas are so important to us because we prefer to be consistently good over occasionally great. Our strategy at-a-glance is to focus on scoring five power cells at a time to the bottom port of the loading bay. Additionally, we want to be able to spin the control panel to be able to advance to the next stage of scoring and activate the shield generator. We also plan to climb onto the generator switch and be able to level ourselves while we are on the switch to get the fifteen point level bonus. This general strategy allows us to do multiple things. First, we are able to be a very reliable alliance partner as we have fast and consistent cycle times. Second, we are able to keep the robot as simple as possible (KISS principle) since we are not planning to have any major actuated mechanisms. And finally, we are able to perform easy maintenance on our robot as a result of simple mechanisms.