Team Number: 6417   **Team Name:** Blu Cru

Video Recording: https://www.youtube.com/watch?v=WOkxKPedPKw
Autonomous objectives:
1. Detect number of rings on field
2. Shoot 3 rings into top goal (3 x 12 = +36)
3. Deposit 1 Wobble Goal into correct target zone (+15)
   a. If time, pick up second Wobble Goal and deposit (+15)
4. Park on white line (+5)

Sensors used: Webcam, Encoders, Inertial measurement unit (IMU)
Key algorithms:
- detect():
  - Activate TensorFlow; take input from webcam
  - Initialize 3 variables: `quad`, `single`, and `none`
  - Repeat 50 times:
    - Check webcam for new "updates" (changes in what the webcam detects)
    - If there is an update, check number of objects
    - If there are objects, check the identity of the first object detected (this will be the stack of rings)
      - If the object is a stack of 4 rings, increment `quad` by one
      - If the object is a single ring, increment `single` by one
    - If there are no objects, increment `none` by one
  - Return String "Quad," "Single," or "None" depending on what is detected on field
- rotate(int degrees, int power, LinearOpMode instance)
  - Takes three parameters: `degrees`, `power`, and `instance`
    - `instance` returns data about the current session so that we know whether the opmode is still active
  - Sets current detected angle to 0
  - Repeat until the current detected angle is equal to `degrees`:
    - Set left motors and right motors to opposite values of `power` so that both sides' wheels are turning in different directions
- nav(int[] distances)
  - Takes one argument: an array of distances that we want the robot to travel
  - The array `distances` contains different values depending on how many rings were detected in detect(), allowing us to navigate three different paths with the same function for more efficient and less repetitive code.
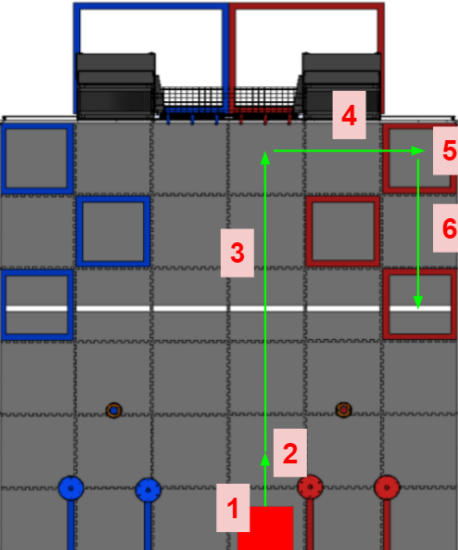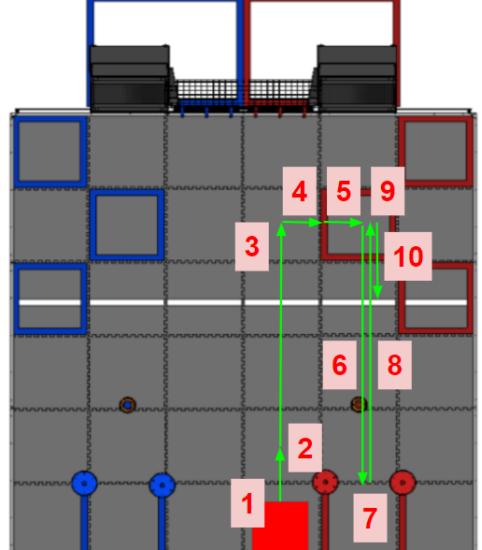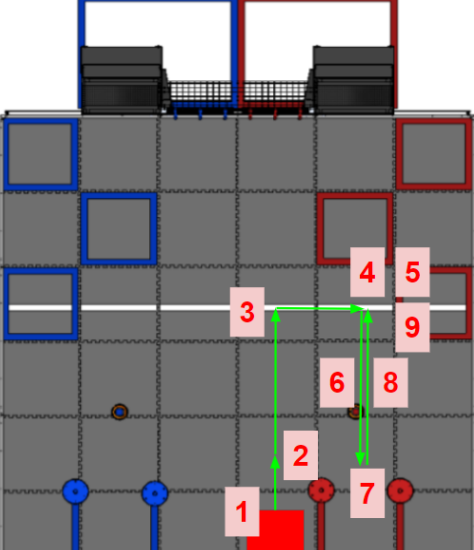
Driver controlled enhancements:
- Nudging: Allows the driver to move minute amounts using the dpads so that driver can navigate smaller movements with more control
- Intake motor and lower shooting motor is controlled with the same button since they are both used concurrently; driver only needs to hold down one button to intake a ring
- Height of grabber arm servo moves suddenly during autonomous but gradually during TeleOp so that driver has more control over movement of grabber arm

Engineering portfolio references:
- Game strategy (p. 68)
    - Initial reactions to game release + our strategy at the beginning of the season (p. 104) - shortly after the game was released, we went through all of the possible ways through score and decided on what we would pursue. As we developed our robot, this strategy evolved into the official strategy we listed on p. 68.
- Coding and Autonomous section: page 89
    - Descriptions of major modules and sensors used (plus sensing techniques we have experimented with) on p. 92
    - Detailed development log of code (p. 94), outlining progress and challenges

Autonomous Program Diagrams

Scenario 1: 4 rings detected	Scenario 2: 1 ring detected	Scenario 3: 0 rings detected

Scenario 1: 4 rings detected

1. Shoot 3 rings into top goal (3 x 12 = +36)
2. Move forward 9 in.; detect rings
3. Move forward 106 in.; rotate 90°
4. Move forward 30 in.
5. Drop Wobble Goal 1 (+15)
6. Rotate 90°; move forward 50 in. to park on white line (+5)

Maximum: 56

Scenario 2: 1 ring detected

1. Shoot 3 rings into top goal (3 x 12 = +36)
2. Move forward 9 in.; detect rings
3. Move forward 74in.; rotate 90°
4. Move forward 6 in.
5. Drop Wobble Goal 1 (+15)
6. Rotate -90°; move forward 50 in.; rotate -90°
7. Pick up Wobble Goal 2
8. Rotate -90; drive 56 in.
9. Drop Wobble Goal 2 (+15)
10. Drive backward 6 in. to park on white line (+5)

Maximum: 81

Scenario 3: 0 rings detected

1. Shoot 3 rings into top goal (3 x 12 = +36)
2. Move forward 9 in.; detect rings
3. Move forward 51in.; rotate 90°
4. Move forward 28 in.
5. Drop Wobble Goal 1 (+15)
6. Rotate 90°; move forward 34 in.
7. Pick up Wobble Goal 2
8. Drive backwards -36 in.
9. Park on white line (+5) and drop Wobble Goal 2 (+15)

Maximum: 81