

Team Number: 6417

Team Name: Blu Cru

Video Recording: <https://youtu.be/ElzbgK5avK8>

Autonomous objectives:

1. Detect number of rings on field
2. Shoot rings and knock down at least one Power Shot Target (+15)
3. Deposit 1 Wobble Goal into correct target zone (+15)
4. Park on white line (+5)

Sensors used: Webcam, Encoders, Inertial measurement unit (IMU)

Key algorithms:

- TensorFlow object detection:
 - Activate TensorFlow; take input from webcam
 - Initialize 3 variables: `quad`, `single`, and `none`
 - Repeat 100 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
 - Determine correct target zone based on which variable stores the greater value: `quad`, `single`, or `none`
- Rotation
 - 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
 - Stop drivetrain motors

Driver controlled enhancements:

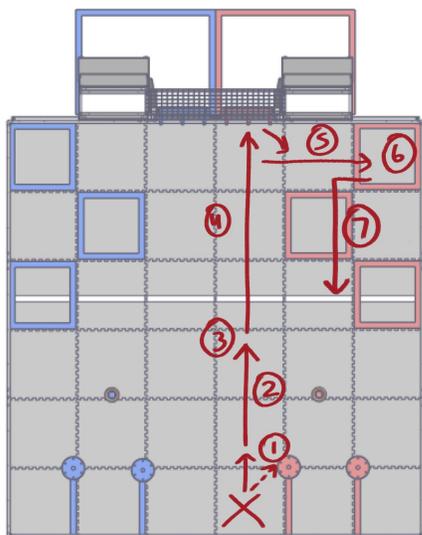
- Nudging: Allows the driver to move minute amounts using the dpads so that driver can navigate smaller movements with more control
- Intake motor and lower shooting motor is controlled with the same button since they are both used concurrently; driver only needs to hold down one button to intake a ring
- 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

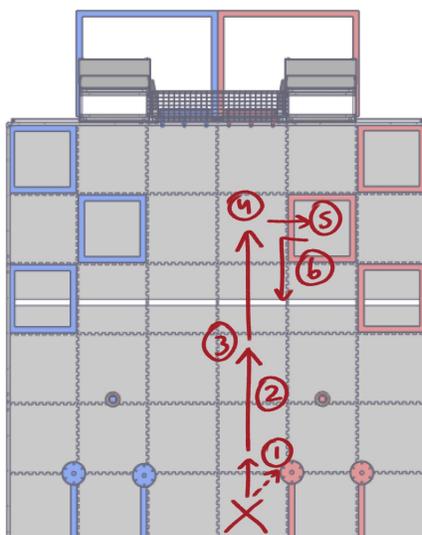
Autonomous Program Diagrams

Scenario 1: 4 rings detected



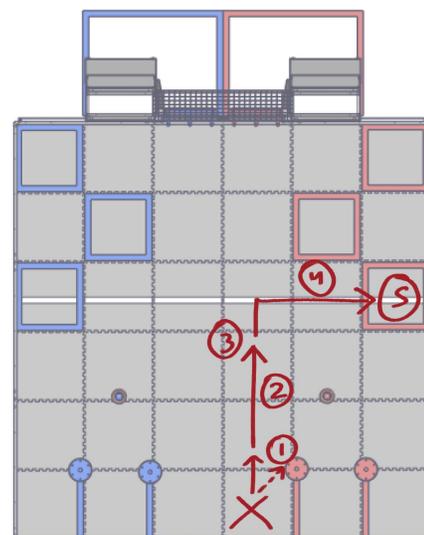
1. Move forward ~12 in.; rotate ~5 degrees to detect rings and rotate back
2. Move forward ~60 in.
3. Shoot rings towards Power Shot targets
4. Drive forward into wall
5. Move back ~6 in.; rotate 90 degrees; drive forward ~30 in.
6. Deposit Wobble Goal in Target Zone
7. Move back ~6 in.; strafe for 4 seconds until parked on white line

Scenario 2: 1 ring detected



1. Move forward ~12 in.; rotate ~5 degrees to detect rings and rotate back
2. Move forward ~60 in.
3. Shoot rings towards Power Shot targets
4. Drive forward ~60 in.
5. Rotate 90 degrees; drive forward ~30 in.; deposit Wobble Goal in Target Zone
6. Move back ~6 in.; strafe for 2 seconds until parked on white line

Scenario 3: 0 rings detected



1. Move forward ~12 in.; rotate ~5 degrees to detect rings and rotate back
2. Move forward ~60 in.
3. Shoot rings towards Power Shot targets
4. Drive forward ~12 in.; rotate 90 degrees; drive forward ~60 in.
5. Deposit Wobble Goal in Target Zone