

Basic Information

Team Number

5024

Team Name

Raider Robotics

Programming Language

What programming language do you use?

Java on the bot, Python everywhere else

Public Code

Is your code public?

Yes

What is your team's GitHub account?

frc5024

Vision

What camera do you use?

Limelight 2

What do you like about your camera?

Fast and easy to share configs with other teams at events

What do you dislike about your camera?

I wouldn't mind more processing power, support for python "filter scripts" for manipulating data on-device, and a UDP socket for the data instead of slow networktables

How would you compare this camera to other cameras you've used in the past?

Faster, but less customizable than running a RaspberryPI. Also, can't do multi-camera CV

If you could do vision differently, what would you change?

I would either integrate LIDAR, or a 3D depth sensing camera

How are you planning to do vision next year?

Just like this year. A multi-camera array of video feeds, all providing different types of feedback based on the robot's current state

Path Planning

How do you design your paths?

We have a custom webapp that both provides a point placement UI, and will automatically generate the Java code needed to execute the path

What library(ies) do you use to make your paths?

We have our own library. It uses a custom PurePursuit implementation, and path smoother

What geometry do you use for your paths? (Splines, piecewise, circle, etc)

Just plain point-to-point between points spaced 6 inches apart. These points are pre-smoothed

How do you integrate sensors with your paths?

2 encoders + a gyro are integrated through dead reckoning to provide an accurate reading of the robot's position, and velocity. Our vision system corrects for errors by re-calibrating our position on the fly when it finds a known target.

If you could do path planning differently, what would you change?

I just want our follower to move faster. We currently run at 90% speed

Training

How do new programmers get trained?

self-taught with weekly lessons about hardware and key concepts

Do new programmers have to work outside of practice?

yes

What is your general training order? (ex. Classes, functions, data types, reading documentation)

robot safety, library usage, code structure, control loops, kinematics, computer vision, networking

What do you do if there is not enough work for all the programmers?

We have yet to have that problem

On average, how many programmers do you have?

9

GitHub

How do you control access to the team GitHub?

Everyone gets access. Master branch is protected by a CODEOWNERS file. This only allows the team lead and mentors to make edits to Master. All PRs require 100% passing CI, up-to-date docs, and approval from the owner of the receiving branch, or a mentor.

How do you handle merge issues and multiple people working on the same file with GitHub?

We coordinate our work, and rarely have to deal with this. If it happens, both groups sit down and fix the file by hand together.

How does your team make ReadME.md documents?

They have A LOT of info. Everything from code structure to robot network configuration to reference links. We add as needed

Other Sensors

What other types of sensors do you use?

mag and optical encoders, limit switches, hall-effect sensors, gyroscopes (type depends on application), Vision co-processors (limelight/rPI/client program running alongside DriverStation), Ferrite content sensors, Optical linebreak sensors, Ultrasonic sensors, Rangefinders

How do these sensors help your robot?

Sensors are used to tell the robot where it is, as safety stops for mechanisms, for feedback loops, and to inform the internal state machines when actions have completed

Of those sensors, which are you planning to use again in the future (if any)?

all

How do you learn what new sensors to try and how to use them?

We have a control-systems mentor who suggests sensors best for the job.

Off Season

What do you do in the offseason to prepare for build season?

Everyone is free to work on offseason projects of their own, and we just refine the last year's code

How does programming interact with mechanical for off season activities?

Small meetings of needed people

Documentation

How do you document your code?

Javadoc everything

Have you documented differently in the past? What do you like better now vs then?

We used to use doxygen. They are basically the same thing. I like both the same

Build Season

What do your programmers do at the start of build season?

Each programmer joins a prototyping group, where they work with mechanical, electrical, and CAD members to design their assigned component on the bot

How useful are the tasks that they do at the start of build season? (from 1 - 10)

9

How much time does programming get to program the robot (without mechanical intervention)?

Not too much. Maybe half an hour per day? But we do most of our work in our team's simulator. So we don't need a ton of time on the bot until the last week of build, where we take the bot for ourselves, and refine autonomous on our practice field.

How do you divide up the time programming gets on the robot between different mechanisms, tuning, and autonomous?

All components are ranked by urgency. If someone with a higher urgency needs the bot, they get it for as long as they need. Usually when they take a break for food, other people jump in and deploy smaller things

During programming's time on the robot, how does your team handle mechanical failures and imperfections?

Test and document them, then provide data to the relevant sub-team.

How do you make the schedule for programming?

Weekly, we spend tuesday, thursday, friday, and saturday with the bot. We are always working

How does your team use gearbox ratios with encoder counts?

They are accounted for in our simulator, and used for multipliers on calculations.

How does your team define code standards?

We generally follow Google's code standard

Creating from Scratch vs Inheritance

How does your team balance inheriting WPILib functions with writing custom functions?

None of our robot code talks directly to WPILib. Our team library contains everything needed for the bot, and will call WPILib if needed for HAL functions, and hardware I/O

What are some examples of custom functions that your team has made?

Simulation hooks, real-time path finding, component coordination, a statemachine system, feedback loops, ...

Interesting WPILib Functions

Are there any WPILib functions that are unusual and make your life a lot cooler or easier?

We use Pose2D for everything. It is my most used object type

What class do you use for joystick control?

We use XboxController with various input filters

What class do you use for automating actions?

Our state machines handle all autonomous actions. For example, calling Superstructure.intakeBalls(3) this year would do everything required to pull 3 balls into the robot, and no more

Joystick Layout

Who determines the layout of the joystick for your team?

Driver's preference

How do you manage changes to the joystick layout?

If a driver wants something changed, we change it in code, then update our "user manual" document

PID Tuning

When you get the robot, what is the first thing your programming team does with it?

We update all firmware, then run the bot through some tests to estimate the needed control gains for all components

How does your team determine if motors should have encoders or not?

Everything needs an encoder

When you PID tune a motor for position control, what is your procedure?

Build a simulation model, ensure our gains work fine in the simulator, then test IRL with feedback from a python script that graphs all sensor data for the system

When you PID tune a motor for velocity control, what is your procedure?

same as position