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PRESENTED BY **Qualcomm**

2024/2025


SEASON


Fruitport FTC Kickoff Event

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PRESENTED BY  HAAS
Gene Haas Foundation

FTC Java Programming Basics

Presented by: Lawrence Welty

Coach - Programming | Fruitport Techno Trojans



Workshop Agenda

- Robot Basics
- Programming Options
- Android Studio Java – Getting Started
- Programming Tools Used
- Equipment Needed
- Java Framework
- Where Do I Start? (I have the framework, now what?)
- Resources
- Questions



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Robot Basics – Control Systems

Rev Robotics Control Hub

Port Pinouts

CONTROL HUB PIN OUT



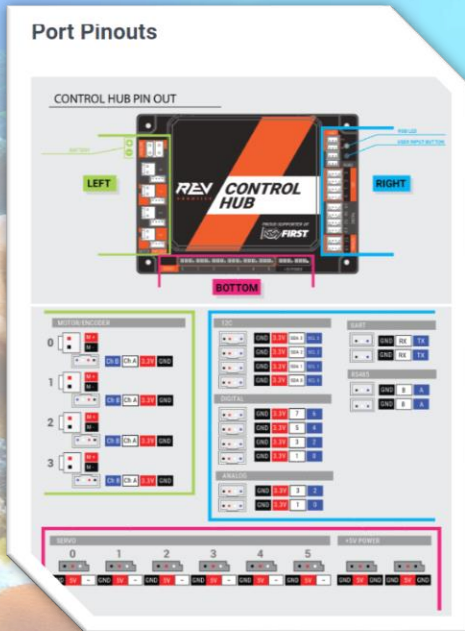
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 **FIRST
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CHALLENGE**

Robot Basics – Control Systems

Rev Robotics Control Hub



Rev Robotics Driver Hub

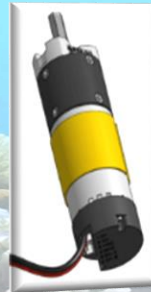


Robot Basics – Control Systems

Rev Robotics Control Hub

Port Pinouts

CONTROL HUB PIN OUT

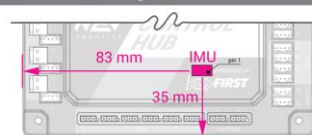


IMU – Inertia Measurement Unit

IMU Location

When using the Control Hub (REV-31-1595) or Expansion Hub (REV-31-1153) please note the location of the IMU in the graphic below. The Hub's orientation may impact the values received from the embedded IMU.

BELOW: IMU Details Shown in Enlarged View

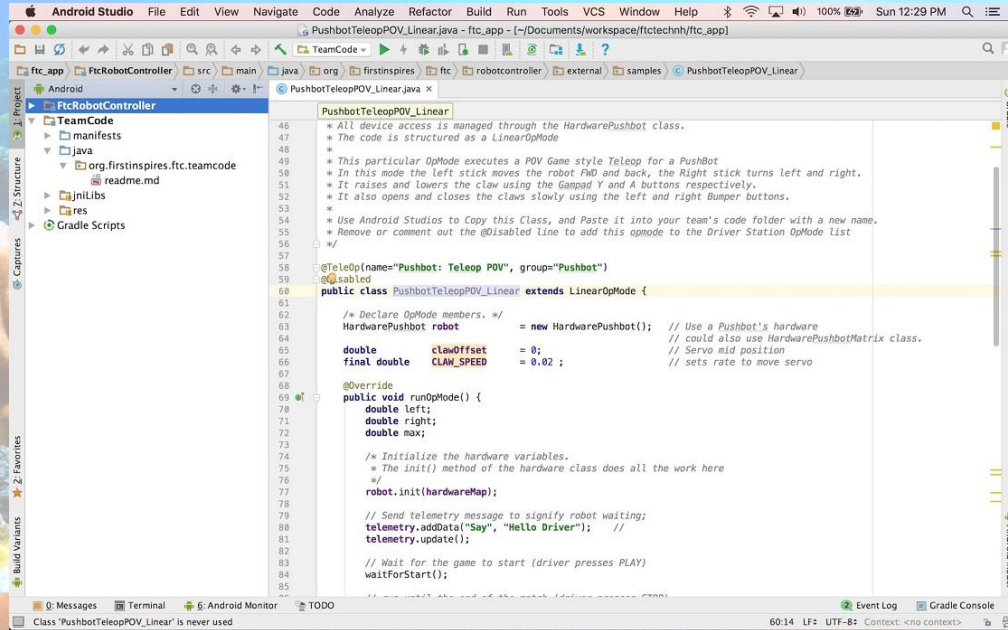


Rev Robotics Driver Hub



Programming Options

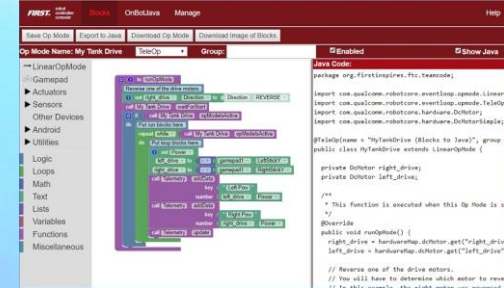
Android Studio - Java



The screenshot shows the Android Studio IDE with a Java file named `PushbotTeleopPOV_Linear.java` open. The code defines a `LinearOpMode` class that controls a robot's movement based on joystick inputs. Comments explain the hardware setup and the specific teleop mode being implemented.

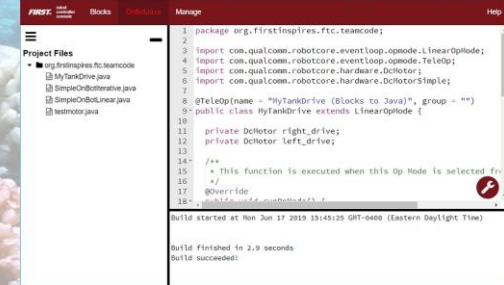
```
46  * All device access is managed through the HardwarePushbot class.
47  * The code is structured as a LinearOpMode
48  *
49  * This particular OpMode executes a POV Game style Teleop for a Pushbot
50  * In this mode the left stick moves the robot fwd and back, the right stick turns left and right.
51  * It raises and lowers the claw using the Gampad Y and A buttons respectively.
52  * It also opens and closes the claws slowly using the left and right Bumper buttons.
53  *
54  * Use Android Studios to Copy this Class, and Paste it into your team's code folder with a new name.
55  * Remove or comment out the @Disabled line to add this opmode to the Driver Station OpMode list.
56  */
57
58  @TeleOp(name="Pushbot: Teleop POV", group="Pushbot")
59  @Disabled
60  public class PushbotTeleopPOV_Linear extends LinearOpMode {
61
62      /* Declare OpMode members. */
63      HardwarePushbot robot = new HardwarePushbot(); // Use a Pushbot's hardware
64                                                    // could also use HardwarePushbotMatrix class.
65      double clawOffset = 0; // Servo mid position
66      final double CLAM_SPEED = 0.02; // sets rate to move servo
67
68
69      @Override
70      public void runOpMode() {
71          double left;
72          double right;
73          double max;
74
75          /* Initialize the hardware variables.
76           * The init() method of the hardware class does all the work here
77           */
78          robot.init(hardwareMap);
79
80          // Send telemetry message to signify robot waiting;
81          telemetry.addData("Say", "Hello Driver"); //
82          telemetry.update();
83
84          // Wait for the game to start (driver presses PLAY)
85          waitForStart();
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Blocks



The screenshot shows the Blocks editor in Android Studio. The code is written in a visual, block-based format, showing the same logic as the Java code but using drag-and-drop blocks for structure and readability.

OnBot Java



The screenshot shows the OnBot Java editor in Android Studio. It displays the same Java code as the previous screenshots, but with a focus on the build and execution status. The build log at the bottom indicates that the code compiled successfully.

```
1 package org.firstinspires.ftc.teamcode;
2
3 import com.qualcomm.robotcore.eventloop.opmode.LinearOpMode;
4 import com.qualcomm.robotcore.eventloop.opmode.TeleOp;
5 import com.qualcomm.robotcore.hardware.DcMotor;
6 import com.qualcomm.robotcore.hardware.DcMotorSimple;
7
8 @TeleOp(name = "MyTandrive (Blocks to Java)", group = "")
9 public class MyTandrive extends LinearOpMode {
10
11     private DcMotor right_drive;
12     private DcMotor left_drive;
13
14
15     /*
16     * This function is executed when this Op Mode is s
17     */
18     @Override
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Programming Tools

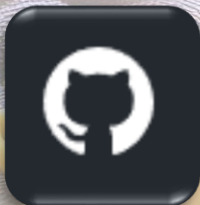
Required Software / Tools

Development Environment

Android Studio



FtcRobotController – Github Repository



Optional Software / Tools

Source Code Management

Git - SCM



GitHub Desktop Client



Equipment Needed

Required Software / Tools

Development Environment

Android Studio



Installation Instructions: <https://developer.android.com/studio/install>

Equipment Requirements:

Windows

★ **Note:** Windows machines with ARM-based CPUs aren't currently supported.

Here are the system requirements for Windows:

Requirement	Minimum	Recommended
OS	64-bit Microsoft Windows 8	Latest 64-bit version of Windows
RAM	8 GB RAM	16 GB RAM or more
CPU	x86_64 CPU architecture; 2nd generation Intel Core or newer, or AMD CPU with support for a Windows Hypervisor Framework.	Latest Intel Core processor
Disk space	8 GB (IDE and Android SDK and Emulator)	Solid state drive with 16 GB or more
Screen resolution	1280 x 800	1920 x 1080

Equipment Needed

Required Software / Tools

Development Environment

Android Studio



Installation Instructions: <https://developer.android.com/studio/install>

Equipment Requirements:

Mac

Here are the system requirements for Mac:

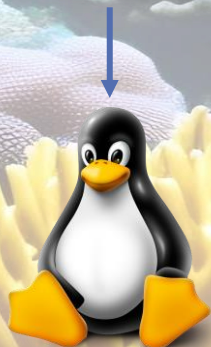
Requirement	Minimum	Recommended
OS	MacOS 10.14 (Mojave)	Latest version of MacOS
RAM	8 GB RAM	16 GB RAM or more
CPU	Apple M1 chip, or 2nd generation Intel Core or newer with support for Hypervisor Framework.	Latest Apple Silicon chip
Disk space	8 GB (IDE and Android SDK and Emulator)	Solid state drive with 16 GB or more
Screen resolution	1280 x 800	1920 x 1080

Equipment Needed

Required Software / Tools

Development Environment

Android Studio



Installation Instructions: <https://developer.android.com/studio/install>

Equipment Requirements:

Linux

★ **Note:** Linux machines with ARM-based CPUs aren't currently supported.

Here are the system requirements for Linux:

Requirement	Minimum	Recommended
OS	Any 64-bit Linux distribution that supports Gnome, KDE, or Unity DE; GNU C Library (glibc) 2.31 or later.	Latest 64-bit version of Linux
RAM	8 GB RAM	16 GB RAM or more
CPU	x86_64 CPU architecture; 2nd generation Intel Core or newer, or AMD processor with support for AMD Virtualization (AMD-V) and SSE3.	Latest Intel Core processor
Disk space	8 GB (IDE and Android SDK and Emulator)	Solid state drive with 16 GB or more
Screen resolution	1280 x 800	1920 x 1080

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Equipment Needed

Required Software / Tools

Development Environment

Android Studio



Installation Instructions: <https://developer.android.com/studio/install>

Equipment Requirements:

Install Android Studio on ChromeOS

Android Studio has been officially supported on ChromeOS since [version 3.5](#). To install Android Studio please follow the Android Studio [ChromeOS install instructions](#).

System requirements for Android Studio

- 8 GB RAM or more recommended
- 20 GB of available disk space minimum
- 1280 x 800 minimum screen resolution
- Intel i5 or higher (U series or higher) recommended

Recommended devices for Android Studio

- **Acer:** Chromebook 13/Spin 13, Chromebox CX13, Chromebook 712 [C871]
- **ASUS:** Chromebox 3, Chromebook Flip C436FA
- **CTL:** Chromebox CBx1
- **Dell:** Inspiron Chromebook 14, Latitude 5300 2-in-1 Chromebook Enterprise, Latitude 5400 Chromebook Enterprise
- **HP:** Chromebook x360 14, Chromebox G2, Chromebook x360 14c
- **Lenovo:** Yoga C630 Chromebook, Flex 5 Chromebook
- **ViewSonic:** NMP660 Chromebox

Equipment Needed

Required Software / Tools

Development Environment

Android Studio



Installation Instructions: <https://developer.android.com/studio/install>

Equipment Requirements:

Required libraries for 64-bit machines

If you are running a 64-bit version of Ubuntu, you need to install some 32-bit libraries with the following command:

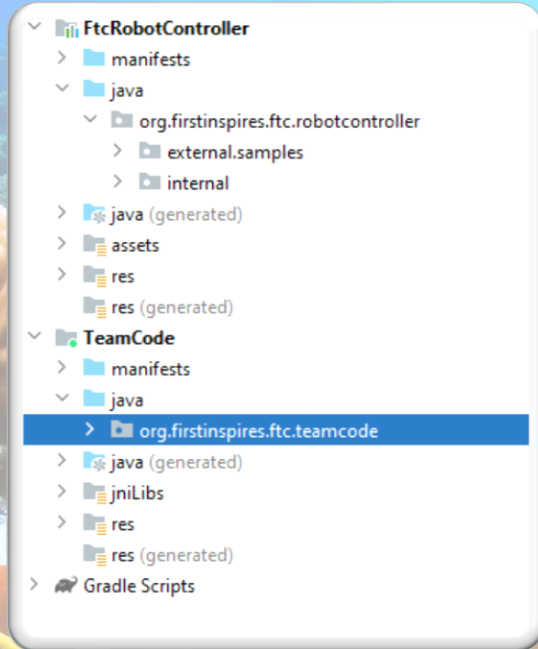
```
$ sudo apt-get install libc6:i386 libncurses5:i386 libstdc++6:i386 lib32z1 libbz2-1.0:i386
```

If you are running 64-bit Fedora, the command is:

```
$ sudo yum install zlib.i686 ncurses-libs.i686 bzip2-libs.i686
```

Java Framework - FtcRobotController

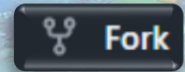
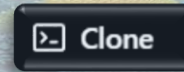
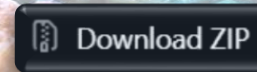
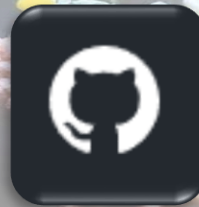
What is the FtcRobotController?



Source project/framework for your Robot

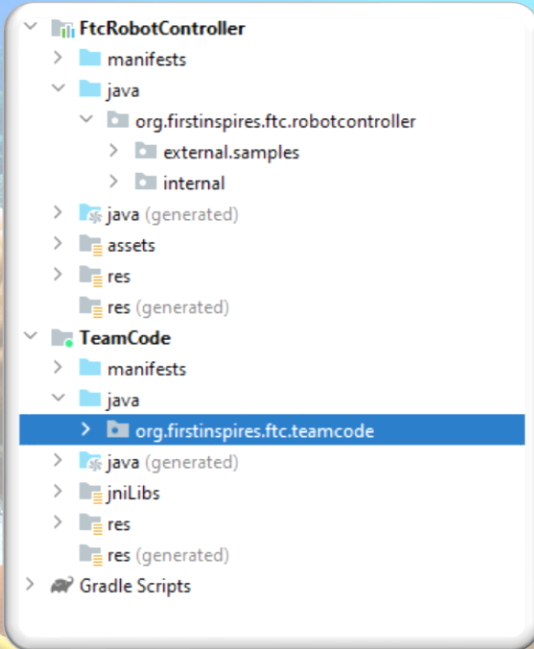
<https://github.com/FIRST-Tech-Challenge/FtcRobotController>

- Obtained from FTC Github repository
- Can download source to zip
- Can clone repository into own project
- Can fork repository into own project

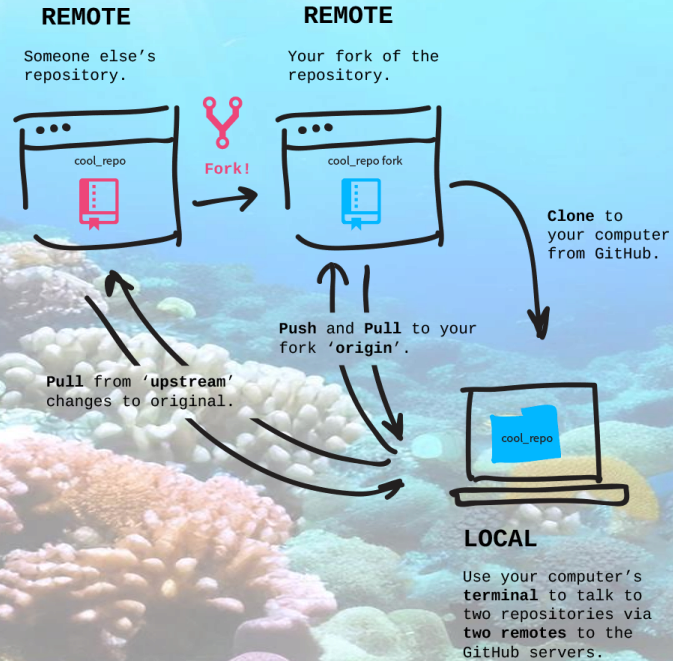


Java Framework - FtcRobotController

What is the FtcRobotController?



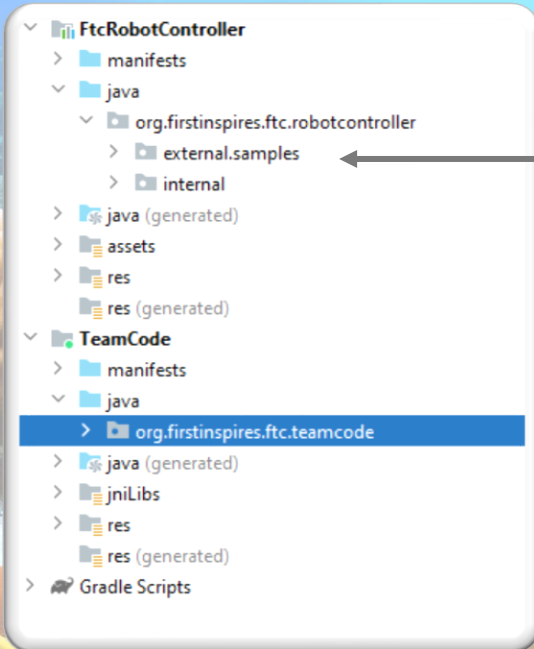
Repository – Clone vs Fork



Java Framework - FtcRobotController

What is the FtcRobotController?

I have the project... what is it?



- Project includes the base framework for your robot

- Contains sample modules

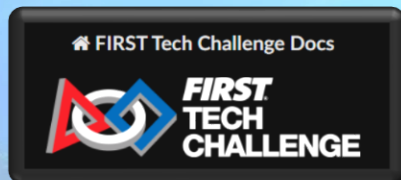
- Sample code located in FtcRobotController package

- FtcRobotController package: `org.firstinspires.ftc.robotcontroller`

- ALL team code (your code) to be maintained in teamcode

- Teamcode package: `org.firstinspires.ftc.teamcode`

Resources



[FIRST Tech Challenge documentation – FIRST Tech Challenge Docs 0.2 documentation \(firstinspires.org\)](https://ftc-docs.firstinspires.org/en/latest/index.html)

<https://ftc-docs.firstinspires.org/en/latest/index.html>

Development Environment

Android Studio

<https://developer.android.com/studio>

FtcRobotController – Github Repository

<https://github.com/FIRST-Tech-Challenge/FtcRobotController>

Git - SCM

<https://git-scm.com/>

Github Desktop Client

<https://desktop.github.com/>



[2023-2024 FTC Resources | fruitportrobotics](https://www.fruitportrobotics.org/2024-2025-ftc-resources)

<https://www.fruitportrobotics.org/2024-2025-ftc-resources>

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