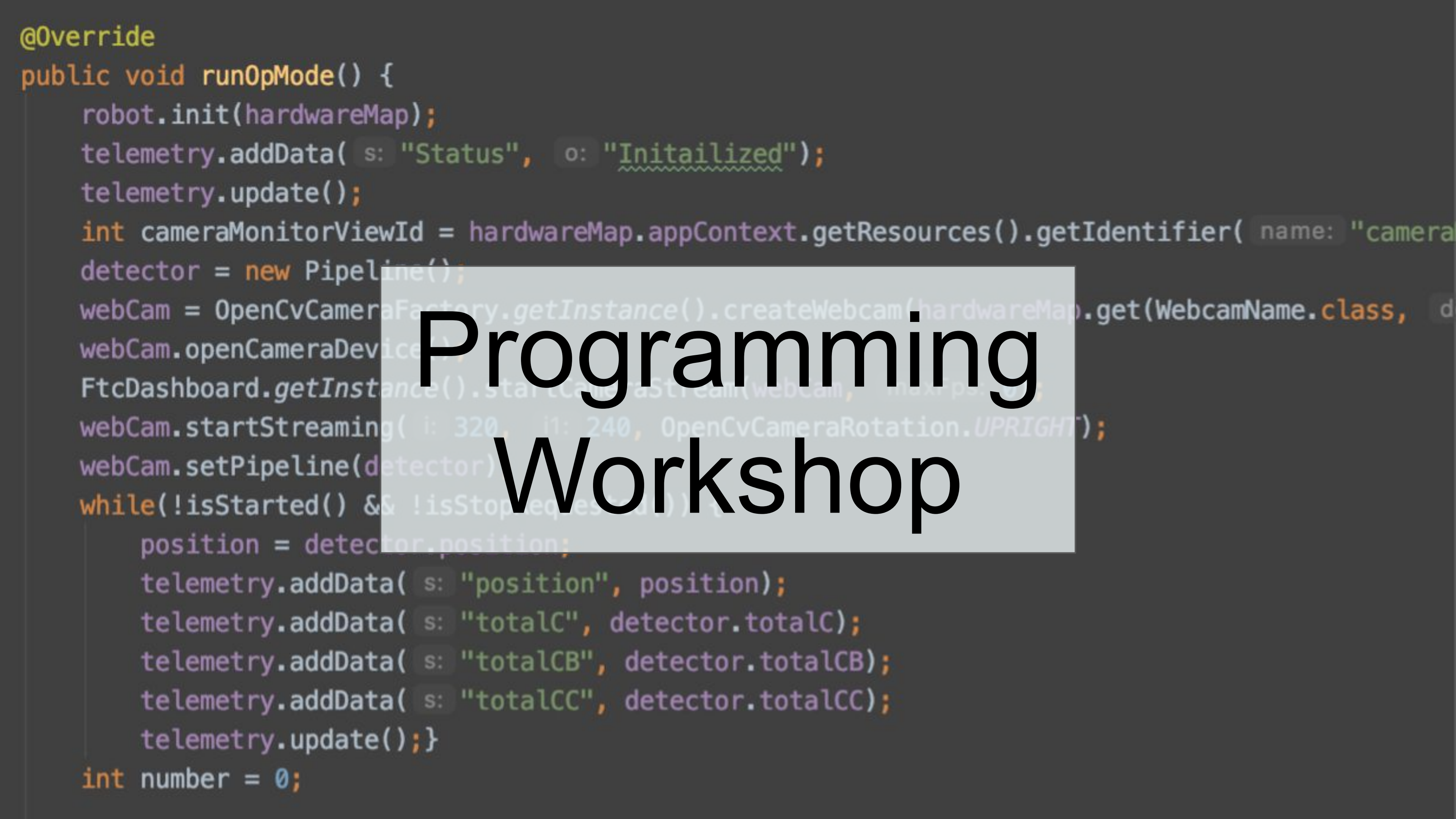
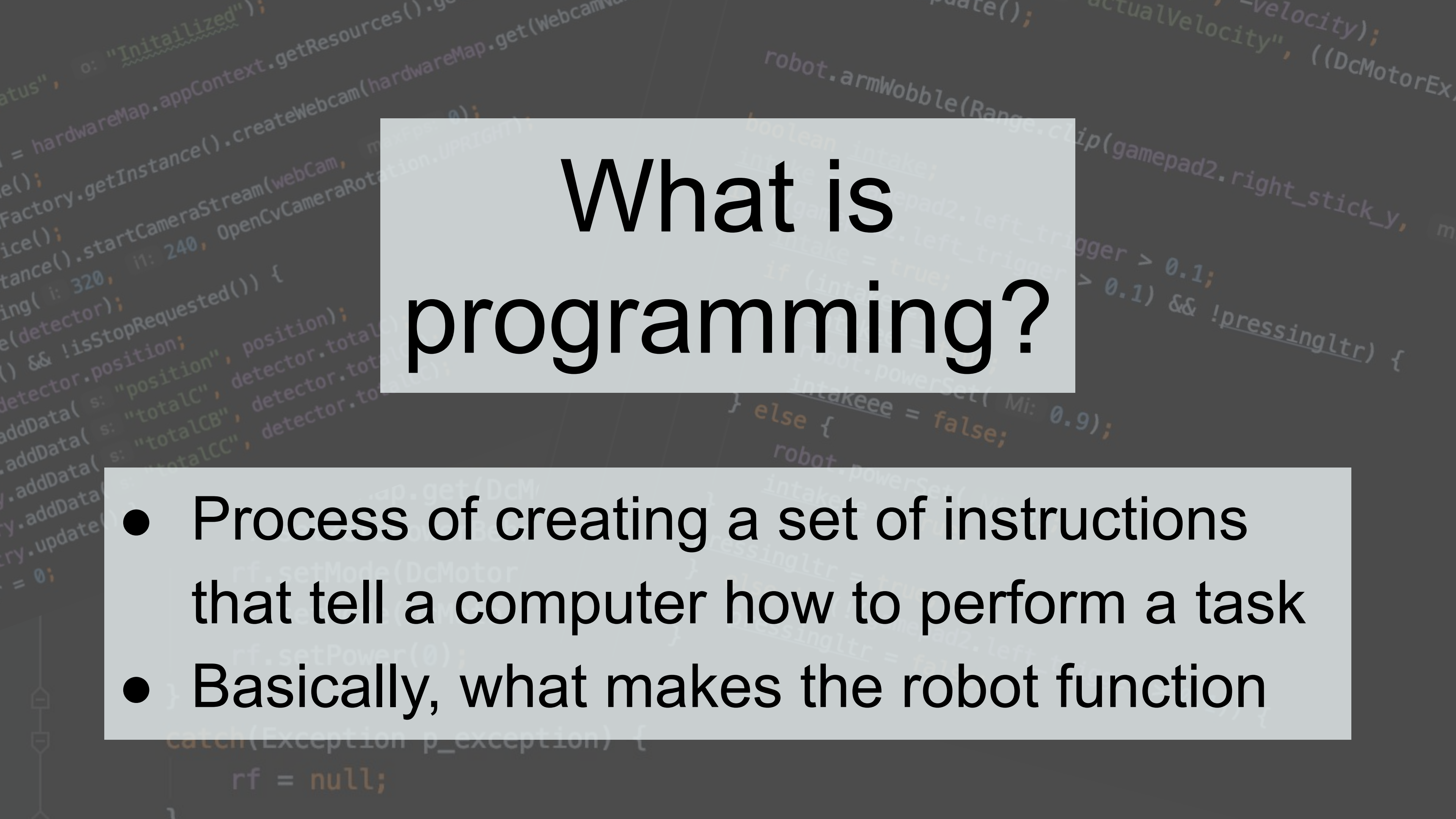
Programming Workshop



```
@Override
public void runOpMode() {
    robot.init(hardwareMap);
    telemetry.addData( s: "Status",  o: "Initailized");
    telemetry.update();
    int cameraMonitorViewId = hardwareMap.appContext.getResources().getIdentifier( name: "camera
    detector = new Pipeline();
    webCam = OpenCvCameraFactory.getInstance().createWebcam(hardwareMap.get(WebcamName.class,  d
    webCam.openCameraDevice();
    FtcDashboard.getInstance().startCameraStream(webcam,  maxFps: 0);
    webCam.startStreaming( i: 320,  i1: 240, OpenCvCameraRotation.UPRIGHT);
    webCam.setPipeline(detector);
    while(!isStarted() && !isStopRequested()) {
        position = detector.position;
        telemetry.addData( s: "position", position);
        telemetry.addData( s: "totalC", detector.totalC);
        telemetry.addData( s: "totalCB", detector.totalCB);
        telemetry.addData( s: "totalCC", detector.totalCC);
        telemetry.update();}
    int number = 0;
```

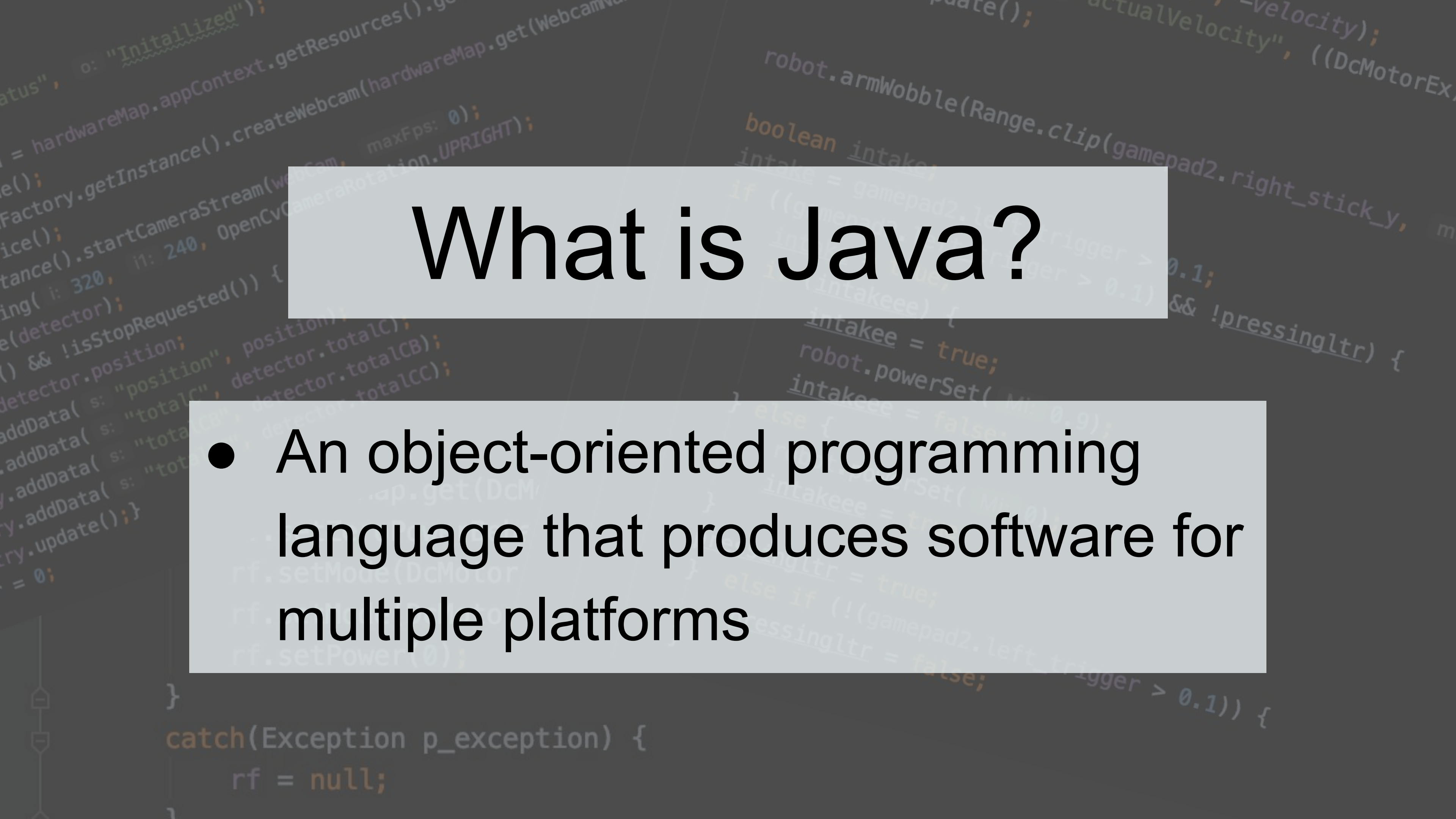


What is programming?

- Process of creating a set of instructions that tell a computer how to perform a task
- Basically, what makes the robot function

What is a programming language?

- Any of various high-level languages used for computer programs
- Ex. Java, C++, Python



What is Java?

- An object-oriented programming language that produces software for multiple platforms

How to learn Java?

- Free Online Resources
  - Codecademy
- AP Computer Science A

What is an SDK?

- Stands for Software Development Kit
- Brings together group of tools that enable programming of mobile applications and robots
- Allows pre-programmed processes to call on
    - Ex. Java’s Math class

What is the FTC SDK?

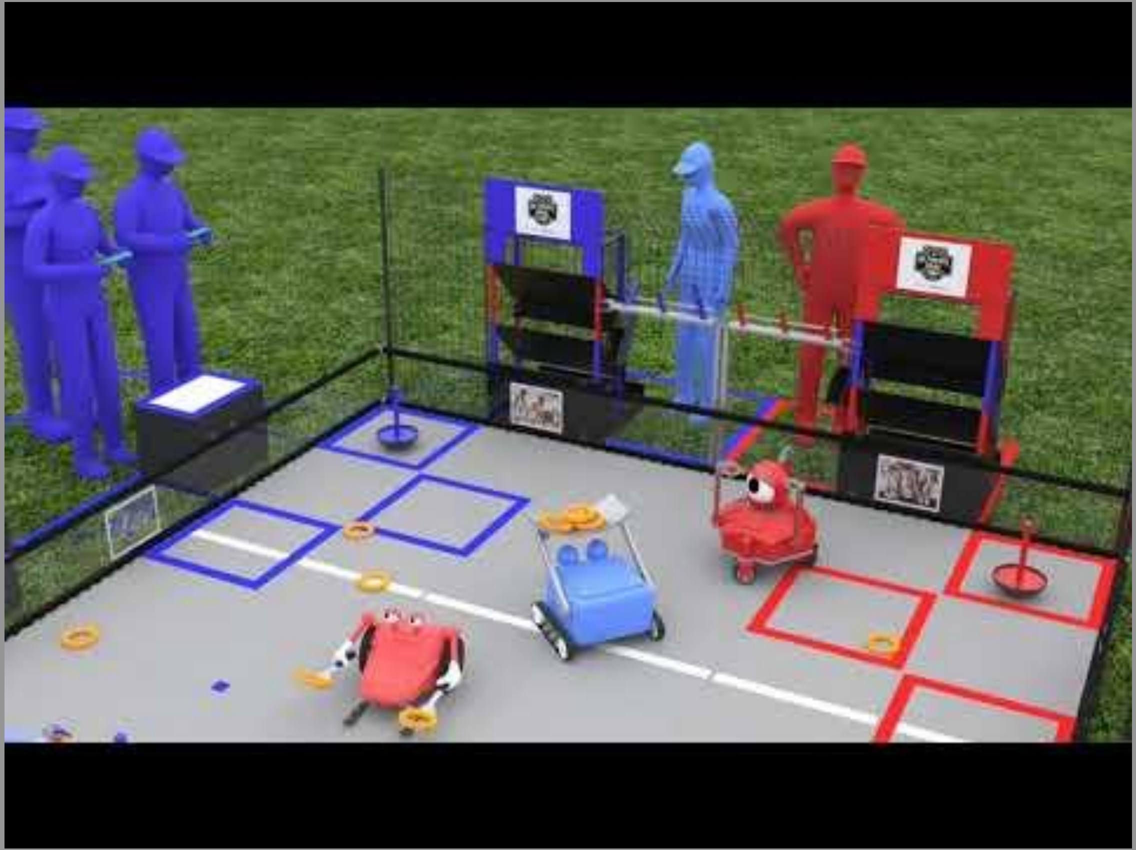
- SDK design specifically for FTC programming
- Provides specific programmed processes
  - Ex. Calling robot.setPower(0)
- Link will be provided as soon as released

Aspects of FTC Competition:

- Two periods with different goals
  - Autonomous - First 30 seconds
  - TeleOp - Remaining 2:00 minutes
    - Endgame - Last 30 seconds of TeleOp

FIRST
TECH
CHALLENGE

Autonomous Period



Autonomous Period

- Only pre-programmed instructions
    - Drivers do not control robot
- Different goals than in other parts of competition

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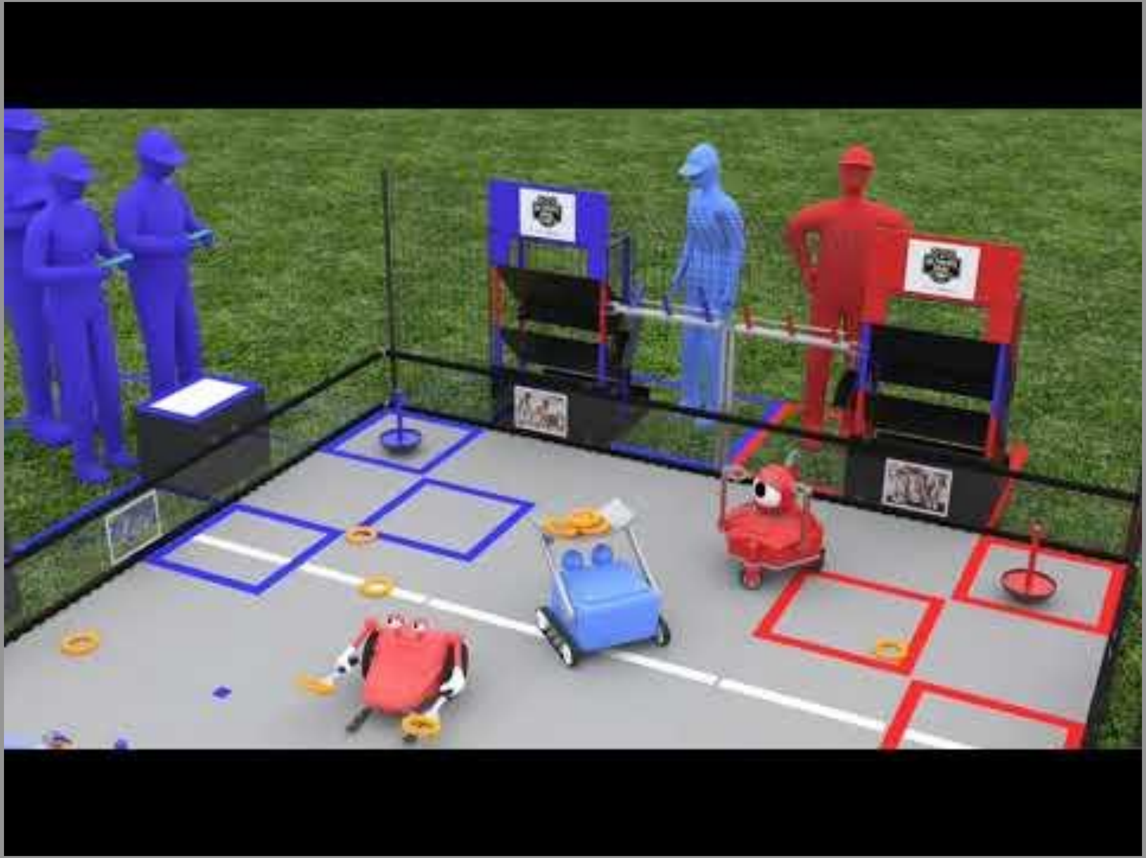
TeleOp Period



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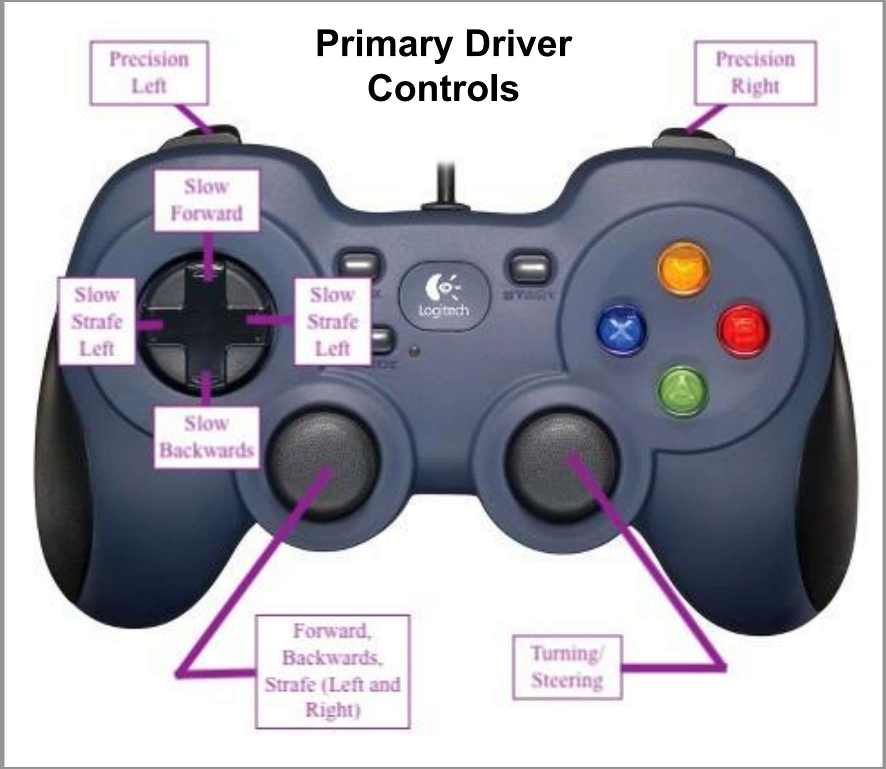
TeleOp Period

- Driver controlled
- Two Driver
    - Primary Driver: Controls driving
    - Secondary Driver: Controls subsystems

TeleOp Period



Sensors

- Gyroscope
- Camera
- Color Sensor
- Touch Sensor

Gyroscope

- Provides accurate angles
- Recommended for precision turning
- Built into Control Hub

Camera

- Used for computer vision
    - Allows to detect different colors, darknesses, etc.
- Detect starter of rings

Color Sensor

- Detect colors
- Determine whether something passes
  - Ex. Rings going through intake
- Sometimes distance sensor
- Driver Automations

Touch Sensor

- Determine contact between two surfaces
- Driver Automations

Motors vs. Servos

- Motors
  - Work with time and encoders
  - Usually used with wheels
- Servos
  - Use positions to complete motions
  - Work only with time or waiting for completion

Movement Tracking

- Time Based
- Encoders
- Odometry

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Time Based

- Uses time (seconds, minutes) to control motion
- Advantages:
    - Travel a distance for a specified time
- Disadvantages:
    - Does not insure for accurate distance
        - Motor/servo only runs as long as programmed for
    - Does not account for slippage

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Encoders

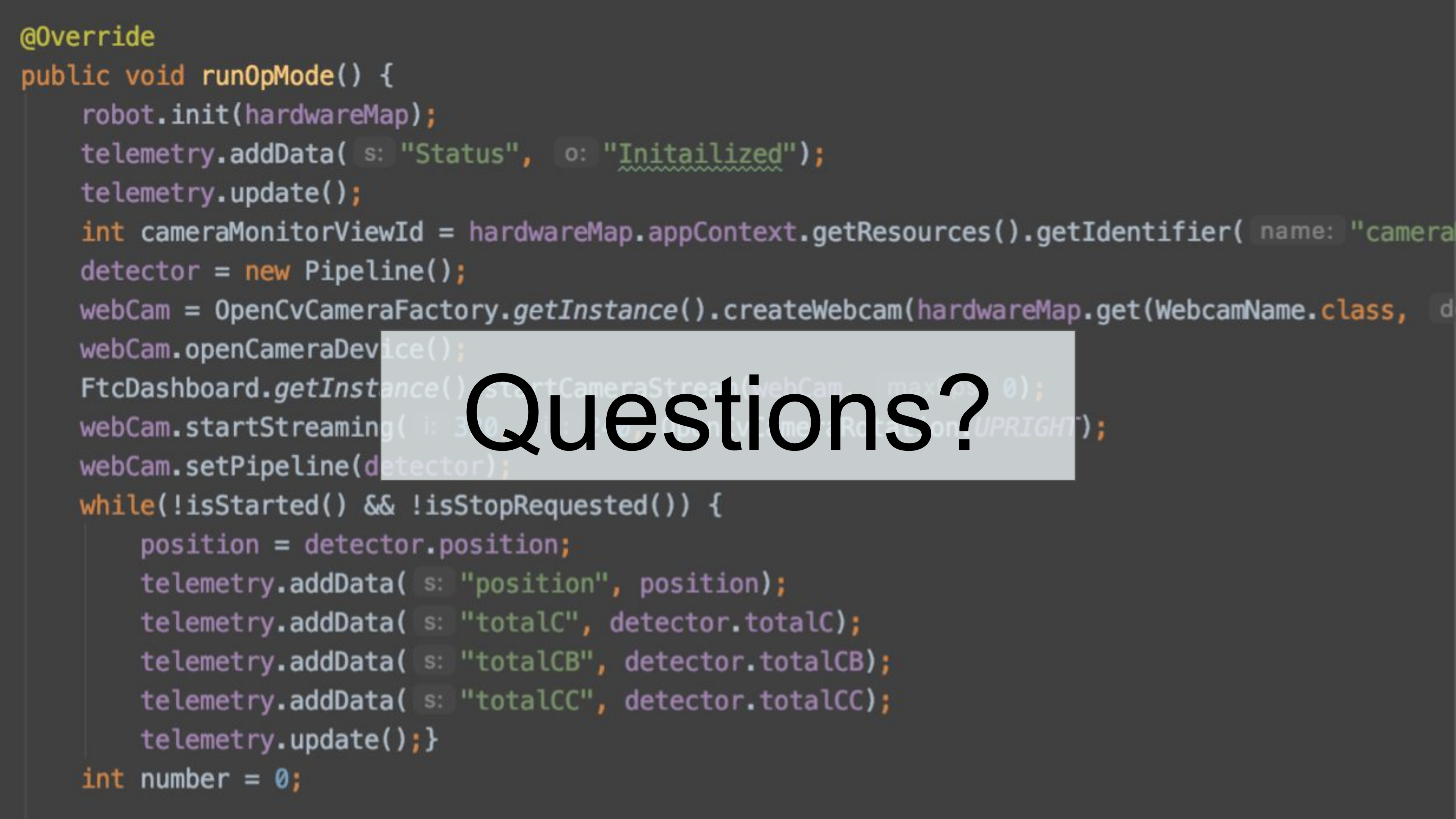
- Plug into motors
- Advantages:
  - Travel precise distances
- Disadvantages:
  - Does not account for slippage
  - Slippage increases as robot travels faster

Odometry

- Uses vertical and horizontal wheels to calculate where to move
- Advantages:
  - Accounts for slippage
  - Travel accurate distances
  - Allows robot to plot own path
- Disadvantages:
  - More difficult to program
  - Wheels difficult to align

Programming in Action

Questions?



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Important Programming Links

Android Studio

Codecademy

This Presentation

Club Announcements

Robotics Application Form

Insurance Website

Club Communication

Remind
Text @phuhsro to
810-10

Discord