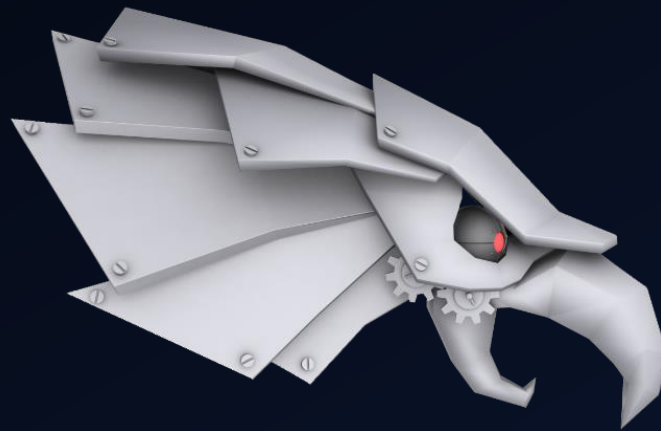


# ***An Introduction to Google Blocks Programming for FTC***

*Rover Ruckus Kickoff 2019-2020*

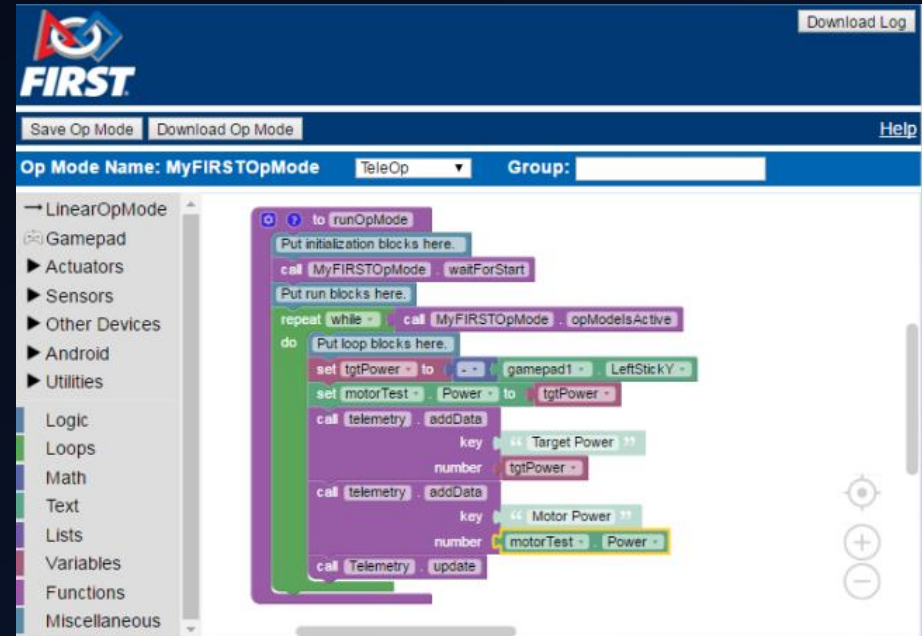
EAGLE ROBOTICS TEAM 7373 CARBON FIBER



# Introduction

What will you learn?

- You will not be a Google Blocks expert
  - This is merely an overview of the basics and how to get started
- Cover the benefits of Blocks, how it works (live demo), settings to configure, and our tips and tricks
- Answer questions and clarify



# FTC Blocks Programming

What is it?

- A version of the Blockly language (made by Google) adapted for use in *FIRST*® Tech Challenge
  - added as a programming option in the 2017-18 season
- Compatible with both REV and Modern Robotics hardware
- Integrated into the FTC Robot Controller/Driver Station App

# FTC Blocks Programming

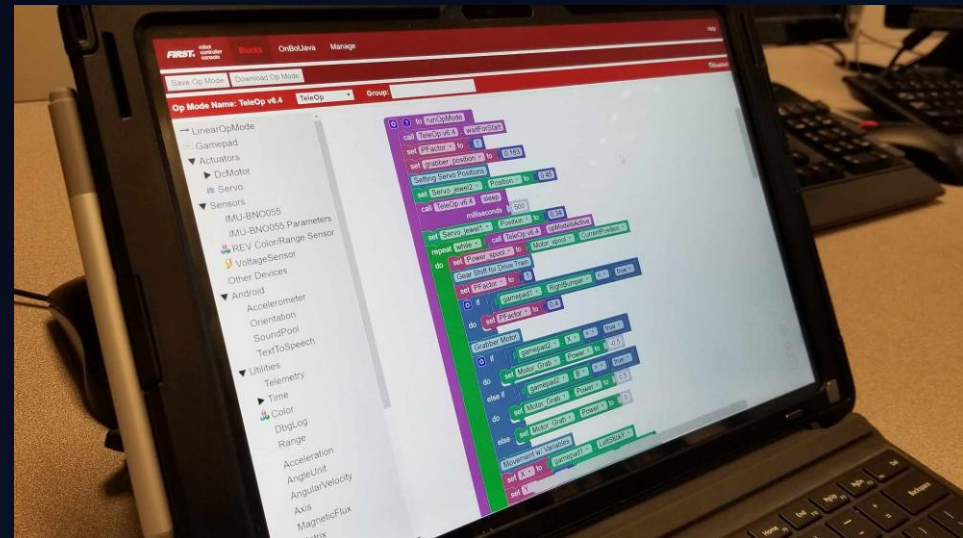
How does it work?

- Teams can create, modify, & store custom programs through a computer and Android devices
  - Code is made in the Blocks website and linked with the phone
- Programs made through connecting a series of block statements to accomplish a task

# FTC Blocks Programming

What are the benefits?

- Setup is minimal and easy (we will cover this)
- Op modes exist on the Blocks website
- Much easier learning curve compared to Java alternatives
- No extra software needed



# Connecting

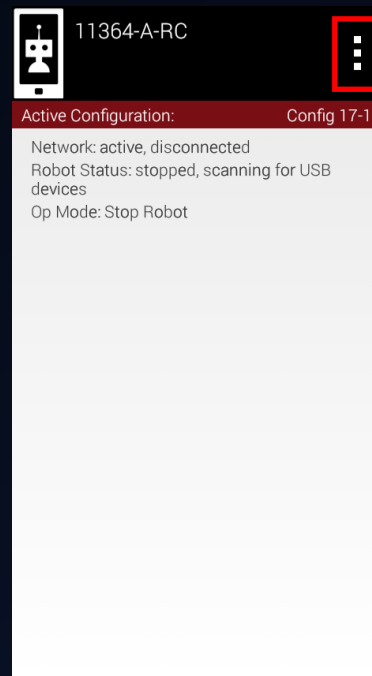
How do I connect the robot controller to my computer?

- Blocks relies on a Wi-Fi connection made between the phone and the computer being used for programming

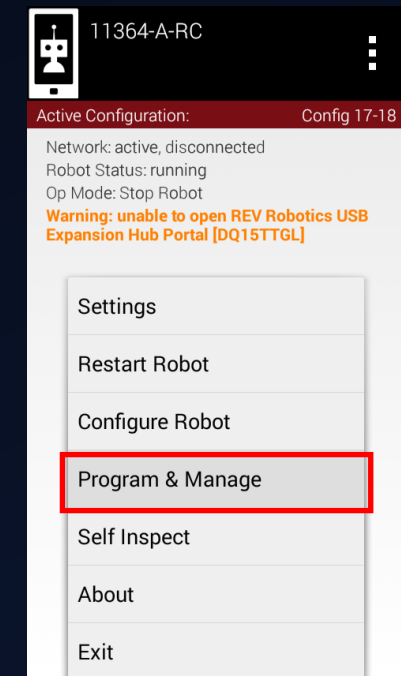
1. Open Robot Controller App



2. Open settings



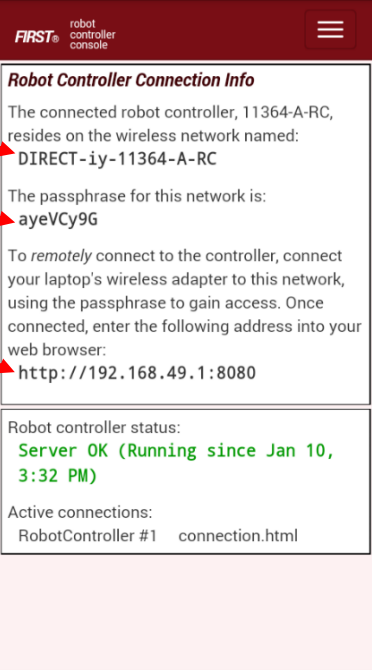
3. Select Program & Manage



# Connecting

How do I connect the robot controller to my computer?

## 4. Use Connection Info



The screenshot shows the FIRST robot controller console interface. It has a red header bar with the FIRST logo and 'robot controller console' text. Below the header, there's a section titled 'Robot Controller Connection Info'. This section contains three paragraphs: the first states the robot controller (11364-A-RC) is on the 'DIRECT-iy-11364-A-RC' network; the second gives the passphrase 'ayeVCy9G'; the third provides instructions for remote connection and the website URL 'http://192.168.49.1:8080'. Below this is a 'Robot controller status' section showing 'Server OK (Running since Jan 10, 3:32 PM)' and an 'Active connections' table with one entry: 'RobotController #1' connected to 'connection.html'. Red arrows point from labels to specific parts of the interface: 'Network Name' points to the network name, 'Network Password' points to the passphrase, and 'Website URL' points to the URL.

Network Name

Network Password

Website URL

**Robot Controller Connection Info**

The connected robot controller, 11364-A-RC, resides on the wireless network named: **DIRECT-iy-11364-A-RC**

The passphrase for this network is: **ayeVCy9G**

To *remotely* connect to the controller, connect your laptop's wireless adapter to this network, using the passphrase to gain access. Once connected, enter the following address into your web browser: **http://192.168.49.1:8080**

Robot controller status:  
**Server OK (Running since Jan 10, 3:32 PM)**

Active connections:

RobotController #1	connection.html
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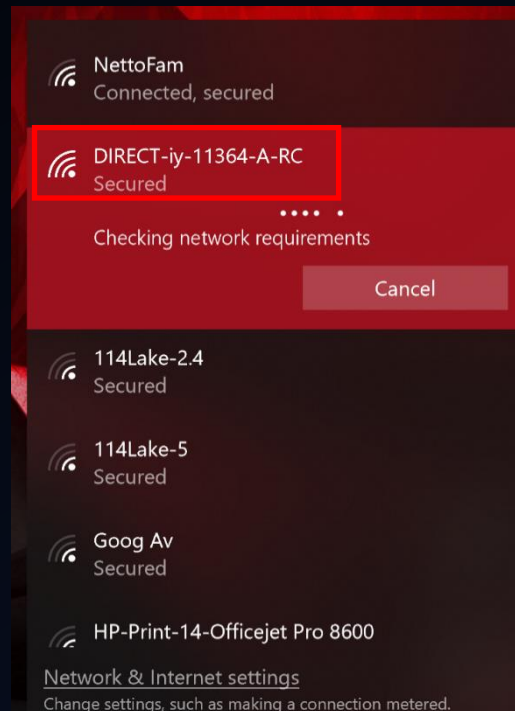


# Connecting

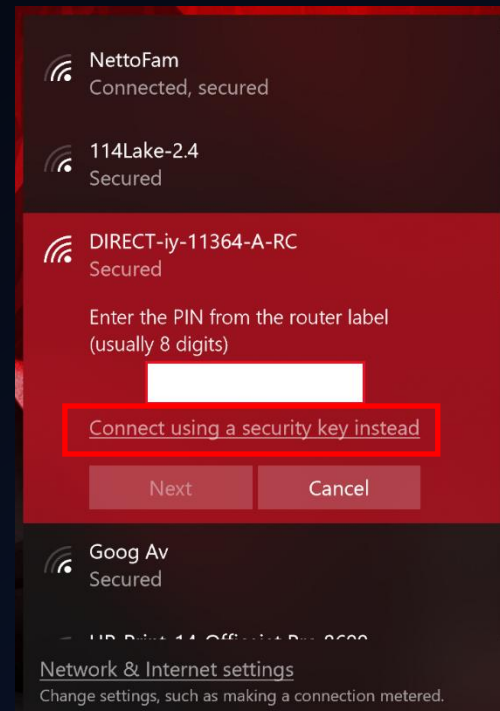
How do I connect the robot controller to my computer?

- Change over to your programming computer to continue
  - Keep the robot controller app open during this process

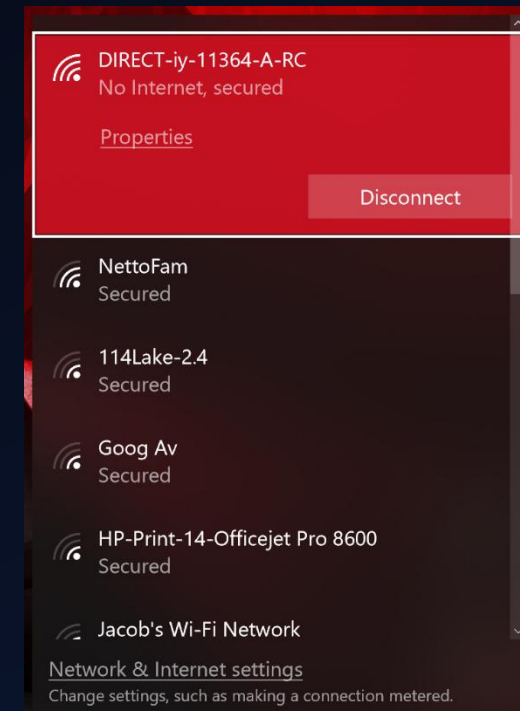
1. Discover phone's network



2. Click "Connect using a security key instead"



3. Enter password and connect



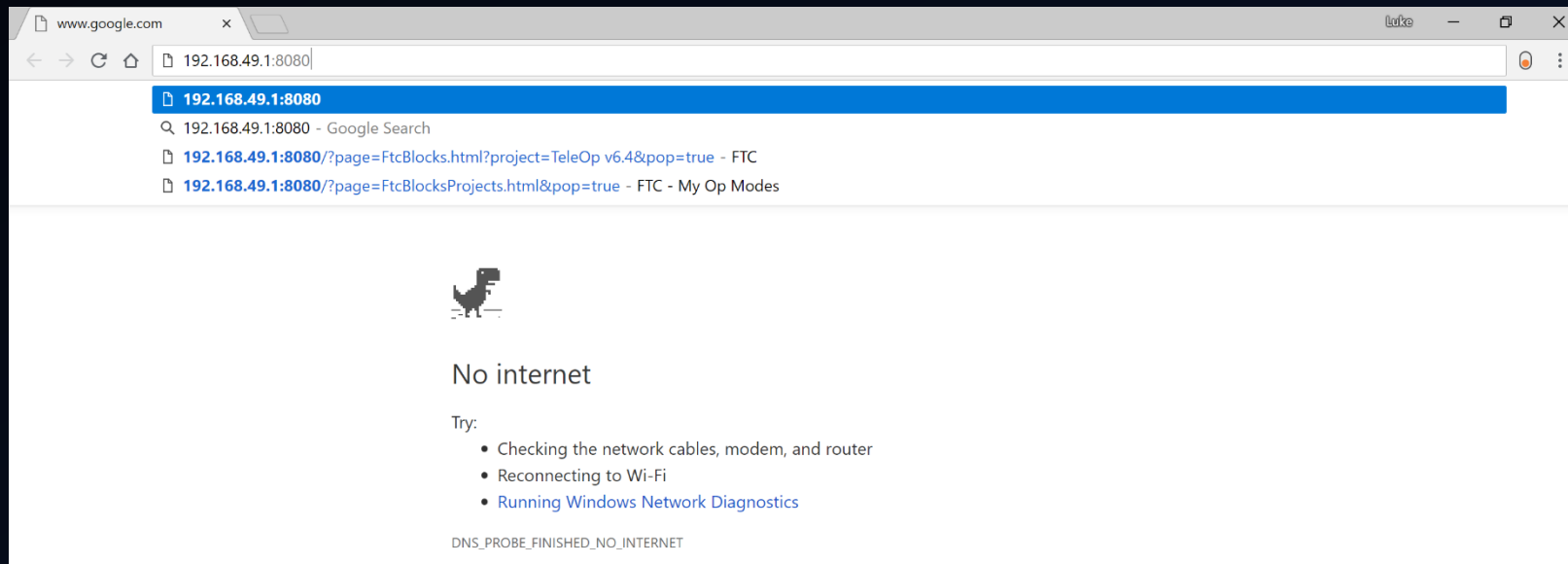


# Connecting

How do I connect the robot controller to my computer?

- Navigate to your preferred browser (Chrome, Edge, Firefox)

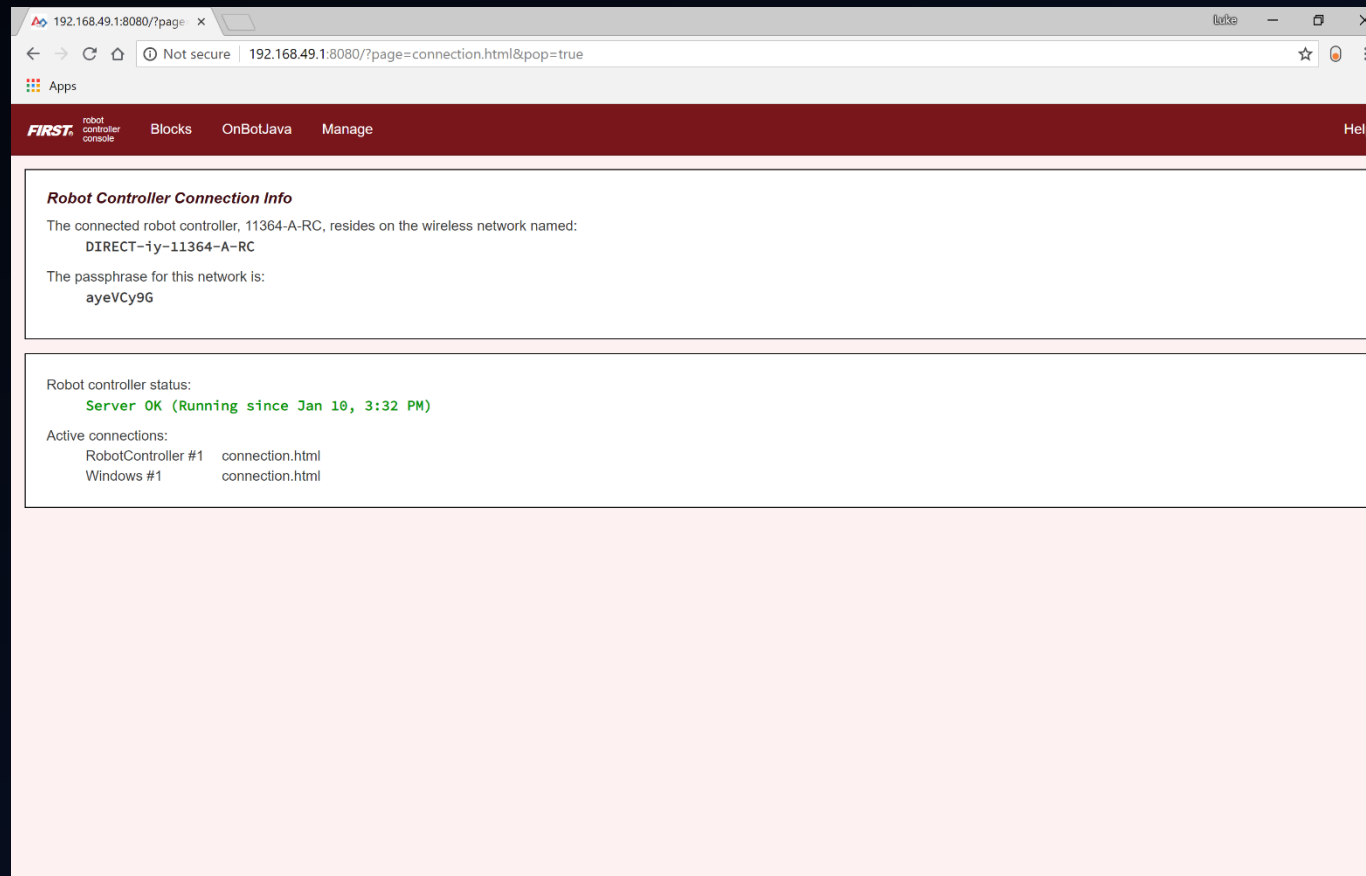
4. Enter website URL



# Connecting

How do I connect the robot controller to my computer?

- You are now connected to the phone and ready to program!



# Configuring

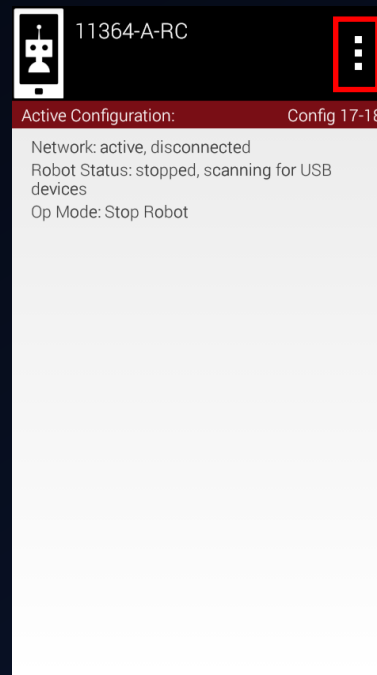
How do I configure the phones?

- Hardware (motors, servos, sensors) need to be recognized and named to be used by Blocks
  - Can then add hardware commands to Blocks code after this is done properly

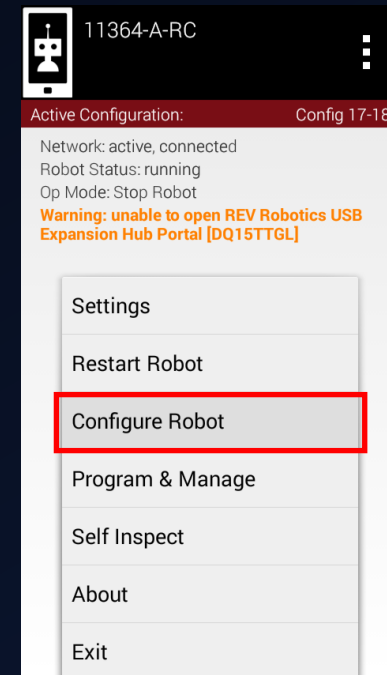
1. Open Robot Controller App



2. Open settings



3. Select Configure Robot



# Configuring

How do I configure the phones?

## 4. Select Edit

Active Configuration: Config 17-18

New

Available configurations:

Config 17-18

Edit Activate Delete

Configure from Template

## 5. Select Scan/Choose Hub Portal

Active Configuration: Config 17-18

Save Cancel Scan

Press the 'Save' button to persistently save the current configuration

Press the 'Scan' button to rescan for attached devices

USB Devices in configuration:

Expansion Hub Portal 1  
DQ15TTGL (not attached)

## 6. Select Expansion Hub

Active Configuration: Config 17-18

Done Cancel

Expansion Hub Portal 1

DQ15TTGL (not attached)

REV E #4

REV E #3

# Configure

How do I configure the phones?

- Now you are able to define your hardware, based on its type, name, and port

## 7. Select hardware type

Active Configuration: (unsaved) Config 17-18

Done Cancel

**REV E #4**

- Motors
- Servos
- Digital Devices
- PWM Devices
- Analog Input Devices
- I2C Bus 0
- I2C Bus 1
- I2C Bus 2
- I2C Bus 3

## 8. Define type & name

Active Configuration: (unsaved) Config 17-18

Done Cancel

Port	Attached
0	NeveRest 40 Gearmot..
	<u>Motor_frontright</u>
	Motor name
1	NeveRest 40 Gearmot..
	<u>Motor_frontright</u>
	Motor name
2	NeveRest 40 Gearmot..
	<u>Motor_backright</u>
	Motor name
3	NeveRest 40 Gearmot..

# Interface

What does Blocks actually look like?

- We will now move on to a live demonstration of the Blocks interface

# Interface

What does Blocks actually look like?

Category	Description
Logic	<ul style="list-style-type: none"><li>logical processes, mainly if else, and, or, =, not equal to statements</li></ul>
Loops	<ul style="list-style-type: none"><li>repeating loops for number of iterations, times, repeat while or until a statement is true or false</li></ul>
Math	<ul style="list-style-type: none"><li>deals with mathematical blocks such as adding, subtracting, multiplying, dividing, exponents, square roots, absolute value of a number, etc.</li></ul>
Text	<ul style="list-style-type: none"><li>deals with text and actual words that appear somewhere</li></ul>
Lists	<ul style="list-style-type: none"><li>deals with lists of items</li></ul>
Variables	<ul style="list-style-type: none"><li>deals with variables and setting certain words or number to equal different values</li></ul>
Miscellaneous	<ul style="list-style-type: none"><li>Comments, null</li></ul>



# Interface

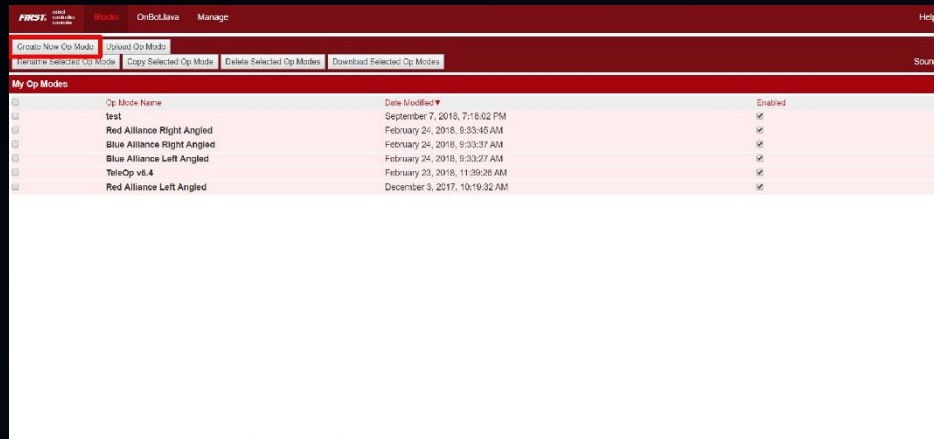
What does Blocks actually look like?

Category	Description
Gamepad	<ul style="list-style-type: none"><li>deals with buttons on the gamepad such as the bumpers or triggers or dpads</li></ul>
Actuators: Motors	<ul style="list-style-type: none"><li>Motors can be either defined 1 by 1 or can be defined 2 at a time. Motors can either be set using power from -1 to 1 or in orientation such as REVERSE or FORWARD</li></ul>
Actuators: Servos	<ul style="list-style-type: none"><li>Servos come in 180 degree and continuous rotation. With 180-degree position positions are between 0 and 1. Limits need to be defined with continuous rotation servos</li></ul>
Sensors	<ul style="list-style-type: none"><li>Include IMU – inertial measurement unit which measures angular velocity or how much the REV Expansion hub turns in degrees and acceleration. REV Color/Range Sensors and voltage sensors</li></ul>
Utilities	<ul style="list-style-type: none"><li>displays values on the driver controller in either text or numbers. Need to have a telemetry update block after if you want telemetry to be real time</li></ul>

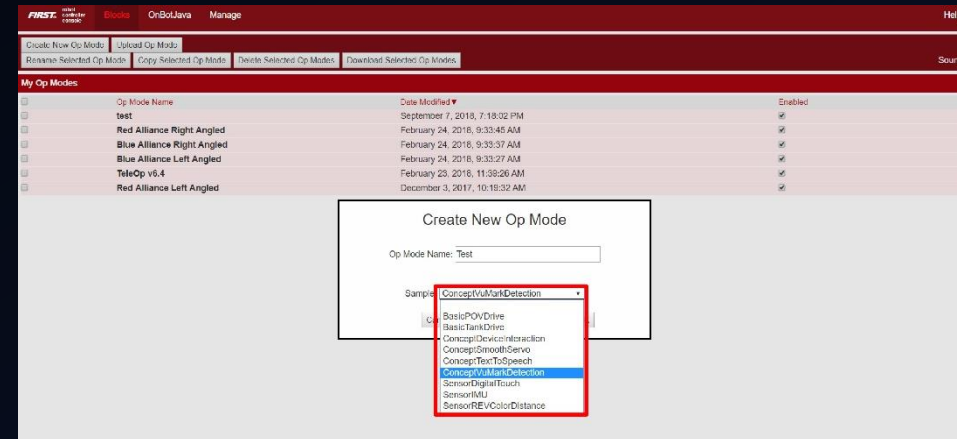
# Interface

## Google Blocks Programming Samples

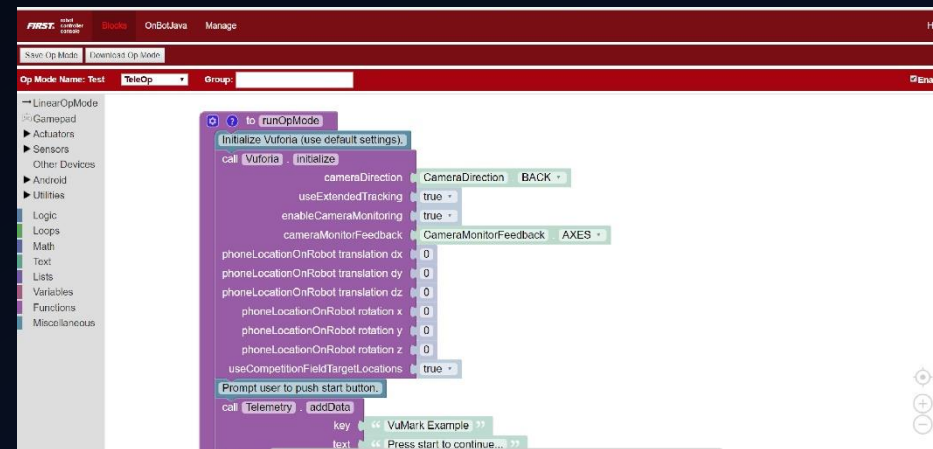
Press Create New Op Mode



Name Op Mode, Select Sample Type, and Press Ok



Vuforia Program Sample



# Our Experiences

What have we learned?

- Had two programmers: one for Autonomous and one for TeleOp
- Make sure to backup programs on a computer or hard drive before every competition
  - Manage versions (0.1 for minor changes, 1.0 for major changes)
- Experiment with variables
  - Define variables at the beginning of code
- Comment each section/function

# Contact Information

## Contact & Resources

- Ben Mueller: [benjaminmuellerusa@yahoo.com](mailto:benjaminmuellerusa@yahoo.com)
- Luke Spinetto: [lukepin21@gmail.com](mailto:lukepin21@gmail.com)
- Brad Smith (Coach): [bsmith@mtparanschool.com](mailto:bsmith@mtparanschool.com)
- Website: <https://www.eaglerobotics.net>
  - Blocks Resources: Scan the QR code on pamphlet