# Pennsylvania



# **Program It!**





Agenda

- New Electronics Rules & Options This Year from REV
- New Rules for Matches
- What is BLOCKS?
- Creating a Teleop Opmode
- Creating an Autonomous Opmode
- REV Color Sensor
- Using Vuforia to "see" the VuMark Pattern

## **Robots: Power Switches**



Power Switch Must Be One of These...



Power Switch on the Modern Robotics Power Distribution Module Is NOT SUFFICIENT This Year!

## **Robots: Alternate Electronics**



### **REV Robotics Expansion Hub**



### Each Hub (Max. 2 Per Robot):

- 4 Motors (with encoders)
- 6 Servos
- Analog (4), I2C (4), Digital (8)
- Bosch 9 axis IMU

#### Pros:

- Cheaper

#### Cons:

- New Motor Connectors
- Smaller Footprint
   New Power Connectors
- Fewer Wires
- Integrated IMU

## **Robots: DEMO Bot Comparison**



### Modern Robotics



### **REV Robotics**



## **Robots: REV vs. Modern Modules**







## **New Rules for Playing Matches**

- Autonomous Mode Starts
- Autonomous Mode Ends after 30 Seconds
- Immediately Pick Up Controllers & Initialize Teleop (5 Seconds)
- Game Announcer Counts Down 3-2-1
- Driver Control Period (Teleop) Starts!

NOTE: FTAs cannot restart robots; Refs cannot fix robots that are entangled or flipped over

## What Is Blocks?



#### https://www.firstinspires.org/resource-library/ftc/technology-information-and-resources

### **Blocks Programming Tool**

- A new graphical development tool available for FTC teams
- Powered by Google's Blockly programming language
- Create, modify and store programs directly on FTC Robot Controller
- Replaces App Inventor
  - App Inventor Phased Out After This Season



## **Start With FTC App Version 3.4!**



- Download and Install Driver Station and Robot Controller
- Important to Use Latest Version (3.4)
  - Minimum Version for this Season is 3.3
  - Latest Bug Fixes
  - Latest Support for Blocks and OnBot Java
  - Includes Images for Game

#### Tap "3 dots" in Upper Right of Robot Η **Programming Mode** Controller Connect your laptop's wireless adapter to the following network: Choose "Program & Manage" DIRECT-F3-9999-C-RC Use the following passphrase to gain access to the • This is Displayed network: 3lipIBQm Once connected, enter the following address into your web browser: http://192.168.49.1:8080 Server status: Server OK (Running since 10/13, 10:17 AM) **Display Server Log**

**Enter Programming Mode** 

FIRST TECH CHALLENGE

## **Connect Computer to RC Phone**

- Click on Wi-Fi Icon on Taskbar
- Click on the RC Phone SSID
  - In this example: DIRECT-Zb-4433-Y-RC
  - Note that this may not appear.
  - If it is not there, click "Network & Internet Settings" and add it manually
- Enter the Password Listed on RC Phone





# Open a Browser (Chrome Recommended)

- Enter URL Listed on the RC Phone (e.g. 192.168....)
- Click on "Blocks" to Begin Programming
- Or OnBotJava if you like java!

Controller console	Blocks	OnBotJava	Manage
Robot Co	ntroller Con	nection Info	
The conne	cted robot con	troller, 4433-Y-	RC, resides on the wireless network named:
DI	RECT-Zb-44	33-Y-RC	
The passpl	hrase for this r	network is:	
el	lVKmrQI		
Robot cont	roller status:		



## Manage Option

$\rightarrow$ C (	) 192.168.49.1:8	0/?page=manage.html&pop=true
robot controlle console	r Blocks	nBotJava Manage
Robot C	Controller Nam	
	1433-Y-RC	Change Name
Downlo	ad Robot Con	oller Logs
Examinat	ion of activity log	from the robot controller can sometimes help diagnose problems and bugs.
Downloa	ad Logs (1)	
	Expansion Hu	Firmware
Upload		
<b>Upload</b> Upload fii	rmware for the R	/ Expansion Hub to the robot controller. Once uploaded, the firmware can be installed on E



## **Blocks**

- Create New Op Mode

   Start coding from scratch, OR
   Using one of the Examples
- Upload Op Mode
  - Send a \*.blk file to the RC Phone
- Download Selected Op Modes
  - Transfer from RC Phone to Computer
  - Look in Downloads Folder

← → C 01	odes 92.168.49	× \1:8080/?page=FtcBlocksF	Projects.html&pop=true	
FIRST. robot controller console	Blocks	OnBotJava Mana	ge	
Create New Op Mo	de Uplo	ad Op Mode		
Rename Selected C	Op Mode	Copy Selected Op Mode	Delete Selected Op Modes	Download Selected Op Mode



Make sure you back up your Blocks Programs!!!

## **Starting a New Teleop Op Mode**



- Sets Up The Basics
  - Initialization
  - Wait for Start
  - Event Driven Loop
  - Automatically Stops
     After 2 Minutes



## Initialization



- "Set" creates a variable and assigns it a value.
- Click "Variable" on Left Side of Screen.
- Drag "set varname to" into program.



## Loop: Get Gamepad Data



- Assign gamepad1 joysticks to variables MotorPower & MotorPower2
- Scale them by multiplying by 0.5
  - This is a bit extreme BUT
  - Need some check to keep them from being < 0 or > 1





## **Other Buttons Control Servos**

 Adjust values of ClawPos & ArmPos based on triggers and bumpers



## **Set Motor Power & Servo Positions**



- Set servo positions
- Loop back to beginning and wait for more events





## Simple Linear Autonomous Op Mode





## **Better Simple Autonomous Op Mode**







## **Color Sensor Example**

Display reflected light.		Create New Op Mode
call Telemetry . addData		Op Mode Name: ColorTest
key 🕽 🎸 Light detect	ted >>	
number 🖌 color 🔻 . Ligh	ntDetected	Sample: SensorREVColorDistance v
Convert RGB values to HSV color model.		Cancel
See https://en.wikipedia.org/wiki/HSL_and_HS	V fo	
set colorHSV to C call Color . argbToC	Color	
a	Ipha 🕻 color 🔽 . Alpha 🔽	
	red ( color 🔨 . Red 🔽	
g	reen 🕻 color 🔨 . Green 🔨	
	blue ( sensor_color_distanceas	Lynxl2cColorRangeSensor, Blue
Get hue.		
set hue to Color . Hue	Click dropdo	own list to see what you called the sensor,

In this case: color

## **Use Color to Control the Arm**







## **Using Vuforia for Image Recognition**

- Click "Create New Opmode"
- Enter an Op Mode Name
- Pull down list of Samples:
  - ConceptVuMarkDetection

Cr	eate New Op Mode
Op Mode Na	me: VuMarkTest
Sample:	ConceptVuMarkDetection •
Car	OK



## **Vuforia Continued...**



• Fully functional app you can customize!



## Vuforia – Recognize Images





## **Vuforia – Get Coordinates**







# **Good Luck!**