

# codestock

## ROBOT ROYAL RUMBLE



@joshgretz



github/jgretz





# JOSH GRETZ

truefit

Husband

Father

Tinkerer

CTO

# WHO IS THIS TALK FOR?

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## INTERESTED BEGINNER

Maybe you've seen some videos or other talks on robotics, but aren't quite sure how to get started

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## HOME HACKER

The number of "connected" devices today is astounding, with more coming every day. Maybe you are someone who wants to hook up their home to their phone.

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## EXPERIENCED CODER

Every day you spend crafting solutions for your company and you have mastered one or more languages along the way. What if you could use that knowledge to control robots?

# WHAT ARE WE TALKING ABOUT?

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## HOW TO GET STARTED

You've decided to get started, now what do you do?

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## PROS / CONS

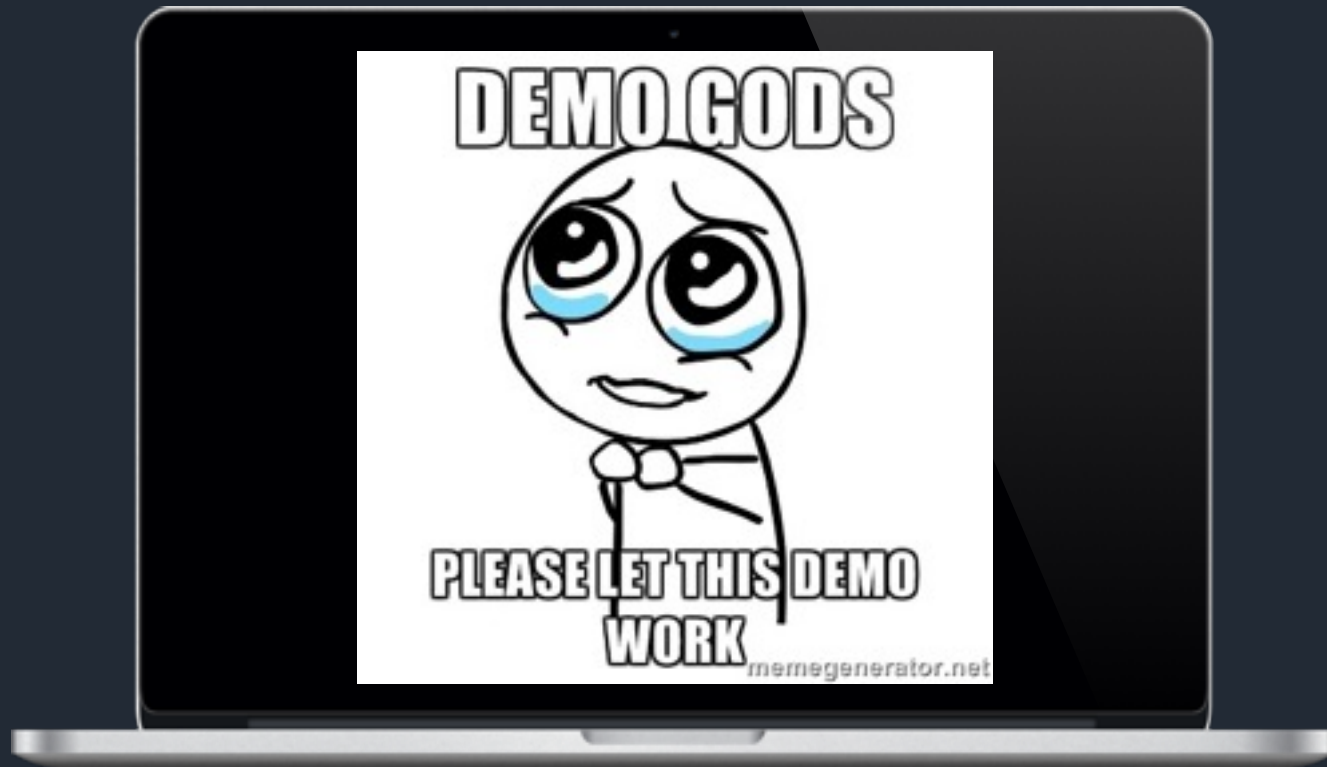
Each language naturally has it's own pros and cons. We will look at those with a lens filtered by their robotic ecosystem

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## WIDE, NOT DEEP

We have a lot of ground to cover today, as such we will just be skimming the surface with each of the languages, touching on the basics.

# LOTS OF DEMOS



WE WILL LOOK AT CODE FOR EACH LANGUAGE



ALTHOUGH WE WONT LIVE CODE, WE WILL RUN IT  
AGAINST A LIVE ROBOT



SO BE KIND

# THE BODY

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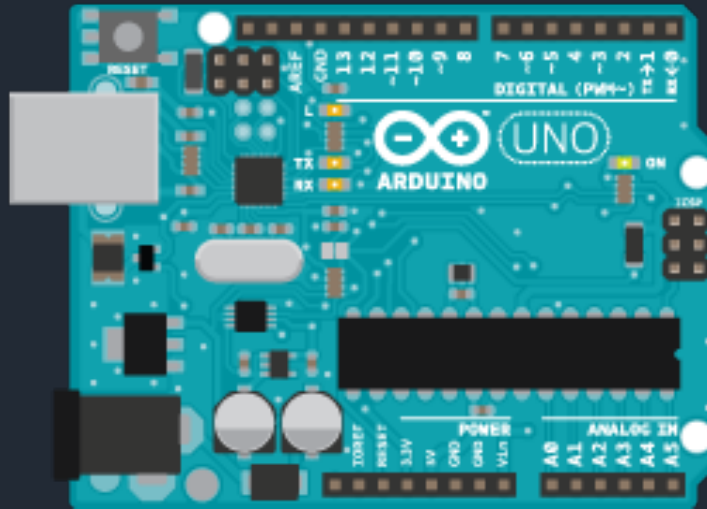
We will be using the  
Zumo Robot for Arduino



# THE BRAIN

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We will be using the Arduino UNO as the basis for our discussion today. Its versatile, easy to work with, and affordable



# GETTING STARTED



## Buy a board

You can buy a board for around \$25 and can find it almost anywhere Amazon, Newegg, or the Arduino site itself.



## Download the IDE

Download the IDE from the [Arduino site](https://www.arduino.cc/). You will need it even if you are going to use another language and IDE.



## Decide on a project

I've always found it better to learn in the context of a project, it gives you something to target.



## Grab a longer cable

The Arduino boards typically come with a 3" cable, I've always found that to be too short, so grab at least a 6" A-B USB cable while you are ordering.







NOW THAT WE HAVE THE HARDWARE  
LETS GET STARTED



# WHO ARE THE CONTESTANTS



- 1** **C**  
Low-level, functional - the incumbent default
- 2** **C#**  
Microsoft's flagship language - well known, but an underdog in robotics
- 3** **Go**  
Google's newest entry into the fray, Simple, yet elegant.
- 4** **Ruby**  
Easy to learn, older than you might think, often forgotten outside Rails
- 5** **Javascript**  
Currently eating the world and robotics is no different



C

# LET'S LOOK AT



**VERSATILE**  
**WELL KNOWN**  
**& BUILT IN**

Despite its low-level capabilities, the language was designed to encourage cross-platform programming.

The language has become available on a very wide range of platforms, from embedded microcontrollers to supercomputers.

# PROS / CONS

## PROS

Built In

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Lots of Examples

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Runs On Device

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## CONS

Low Level

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Manual Memory

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No Debugging

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# GETTING STARTED

- We've already covered it - install the Arduino SDK and that's it!



DEMO





QUICK SIDETRACK - FIRMATA

# FIRMATA

Firmata is a protocol for communicating with microcontrollers from software on a host computer.

You load the firmata onto your arduino, then in the language of choice, you interact with an SDK that is implemented against the same protocol.

Arduino has had a list of firmatas developed for it from python to elixir. We will be using these firmatas for the remainder of the talk.

[Github](#)



DEMO



C#

# LET'S LOOK AT



**MODERN**  
**MANAGED CODE**  
**& POWERFUL**

A general-purpose,  
object-oriented  
programming language.

It is intended to be a  
simple, modern,  
general-purpose,  
object-oriented  
programming language.

# PROS / CONS

## PROS

C#

Visual Studio

## CONS

Fringe

Specialized Hardware

Manual Code

# GETTING STARTED

- Windows
- .Net 3.5 - 4.5
  - Key is you need System.IO.SerialPort
- There are attempts at C# Firmata libraries, but they haven't kept up with the times
  - [Firmata.NET](#)
  - [SolidSoils](#)

# WHAT ABOUT .NET CORE?

Unfortunately, they chose to not implement `Serial.IO.Ports` in .NET Core yet.

Depending on who you ask, it may or may not be on the roadmap, but they have at least acknowledged that it been requested



# ASIDE - A DIFFERENT APPROACH

Microsoft has taken a mixed approach to IOT. Rather than integrating with arduino there are two alternative approaches:

- [Windows 10 IOT](#)
- [Netduino](#)



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GO



JOE

# LET'S LOOK AT



**CONCISE**  
**SIMPLE**  
**& SAFE**

In the tradition of C,  
but built to answer  
many of it's  
shortcomings.

Built-in concurrency.

Intentionally kept small  
to fulfill the goal of  
having the entire  
language be simple  
enough to be held in a  
single programmers  
head

# PROS / CONS

## PROS

Fast

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Simple Language

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Concurrent

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Lots OOB Support

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## CONS

Smaller Community

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Simple Language

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Young Language

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# GETTING STARTED

- Install [Go](#)
- Install [Gobot](#)
- Flash Arduino with the Standard Firmata
- Install [gort](#)
- Copy the port your arduino is connected to

# DRIVERS OUT OF THE BOX

- Ardrone
- Arduino
- BeagleBone
- Bebop
- C.H.I.P.
- Digispark
- Intel Edison
- Joystick
- Keyboard
- Leap Motion
- Mavlink
- MQTT
- Neurosky Mindwave
- OpenCV
- Pebble
- Raspberry Pi
- Spark
- Sphero
- Analog Sensor
- Button
- Direct Pin
- Grove Touch
- Grove Sound Sensor
- Grove Button
- Grove Buzzer
- Grove Rotary
- Grove Relay
- Grove Temperature Sensor
- LED
- Makes Button
- Moto
- Servo
- BlinkM
- Grove LCD
- Grove Accelerometer
- HMC6352 Compass
- LIDAR-Lite
- MPU6050
- MPL115A2
- Wiimote with Nunchuck





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RUBY

# LET'S LOOK AT



**DYNAMIC**  
**REFLECTIVE**  
**& FRIENDLY**

Designed for programmer productivity and fun following the principles of good interface design

Object Oriented (by default), it's intent is behave in way that minimizes confusion for experienced programmers

# PROS / CONS

## PROS

Unicorns

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Stable

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Gems

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## CONS

Small Community

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Rails

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Speed

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# GETTING STARTED

- Install [Ruby](#)
  - Install [Artoo](#)
  - Flash Arduino with the Standard Firmata
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- Install [gort](#)
  - Copy the port your arduino is connected to

# DRIVERS OUT OF THE BOX

- Ardrone
- Arduino
- BeagleBone
- Crazyflie
- Digispark
- Joystick
- Keyboard
- Leap Motion
- Neurosky Mindwave
- OpenCV
- Pebble
- Raspberry Pi
- Roomba
- Spark
- Sphero
- Analog Sensor
- Button
- Continuous Servo
- LED
- Makes Button
- Maxbotix
- Moto
- Servo
- BlinkM
- HMC6352 Compass
- Wii Classic Controller
- Wiimote with Nunchuck



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# JAVASCRIPT



# LET'S LOOK AT



**DYNAMIC**  
**FLEXIBLE**  
**& FAMILIAR**

A high level, untyped  
interpreted programming  
language.

Commonly used as one of  
the three core Web  
technologies alongside  
HTML and CSS.

# PROS / CONS

## PROS

Large Community

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NPM

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Common

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## CONS

JS Bad Parts

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Speed

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# GETTING STARTED

- Install [Node](#)
  - Install XCode
  - Install node-gyp
  - Install [Johnny-Five](#)
  - Flash Arduino with the Standard Firmata Plus
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- Install [gort](#)
  - Copy the port your arduino is connected to

# DRIVERS OUT OF THE BOX

- Arduino
- SparkFun
- chipKit
- Spider Robot
- DFR Robot
- Teensy 3
- BeagleBone
- C.H.I.P
- Blend Micro
- Elector Imp
- Intel Galileo Gen 1 & 2
- Intel Edison
- LightBlue Bean
- Lining One
- pcDuino3 Dev Board
- Pinoccio Scout
- Raspberry Pi
- Particle Core
- Particle Photon
- Tessel 2
- LED
- Motor
- Stepper Motor
- Servo Motor
- GRP
- Lego NXT
- Lego EV3
- Button / Switch
- Keyboard
- Keypad
- Relay
- Infrared
- Proximity
- Motion
- Joystick
- Magnetometer
- Sensors (Temp, Gyro, Noise, Accelerometer, etc ...)
- Grove
- **And More ....**



DEMO

# WHO WINS?



# WHERE DO I GO FROM HERE

- Grab an arduino
- Start a project!
  - Don't be intimidated by hardware - there are plenty of kits out there that are pre-assembled
- [Make Electronics](#)
- [Raspberry Pi](#)

Thank You

Any Questions?



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